SPECIFYING CAUSAL RELATIONS BETWEEN
STUDENTS’ GOALS AND
ACADEMIC SELF-CONCEPT:
AN INTEGRATED STRUCTURAL MODEL OF
STUDENT MOTIVATION

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Statement of Authentication

The work presented in this thesis is, to the best of my knowledge and belief, original except as acknowledged in the text. I hereby declare that I have not submitted this material, either in whole or part, for a degree at this or any other institution.

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We shall not cease exploration
And the end of all our exploring
Will be to arrive where we started
And know the place for the first time.

T.S. Eliot (1888-1965)
ABSTRACT

Specifying causal relations between students’ goals and academic self-concept: An integrated structural model of student motivation

Relationships between students’ goals and their academic achievement have been widely explored in the literature. Similarly, relationships between students’ academic self-concepts and their achievement have also been widely investigated. However, inter-relationships between students’ goals and academic self-concepts, and how these two sets of variables interact to influence academic achievement, remain largely unexplored. Consequently, the present study seeks to provide an integrative framework which proposes that, when combined, achievement goals (academic and social goals) and domain-specific academic self-concepts (English and Mathematics) provide a more comprehensive explanation of student achievement than either set of variables taken alone.

The central aim of this thesis was to investigate relationships between students’ goals and self-concepts and to demonstrate how these two sets of motivational variables interact to influence academic achievement. Answers were, thus, sought for vexed questions concerning the causal ordering of students’ goal orientations, academic self-concepts and academic achievement by hypothesising three competing models of causality: (a) goal orientations affect academic self-concepts, which in turn affect subsequent academic achievement, (b) academic self-concepts affect goal orientations, which in turn affect subsequent academic achievement and, (c) goal orientations, academic self-concepts, and academic achievement affect each other such that they are reciprocally related over time.

The study involved a 3-year panel design which examined the causal orderings described above utilising longitudinal structural equation modelling. Data were derived from 535 Australian high school students in Years 7, 8, and 9 in the first year of the study, Years 8, 9, and 10 in the second year, and Years 9, 10, and 11 in the final year of the study.
Key findings from the study include: (a) that students’ goal orientations and academic self-concepts can be validly conceptualised as interrelated components of an overall model of student motivation that is multidimensional and hierarchically structured, and (b) there is evidence for the causal predominance of self-concepts over goal orientations with respect to subsequent academic achievement. Findings from this research hold important implications for our theoretical understanding of factors affecting student motivation, and also for educational practice and research relating to students’ goals and academic self-concepts. These implications, in turn, provide new perspectives for promoting optimal motivation and academic achievement amongst secondary school students.
CHAPTER 1
INTRODUCTION

1.1 Disentangling the Causal Ordering of Students’ Goal Orientations, Academic Self-concepts, and Academic Achievement

This study addresses the complex nature of student motivation. It presents an integrated model of student motivation by combining two related but independent constructs, goal theory and academic self-concept, with the purpose of providing a more comprehensive explanation for academic achievement. A small number of studies have investigated relations between goals and academic self-concept. Of these studies, most have examined relations utilising correlations with a single wave of data. Although these correlations are informative and heuristic, such that they provide important information concerning the nature of the relationship, they neglect to explain the underlying mechanisms responsible for the pattern of relations. To extend previous research and to address this apparent void, this study (a) demonstrates not only how students’ goal orientations and academic self-concepts are related but also how these constructs relate over a period of three years, (b) examines whether they combine to affect subsequent academic achievement, and (c) most significantly, focuses on unravelling the underlying mechanisms that are responsible for the pattern of relations by disentangling the causal flow of these two constructs.

This study sets out to demonstrate that in learning situations, perceptions of ability (academic self-concept) and perceptions of the purpose of a task (goal orientations) combine to influence achievement behaviour. It is argued that when combined, goal orientations and academic self-concepts can provide a more thorough and comprehensive explanation of student achievement than either set of constructs taken alone. This integrative model proposes that in learning situations, students question
themselves about how capable they are and question the reasons why they should achieve (or not) at learning tasks. Thus, academic self-concept and goal orientations are related such that they interact to affect achievement-related behaviours. Centrally, this study extends beyond examining ways in which goals and self-concept are related but aims to identify which of these two key psychological drivers is causally predominant in affecting subsequent academic achievement.

In tackling the vexed question of causal ordering, three alternative models of causation are hypothesised, each of which is tested in an attempt to find the model that best explains relations between goal orientations, domain-specific self-concepts, and academic achievement. These three competing models of causality comprise: (1) prior goal orientations affect domain-specific self-concepts, which in turn affect subsequent academic achievement, (2) prior domain-specific self-concepts affect goal orientations, which in turn affect subsequent academic achievement, and (3) goal orientations, domain-specific self-concepts and academic achievement are mutually reinforcing such that they are reciprocally related.

Recommended procedures for analysing longitudinal causal models have recently been proposed by Marsh, Byrne, and Yeung (1999) and are applied to this study. Based on these guidelines, analyses in this study progress with straightforward confirmatory factor analysis (CFA) and progress to testing more complicated CFA models to resolve measurement errors. Following the CFAs, a full-forward longitudinal structural equation model (reciprocal effects model) and two alternative causal models (goals causally predominant model and self-concept causally predominant model) are tested to determine which of these models provides the best representation of the data.

In the course of unifying the literature on student motivation the foreseen contributions of this study to theory and practice are multifold:

- it provides an integrative measurement model of student motivation which comprises goal orientations and academic self-concept;
- in contrast to the majority of goal theory research, which typically examines mastery and performance goals, this study includes an additional salient goal pursued by adolescents, social goals, in the goal theory framework;
- consistently with the trend of research that “emphasises a positive psychology” (Marsh & Craven, 2006, p.133) this study exclusively focuses on approach forms of goal orientations, not avoidance goals. This is primarily a result of the fact that the instrument utilised in this study was designed prior to the recent spate of literature on avoidance goals but also a result of wanting to focus on adaptive goals and their relation to academic self-concept and achievement;

- the study enriches our understanding of goal structures and the coordination of multiple approach goals;

- the study highlights issues with contemporary conceptualisations of the hierarchical structure of academic self-concept;

- the complex nature of the relations between goal orientations (mastery, performance, and social approach goals) and English and mathematics self-concepts are revealed, as well as their relations to academic achievement;

- relationships between the constructs and their relationship to academic achievement, which to date have typically been examined utilising (chiefly single wave) correlational or experimental methods, are assessed using longitudinal data;

- a significant contribution of this study is the examining of the causal flow between goal orientations and academic self-concept and their effects on academic achievement; and

- findings emerging from the study present a number of substantive and methodological implications for researchers and educational practitioners.

The following four chapters (Chapter 2 through to Chapter 5) presents a review of the literature as it applies to this study. Specifically, Chapter 2 considers the multidimensionality of goals and academic self-concept and presents the proposed integrative model of student motivation. Whereas Chapter 2 considers the multidimensionality of goals and academic self-concept, Chapter 3 considers the potential for these constructs to be hierarchically structured.
In order to explain causal relations between goals, self-concepts, and academic achievement, it is essential to examine how these variables relate with each other before making predictions on possible causal orderings. Chapter 4 reviews research that demonstrates how goals and academic self-concept independently relate to academic achievement. Following this, Chapter 5 reviews the literature examining the direct relationship between goals and academic self-concept. This research is then used to formulate competing models of causality between goals, domain-specific self-concepts, and academic achievement. A rationale for these competing models of causation is detailed in Chapter 5.

Chapter 6 presents the hypotheses and research question. Chapter 7 provides an orientation to the methodology and Chapter 8 discusses methodological considerations. Chapters 9 through 12 present the first-order confirmatory factor analyses, the results, and a discussion of the findings. Chapter 13 presents the higher-order analyses, the results, and a discussion of the findings. Chapter 14 presents the longitudinal structural equation analyses, the results, and a discussion of the findings. Chapter 15 provides a general discussion of all key findings from analyses conducted in the thesis and Chapter 16 presents the conclusion.
CHAPTER 2
MULTIDIMENSIONAL NATURE OF GOAL ORIENTATIONS
AND ACADEMIC SELF-CONCEPT

2.1 Integrated Models of Student Motivation

In 1994 Paul Pintrich invited researchers to contemplate current research and literature on motivation, to attempt to link it meaningfully together, and to develop more thorough integrated theoretical models. He highlighted that prior research on the processes involved in learning in a school context had focused predominantly on cognitive, motivational, and affective components independently of each other, and very few studies had attempted to examine interactions and interrelations among these components. He highlighted the consequential need for integrated models that incorporate a number of components in order to provide a more comprehensive explanation for student learning and achievement. This research fills some of this void by going beyond the separate analyses of variables. It proposes an integrated model which not only incorporates both motivational (goal theory) and affective components (self-concept), but also relates a cognitive dimension (student academic achievement). The proposed model demonstrates how these variables interrelate but, more importantly, how they relate over a period of time. The purpose of the integrated model of student motivation is to explain how goals and academic self-concept may be causally related and how they may combine to affect academic achievement in high school age students.

This research is structured along two dimensions that may be related to academic achievement: (a) achievement goal theory and (b) academic self-concept. A rationale for combining these two constructs into an integrative model of student motivation is initially explained. Following this justification, Chapter 2 continues by
reviewing goal theory and academic self-concept and proposes that both constructs are multidimensional. The following chapter (Chapter 3) addresses recent advances in conceptualising goals and academic self-concept and examines whether the structure of goals and academic self-concept can be represented as hierarchical.

Chapters 4 and 5 of the review focus on relations between goals, domain-specific self-concepts and academic achievement. Specifically, Chapter 4 investigates the nature of relations between (a) goals and academic achievement and (b) academic self-concept and academic achievement. The final literature review chapter, Chapter 5, examines how (c) goals and academic self-concept are related. Based on research reported in Chapters 4 and 4, on relations between goals, academic self-concept and academic achievement, three potential explanations for how they are causally related are explored. Chapter 5 postulates three alternative causal models, derived from the earlier conceptual review of relations between the factors, each of which will be empirically tested in this study.

2.1.1 Unifying goals and academic self-concept
To date, few studies have endeavoured to unify the numerous competing motivational constructs. There have been repeated calls for a comprehensive model to more fully explain the dynamic interactions among motivational variables (Valle, Cabanach, Núñez, González-Pienda, Rodriguez & Piñeiro, 2003). This study, although not as complete in scope as the proposed comprehensive model, attempts to display greater depth and breadth by combining two related but independent motivational dimensions, specifically: goal theory and academic self-concept. Curiously, there appears to be a degree of division between many researchers investigating motivation from a goal theory perspective and those investigating academic self-concept (although see Skaalvik, 1997a; Skaalvik, Valas, & Sletta, 1994; Skaalvik & Valas, 1999 as exceptions). Researchers of goal theory repeatedly avoid the explicit discussion of academic self-concept, instead referring more frequently to perceptions of ability, which implicitly rather than explicitly denotes a self-concept linkage. Self-concept researchers acknowledge the impact of motivation but habitually avoid goal theory frameworks as an explanation. The present study endeavours to unify goal theory and self-concept as they are
interconnected and when combined can provide valuable insight into student achievement.

The self-concept–goal orientation linkage is explicitly recognised in questions such as whether a person will attempt a particular task, how much effort is expended, and how much persistence will be demonstrated in the face of difficulty. Both students’ goals and academic self-concept are influential in students’ academic performance and achievement. Therefore, it is reasonable to suggest that a combination of the two, especially when operationalised as a multidimensional construct, may provide a fuller explanation for students’ achievement than either taken alone, especially when over-simplified structures for these constructs have been investigated. A basic requirement for combining these two constructs will be to design and validate instruments that capture the multidimensional and possibly hierarchical structure of both academic self-concept and goals, and to determine whether these instruments are invariant across sex groups. Also, a theoretical rationale for why a combination of constructs from two largely distinct literatures should be explored is also required. The required rationale follows.

Given any achievement-related situation, there are at least two fundamental variables, the task (e.g., a sporting activity, a mathematics test or poetry writing) and the person doing the task (the self). These variables are fundamental in the sense that a task cannot be achievement-related unless there is a person (a self) to construe the task as achievement-related, and a person cannot construe a task as achievement-related unless there is a task to complete in the first place. Goal theory essentially suggests that self-perceptions of the purpose and structure of the task are influential in academic performance and achievement (Harackiewicz, Barron, Tauer, Carter, & Elliot, 2000; Kaplan & Maehr, 1999; Skaalvik, 1997b). Conversely, self-concept theory suggests that self-perceptions of relative ability are influential in academic performance and achievement (Anderman, Anderman, & Griesinger, 1999; Marsh & Craven, 1997). Thus, if task and self are the key variables in achievement-related tasks, then goal theory and the self-concept construct suggest that perceptions of task and self are fundamental psychological drivers of performance and achievement arising from engagement in those tasks. Thus, if only goal theory or only the self-concept construct are used to examine achievement-related behaviours, or indeed
achievement itself, then either key perceptions concerning tasks, or key perceptions concerning self may be missing from the respective analyses. To the extent that this is the case, a holistic account of both foundational variables in achievement-related behaviours will therefore be missing.

In addition to the above, perceptions of the purposes of a task and perceptions of the ability of self may be interconnected in a learning situation, such that perceptions of task purpose affect perceptions of self ability. For example, there is considerable evidence (e.g., Harackiewicz, Barron, & Elliot, 1998) that if one perceives a task to be competitive in nature this may negatively impact upon self-perceptions of relative ability. On the other hand, non-competitive tasks may enhance self-perceptions of relative ability. Conversely, poor perceptions of ability (low self-concept) may lead to disengagement in achievement-related tasks, and high self-concept may lead to enhanced engagement in tasks (see Zusho & Pintrich, 2001). Thus, perceptions of the purposes of a task and the abilities of the self are not only fundamental to achievement-related behaviours, but are also interactive in determining engagement (or not) in achievement-related behaviours. This latter reason provides further justification for investigating the simultaneous effects of perceptions of task and self on academic achievement.

The above discussion postulates that the nature of the task impacts upon perceptions of self, and that these causally related influences affect achievement outcomes. An alternative (perhaps complementary) perspective is that perceptions concerning “Why am I doing this?” (goal orientation), and perceptions concerning “Can I do this?” (self-concept), may interact reciprocally to influence both academic engagement and academic achievement. For example, one individual may perceive that the purpose of a task is to demonstrate competitive superiority (i.e., “I am doing this to win”), but be unsure that they have the ability to “win”. Another student may perceive the same task as competitive, but be sure of their ability to win. Yet another student may perceive the purpose of the task to be competence (mastery) related, yet evaluate themself to be incompetent, and so on. The point is that the relative salience of the “mix” of task and self evaluations is crucial in determining, firstly, engagement in a task, and then achievement outcomes from the task. Thus, it may be (as discussed in the paragraph above) that perceptions of task affect evaluations of
self, which in turn affect academic engagement and achievement. Alternatively, (again from this discussion) perceptions of task and self may interact to influence engagement and achievement. Whatever the case, a prerequisite for investigating both these alternatives is an instrument capable of simultaneously measuring both goals and self-concept equally well for males and females.

Theory and measurement are interrelated; thus, an important consideration is how research has conceptualised goal theory and academic self-concept. The following section commences with conceptualisations of student motivation and focuses specifically on the developments of goal theory. Following this, conceptualisations of academic self-concept are examined.

### 2.2 Theories of Student Motivation

If motivation were a straightforward concept it would be uninteresting. The challenge is to find ways of conceptualising it which help teachers to understand children’s progress and behaviour, thereby helping them to evaluate their classroom practice and teaching methods (Galloway, Rogers, Armstrong, & Leo, 1998, p.42).

Conceptualisations of motivation have transformed dramatically over the last half of the 20th century. Initially, biological perspectives were used to explain individual motivation, followed by a shift to the assertion of a behavioural-mechanistic perspective. The current approach to explaining individual motivation is a cognitive-mediational/constructivist perspective (Dornyei, 2000). “The conception of the individual as a purposeful, goal-directed actor who must coordinate multiple goals and desires across multiple contexts within both short- and long-range time frames currently is predominant.” (Eccles, Wigfield, & Schiefele, 1998, p.1074.)
Arising from cognitive approaches of the late 1960’s were social-cognitive perspectives. Examples of social cognitive theories include goal theory (Ames, 1984), self-efficacy theory (Bandura, 1986a), attribution theory (Weiner, 1986), and expectancy-value theory (Eccles, Adler, Futterman, Goff, Kacala, Meece, & Midgely, 1983).

Although an abundance of models explore academic motivation, there is no solitary model that fully explains motivated behaviour. Bong (1996) believes that competing theoretical orientations, which differ between investigators, are primarily responsible for indeterminate findings. For instance, cognitive models of academic motivation are predominantly concerned with “understanding learners’ covert thought processes, often overlooking the impact of social and contextual variables” (Bong, 1996, p.150). Alternatively, models of self-perception (self-concept, self-efficacy), which explain different motivational patterns for given tasks (Skaalvik, 1997a), rarely consider related social and contextual variables. Another set of models arising from cognitive theory belongs to the social-cognitive approach, often conceptualised as goal theory. Unlike those previously described, goal theory pulls together different aspects of achievement research (Weiner, 1990) because these models formulate and test specific hypotheses on the nature and direction of influential social and contextual factors (See for example Ames, 1992; Ames & Archer, 1988). This study acknowledges both the usefulness and value of a goal theory framework because it encompasses social and contextual factors which influence students’ achievement behaviour.

Bong (1996) warns, however, that social-cognitive models are often inept, due to vague construct definitions, as researchers have created their own terms perhaps before thoroughly examining existing terms. For example, conceptualisations of adaptive and maladaptive patterns of academic motivation have been coined in terms such as: intrinsic versus extrinsic orientations (Lepper & Greene, 1978), task involvement versus ego involvement (Nicholls, 1984a), and mastery goals versus performance goals (Ames, 1992). In addition, d’Ydewalle (1987) acknowledges that many of these constructs lack discriminant validity. This study provides a measurement framework within which goal theory is clarified but importantly, is extended to include social factors.
Goal theory, also known as *achievement goal theory* (Cury, Biddle, Sarrazin, & Famose, 1997), is currently the dominant approach to the analysis of achievement motivation (Anderman & Wolters, 2006; DeShon & Gillespie, 2005; Meece, Anderman, & Anderman, 2006). Weiner (1990) acknowledged the current dominance of cognitive approaches to motivation and regarded goal theory “as a major new direction, one pulling together different aspects of achievement research” (p. 620). A principal objective of contemporary achievement motivation has been the explanation and prediction of human behaviour in educational contexts (e.g., Ames, 1984; Dweck, 1991; Elliot & Harackiewicz, 1996; Kurita & Zarbatany, 1991; Nicholls, 1984a, 1984b). Central to this cognitive perspective is the initiation and regulation of behaviours referred to as “goal theory” (Weiner, 1990).

### 2.3 Achievement Motivation

Goal theory focuses on the goals or purposes perceived for learning, rather than on the actual level of motivation (e.g., students’ ongoing interest or deep task involvement; Middleton & Midgley, 1997; Seifert, 2004). Essentially, students are concerned with reasons for doing the task. Students’ individual answers to the question “Why am I doing the task?” (Pintrich & De Groot, 1990; Pintrich & Schrauben, 1992) orient students’ intensity and direction of behaviour toward the academic task. These goals provide a framework within which individuals interpret, experience, and react according to the achievement situation, and result in different patterns of affect, behaviour, and cognition (Bouffard, Vezeau, & Bordeleau, 1998; Dweck & Leggett, 1988; Elliot & Dweck, 1988; Weiner, 1986).

Within an achievement context, the predominant interest is the demonstration of competence. This may be achieved in two significant ways which are associated with two distinct motivational goals. Various conceptualisations of these two tendencies exist within the literature but most research maintains that students who engage in a task in order to master a skill or activity in an attempt to seek competence are claimed to have *mastery* goal orientation, whilst students who engage in a task to attain favourable judgements of competence are claimed to have *performance* goal orientation (Ames & Archer, 1988; Rose & Thornburg, 1984).
2.3.1 Mastery goals

*Mastery goal* oriented individuals assert self-referenced criteria for success (Seifert, 2004). Learning is valued for its own sake because the emphasis is on learning a skill, understanding and improving individual performance (Butler, 1999; Graham & Golan, 1991; Solomon, 1996). Some researchers have termed analogous goal dimensions as *intrinsic* goals (Lepper & Greene, 1978; Harter, 1981; Green & Foster, 1986; Vallerand & Bissonnette, 1992), *task-involved* goals (Nicholls, 1984b), *learning* goals (Dweck & Leggett, 1988; Elliot & Dweck, 1988) and *process* goals (Ertmer & Newby, 1996).

Strong support exists for a mastery goal perspective, also referred to as the normative perspective (Pintrich, 2000a): that is, the adaptive qualities of a mastery goal are beneficial across cognitive, socio-emotional, and achievement outcomes (Kaplan & Middleton, 2002; Midgley, Kaplan, & Middleton, 2001). Congruent with previous literature, this goal perspective is associated with adaptive motivational behaviours, some of which include persevering with difficult tasks (Elliot & Dweck, 1988; Nadler, 1998; Rudisill, 1990; Ryan & Pintrich, 1998), preference for challenging tasks (Nicholls, 1984b; Sarrazin, Famose & Cury, 1995; Seifert, 2004) and exerting effort, interest and value (Duda, Smart, & Tappe, 1989; Linnenbrink, 2005; Robins & Pal, 2002). Due to the internally referenced criteria for success, a sense of accomplishment is acquired on the basis of improved performance or successful completion or *mastery* of a task. This goal tendency adopts the perspective that competence or ability can be increased through effort; that is, intelligence is malleable (Seifert, 1997).

2.3.2 Performance goals

Alternatively, *performance goal* oriented individuals determine success as a means of demonstrating superior ability relative to others and/or against external standards such as marks and grades (Ames, 1992; Cury et al., 1997; Nicholls & Utesch, 1998). Central to a performance goal orientation is the establishment of ability (Dweck, 1986), self-worth (Butler, 1999) and seeking favourable judgments from others (Meece, 1994). Parallel terminologies for this tendency are *extrinsic* goals (Lepper & Greene, 1978), *ego-involved* goals (Nicholls, 1984b), *ego-social* goals (Meece,
Blumenfeld, & Hoyle, 1988; Nicholls, Patashnick, & Nolen, 1985). This goal perspective has been associated with maladaptive motivational patterns, for example the reluctance to exert effort for demanding or challenging tasks (Midgely et al., 2001) but has also been related to adaptive motivational patterns, for example, persisting in the face of difficulty (Elliot & McGregor, 1999; Sideridis, 2005).

Performance oriented individuals attribute success to ability (Solomon, 1996). This criterion for success depends on the performance of peers, so improved performance or mastery of a task is not in itself sufficient to evoke feelings of competence. One must surpass or outperform others to feel a sense of achievement and, consequently, may not always view success as a possibility. From this perspective, ability is likely to be characterised as a fixed attribute. Little or no effort will be invested in a task if an individual perceives they lack the ability to succeed, that is, to “beat” others.

Striving to attain mastery, or to demonstrate superior ability reflect two distinct motivational orientations for schoolwork (Ames & Archer, 1988; Nicholls, Cheung, Lauer, & Patashnick, 1989). Nicholls (1984b) argues, however, that the degree to which either goal will be salient depends on situational cues. Studies (see review by Jagacinski, 1992) concur that attributes of effort and preference for challenge were more profound in mastery goal experimental conditions where an activity provided an opportunity to learn and develop competence, than in performance conditions, where the focus is on measuring ability relative to others. According to Nicholls (1984b), performance goal oriented individuals maintain a differentiated conception of ability, where individual difference in ability limits the efficacy of effort. Moreover, feelings of success derived from gaining favourable judgements from others may be modified by concerns to uphold self-worth by masking low ability and avoiding further failure among people who perform poorly. In contrast, mastery goal oriented individuals maintain a less differentiated conception of ability as developing through effortful learning. That is, even less competent individuals will persevere and feel successful if they can satisfy strivings to learn and improve (Butler, 1999).
2.3.3 Approach and avoidance goals

Traditionally, mastery and performance goal orientations have received the most attention in studies concerning achievement motivation. However, recent research (for example, Barker, Dowson, & McInerney, 2004; Barker, McInerney, & Dowson, 2003; Elliot & Sheldon, 1998; Middleton & Midgley, 1997), offers an alternative framework by partitioning the performance goal into two independent, but related orientations. These are the performance approach and performance avoidance orientations. This recent dichotomy provides the opportunity to assess the distinct difference between the goal to demonstrate ability (directed towards the attainment of favourable judgements of competence) and the goal to avoid demonstrating lack of ability (focused on avoiding unfavourable judgements of competence). Interestingly, the approach of partitioning the performance goal into performance approach and performance avoidance was incorporated into the earliest achievement motivation conceptualisation (see, for example, Atkinson, 1957; Lewin, Dembo, Festinger, & Sears, 1944; McClelland 1951; McClelland, Atkinson, Clark, & Lowell, 1953; Murray, 1938).

Early theorists proposed that individuals’ achievement pursuits may be oriented toward the attainment of success or the avoidance of failure (Rawsthorne & Elliot, 1999). These achievement goal theorists pursued the lead of Lewin, McClelland, and Atkinson in conceptualising an approach and avoidance motivation (Atkinson, 1974; Lewin, 1944; McClelland et al., 1953). However, it later received little theoretical and empirical attention and was eventually overlooked (Elliot & Harackiewicz, 1996). As reported by Middleton and Midgley (1997), for example, performance approach and avoidance goals were overlooked by Nicholls and his colleagues (e.g., Nicholls, Patashnick, Cheung, Thorkildsen, & Lauer, 1989). Their early work assessed an avoidance goal with a two-item scale. The two scales were combined and labelled “ego-orientation”. Studies following this research disregarded the items assessing avoidance goals from the ego-orientation measure.

Dweck (1986) abandoned the concept of performance approach and performance avoidance since the constructs were statistically indistinguishable. Nicholls et al. (1989) attested that performance approach and avoidance were “two forms of approach motivation” (p.181). Conversely, Midgley et al. (2001) concluded that
both performance approach and performance avoidance goals were maladaptive and that performance approach goals, like performance avoidance goals, lead to deleterious outcomes. These studies questioned the usefulness of distinguishing between approach and avoidance goals (Harackiewicz, Barron, Pintrich, Elliot, & Thrash, 2002; Pintrich 2000b). In a review of the literature, Urdan (1997) questioned the usefulness of the dichotomy by highlighting the limitations of a performance avoidance orientation.

More recently the trend in achievement motivation research has been to reintroduce the dichotomy of performance goals (Elliot, 2006; Elliot & Moller, 2003; Sideridis, 2004; in press). This recent reconsideration led by Elliot and colleagues (Elliot, 1994, 1997; Elliot & Church, 1997; Elliot & Harackiewicz, 1996) strives to differentiate performance goals in terms of approach and avoidance (Pintrich, 2000b). Conceptualisations of achievement goals have continually evolved, particularly for approach and avoidance goals. These evolving conceptualisations of goals have caught the attention of Urdan and Mestas (2006) and have led them to raise questions concerning the number of inconsistent and elusive definitions of goals reported in research programs.

A number of contemporary studies continue to have difficulties distinguishing between performance approach and performance avoidance goals. From a measurement perspective, performance avoidance goals prove to be problematic because they are highly correlated with performance approach goals (Middleton & Midgley, 1997). For instance, researchers employing the Patterns of Adaptive Learning Survey to examine performance approach and performance avoidance have frequently reported high correlations between the two scales, with \( r \) approaching or exceeding .70 (Urdan & Mestas, 2006). From a theoretical perspective, results on performance goals continue to be in conflict, such that some studies attest that performance goals facilitate adaptive achievement behaviour (Elliot & McGregor, 1999; Sideridis, 2005), whereas a substantial number of studies reveal performance goals have negative consequences, while other studies posit that performance goals have no discernible effect (Elliot, 1999).
Debate concerning the utility of dichotomising performance goals is no longer hotly contested, as most researchers agree there are fundamental differences between performance approach and performance avoidance goals (Elliot, Shell, Henry, & Maier, 2005). A consensual and lucid definition of each goal and its pattern of associations, however, remains elusive. Elliot and Moller (2003) concede that the measurement of performance approach goals and performance avoidance goals has been problematic. In particular, these researchers have had difficulties tracing specific item components for each construct.

There is no firm consensus for how performance goals should be operationally defined. Measurement of performance-based goals has encompassed aspects of social goals. These measurements combine elements of a performance goal with elements of a social goal such that instruments have been designed to measure: performing for teachers, and working with friends as the objective for engagement (see Nicholls et al., 1985), or performing for grades (Ames & Archer, 1988), and partiality for challenge (Pintrich & Garcia, 1991). Albeit that these operational definitions of performance goals relate to demonstrating competence, they do not, however, align with the current argument that performance goals are represented by two distinct components: (a) social comparisons and (b) concerns with appearance (Elliot, 1999; Urdan, 2000; Urdan & Mestas, 2006). Other instruments have vaguely defined performance goals such that they comprise positive and negative valenced items and assess a hybrid performance approach/avoidance goal (Elliot & Moller, 2003).

In an attempt to clarify performance goals, Urdan and Mestas (2006) conducted interviews which questioned high school seniors about their responses to survey items. Unexpected interpretations by the participants occurred for the performance avoidance items. A large number of participants had difficulties distinguishing between wanting to do better than others (performance approach) and wanting to avoid performing worse than others (performance avoidance). A significant implication of these findings is the question whether students genuinely interpret any survey item that relates to performance avoidance goals consistently with researchers’ intentions. Given high correlations between performance approach and performance avoidance scales in other studies, it appears that the distinction between
wanting to demonstrate superior ability and wanting to avoid demonstrating lack of ability remains vague and indistinct.

More recently, theorists (see for example Cury, Elliot, Fonseca, & Moller, 2006; Pintrich, 2000c; Elliot, 1999; Elliot & McGregor, 2001) have conceived a fourth dimension of goal orientation. The trichotomous (mastery, performance approach and performance avoidance goals) framework has been further modified to include a mastery avoidance goal. Typically, mastery goals focus on approach forms since individuals strive to master tasks. In contrast, mastery avoidance goals can be maladaptive as they represent individuals who strive to evade falling short of task mastery (DeShon & Gillespie, 2005). Mastery avoidance goals are a relatively new dimension and their predictive pattern has yet to be clearly established (Cury et al., 2006). Elliot acknowledges that only a select few will pursue a mastery avoidance goal, as they require specific conditions. For instance, a mastery avoidance goal may be adopted by an expert who values not losing their skill set. To date, there is minimal empirical support for dichotomising mastery goals into approach and avoidance forms, whereas a performance goal dichotomy has been supported.

2.3.4 Social goals

Despite the recent focus, almost exclusively on mastery and performance goals in research, students may also adopt other goals which possibly affect their academic performance (Blumenfeld, 1992). Another important class of goals represented in theoretical literature is that of students’ social goals (Blumenfeld, 1992; McInerney, Hinkley, Dowson, & Van Etten, 1998; Urdan & Maehr, 1995; Wentzel, 1994). Unlike academic goals, social goals are directly referenced to individuals or groups associated with the academic task, in addition to being referenced to the tasks themselves (Dowson, 1999).

In the past, social goals have been overlooked and ignored by studies examining motivation (Blumenfeld, 1992). Most of the research on social goals has been conducted with adults and younger children, not adolescents (Jarvinen & Nicholls, 1996). This is astonishing, given that adolescence denotes a time of significant social change (Snowman & Biehler, 2006). For many, adolescence is a turbulent time, typically characterised as a period of “storm and stress” (see for example Arnett,
Some evidence of this turmoil is displayed through disturbingly low levels of school motivation, increasingly negative attitudes toward school and decreasing perceptions of self (Anderman & Maehr, 1994; Marsh, 1989). Some evidence suggests that social goals could be significant motivators for students, especially for those going through adolescence (Dowson & McInerney, 2003; McInerney, Dowson, & Yeung, 2005; McInerney et al., 1998). For this reason, social goals are considered to be relevant goals pursued by high school students, and so are examined alongside academic goals in this study. The multiple goals perspective is expanded to include both academic and social goals.

In addition to the predominant two-goal structure of achievement motivation, which emphasises students’ interest in demonstrating competence, social goals acknowledge other reasons for engaging in, or failing to engage in, academic tasks. The extensive range of goals associated with the investigation of social aspects in achievement motivation has proven to be problematic (Patrick, Hicks, & Ryan, 1997; Urdan & Maehr, 1995). Therefore the present study limits the focus to social academic goals; that is, goals associated with students’ beliefs about the social reasons for attempting to achieve in academic situations. Hence, social goals in this study are defined as the perceived social purposes for attempting or not attempting to achieve in academic tasks or situations (Urdan & Maehr, 1995). This definition of social goals varies from other research studies since it is specific to social reasons for achieving academically, whereas other researchers more broadly define social goals as “what students are trying to accomplish in the classroom” (Wentzel, 1996, p. 393). In order to clarify, social goals in this study focus on social reasons for why students try to achieve academically.

Also deemed problematic for research on social goals is the large number of studies investigating social goals that simply reiterate research findings from previous studies and then postulate hypotheses without theoretical underpinnings. The present research proposes a multiple goal coordination model as the theoretical framework underpinning the function of social goals. This theoretical framework predicts that social goals have underlying common processes with academic goals such that they share a common foundation. For instance, social goals (e.g., social affiliation, social concern) that focus on cooperation relate strongly to mastery goals
Thus, social goals in this study are proposed to relate strongly with academic goals.

The common process between academic goals and social goals is often reported between performance approach goals and social goals (e.g., social approval, social status) that focus on favourable judgements from significant others. Often, performance goals have incorporated content that directly relates to the operationalising of a social goal (see for example Nicholls, Patashnick, & Nolen, 1988). Ryan, Hicks, and Midgley (1997) note the similarities of social goals and performance goals, as both concern the importance of maintaining a positive public image in front of others. Furthermore, they found that academic goals that focused on self-presentation correlated highly with social comparison. Ryan et al. (1997) concluded that goals that reflect relative ability and social status could represent a singular motive toward social comparison.

Since this study is primarily concerned with adaptive goals, the social goals in this study focus on encouraging cooperation through assisting peers and friends to complete academic tasks. Affectively, these social goals engender feelings of belonging and solidarity, although occasionally these goals can result in negative feelings of isolation or rejection, if desires to facilitate remain unfulfilled. Social affiliation and social concern goals are associated with a variety of adaptive approaches to learning (Dowson, 1999). For instance, Dowson (1999) reported that social affiliation and social concern goals resulted in increased student effort. Effort expenditure facilitates these students’ understanding of academic tasks so as to transfer this understanding to peers.

Although not extensively researched, students’ social goals have been represented in theoretical literature. For instance, social constructs have been included in conjunction with (or even within) research measures that operationalise students’ academic goals. Specifically, Maehr (1984) prescribes social solidarity goals in addition to performance, mastery, and extrinsic reward goals. Correspondingly, Pintrich and colleagues (Pintrich, Marx, & Boyle, 1993) prescribe social goals in addition to performance, mastery, and epistemic goals. Dodge, Asher, and Parkhurst’s (1989) formulation includes multiple (and on occasions, conflicting)
social goals which students adopt with respect to schooling. Urdan and Maehr (1985) stipulate a list of social goals students may adopt that comprise social approval, social compliance, social solidarity and social welfare goals. Although not entirely congruent with the definition of goals used in this research, Ford (1992) maintains a detailed description of eight social goals that differentially affect motivation, cognition, and affect. Finally, Wentzel (1991a, 1989) has researched students’ multiple social and academic goals and their interactive effect on students’ academic achievement. While Ford and Wentzel have both referenced social goals, their definition is not entirely congruent with this study’s definition.

When social goals are evident in the literature, it is essential to differentiate between the definitions of social goals. In this study, social goals remain analogous with achievement goal definitions as intentions and purposes that drive cognitions, affect, and behaviour (e.g., Bouffard et al., 1998; Dweck, 1992; Pintrich et al., 1993). Notable, however, is the refinement of this definition since social goals are operationalised in this study as social purposes expressed in academic achievement situations (Dowson & McInerney, 2004; Urdan & Maehr, 1995). This definition of social goals differs from other definitions which define social reasons for desiring to achieve in social situations (eg., Eder, 1985; Lochman, Wayland, & White, 1993; Pietrucha & Erdley, 1996; Wentzel, 1991b, 1989).

Few theorists have examined social goals in the context of goal theory (see Farmer, Vispoel & Maehr, 1991; Schneider, Ackerman, Kanfer, 1996 as exceptions). This study highlights the need to address social goals within the framework of goal theory. Parallel to academic goals, social goals assist individuals to organise and direct behaviour so as to empower them to achieve in academic situations (Covington, 2000). How social goals operate in the dynamic context of a classroom and how they influence academic achievement remains largely unexplored. This is surprising, given that individuals of all ages value social purposes for engaging in academic tasks (Allen, 1986; Ford, 1992). For example, students acknowledge that they are motivated at school when there are opportunities to work with their friends, or when they help their peers to complete tasks (Dowson & McInerney, 2004). Furthermore, social dimensions become increasingly salient for early adolescence (Berndt, 1982; Brown, 1990).
A large proportion of the extant literature on adolescent development focuses on the negative effects of peer groups (Arnett, 1999). Nevertheless, effects of peers can also be a positive influence, as is frequently the case with the limited research findings on social goals (Dowson & McInerney, 2003). It is argued that social goals become increasingly important as a goal pursuit during adolescence. Adolescents spend more time with their peers, and these relationships impact on how an individual thinks, feels and behaves (Hartup & Sancilio, 1986; Rubin & Krasnor, 1985). Furthermore, the quality of interactions among peers plays a central role in academic achievement and school behaviour (Fredricks, Blumenfeld, & Paris, 2004; McInerney et al., 2005; Wentzel, Barry, & Caldwell, 2004). Clear and well-documented evidence highlights students’ preferences for working with peers, which has been shown to heighten motivation and to support and extend learning (Eccles et al., 1998; Zusho & Pintrich, 2001).

Investigation of “how students’ social goals could complement, compensate, or conflict with mastery and performance motivation goals” is recommended by Pintrich et al. (1993, p.181) and Dowson and McInerney (2001). The successful pursuit of multiple goals may directly assist the learning processes whereby the goals may complement one another to heighten student incentives to achieve (Atkinson, 1974; Reuman, Atkinson, & Gallop, 1986, Wentzel, 1989). Conversely, goals may conflict if the adoption of social goals takes priority over the pursuit of mastery goals (Wentzel, 1991a). Alternatively, social goals may compensate for academic goals if the adoption induces insufficient motivational incentive to engage in tasks (Wentzel, 1991a).

Classroom goal structures may also influence how social goals interact with academic goals. Lemos and Goncalves (2004) suggest that students are often discouraged from engaging in interpersonal relationships within classroom learning experiences. The opportunities for independent work seem to be reduced in high schools due to the perceived need for teachers to maintain “control” of student behaviour so as to avoid adverse behaviour management issues. It is no surprise that Lemos and Goncalves (2004) found that social goals often conflict with classroom goal structures, so students prefer to pursue academic goals since they align more closely with class structures. Classroom goal structures that promote the perusal of
academic goals over social goals seem particularly relevant in Western cultural settings, whereas social goals are more often congruent in non-Western cultural settings where social dimensions are more salient (Maehr & McInerney, 2004).

The above discussion has focused solely on social goals that emphasise social purposes for achievement. This conceptualisation of social goals appears to relate closely to an approach motive, since it is positively oriented toward achievement rather than avoidance of achievement. Recently, Gable and colleagues (Gable, in press; Gable & Strachman, in press) proposed an approach and avoidance dichotomy of social motives. Approach social motives energise adaptive relational behaviour and have been linked to social affiliation; contrastingly, avoidance social motives relate to aversive relational behaviour and have been linked to fear of rejection (Elliot, Gable, & Mapes, 2006). Consistent with approach and avoidance predictions for mastery and performance goals, it is hypothesised that approach social motives will lead to positive outcomes, while avoidance social motives will lead to negative outcomes. Since this dichotomy of social motives is a very recent development, researchers are only beginning to empirically test the proposed distinction.

2.3.5 Three positively oriented goals

Central to the purpose of the present study is an exploration of three positively oriented goals (mastery, performance, and social approach goals). These goals are “positively oriented” in the sense that they express students’ purposes for achieving, rather than their purposes for avoiding achievement (such as is the case with work-avoidance or performance-avoidance goals). Importantly, the approach goals in this study are associated with adaptive motivational patterns (Elliot & McGregor, 1999; Sideridis, 2005).

“Mastery goals and performance approach goals both represent regulation according to positive potential outcomes and are thus considered approach orientations” (Rawsthorne & Elliot, 1999, p.329). Urdan (1997) references the vast number of studies that confirm the adaptive nature of mastery goals. He substantiates that since mastery goals and performance goals are positively correlated, performance goals must have adaptive qualities in common with mastery goals. Elliot and Moller (2003) set out to determine whether performance approach goals were adaptive.
Evidence from 41 studies, all of which addressed the dichotomy of approach and avoidance, concluded that performance approach goals were positively associated with a large number of positive processes and outcomes. These studies supported the adaptive pattern for performance approach goals. Approach social goals have also been shown to have adaptive motivational patterns since they induce positive relational behaviour in the classroom (Gable, in press).

There is a number of reasons for the exclusive emphasis on approach goals in this study. First, although there is substantial empirical support for dichotomising performance approach and performance avoidance goals, there is minimal empirical evidence available that substantiates the recent proposal of social avoidance goals and mastery avoidance goals. Furthermore, due to the difficulties (which were reported earlier in the section on avoidance goals) in statistically defining performance goals, and since the instrument used for this study was developed prior to the recent surge of literature concerning avoidance goals, the present study focuses on the independent and interactive effects of mastery approach, performance approach, and social approach goals.

A second purpose for focusing upon positively oriented goals was to avoid methodological complexities. Negative items and negative constructs, when used alongside positive items and constructs, can lead to difficulties in model construction and validation, through the presence of negative item method factors, for example (Marsh, 1994; 1996). Finally, since mastery avoidance goals are rare and exclusive to a small sample such as experts in a particular domain, mastery avoidance goals were not included within the framework. For these reasons this study focuses on adaptive goals. Hence, reference to mastery goals, performance goals, and social goals in this study, represents mastery approach goals, performance approach goals, and social approach exclusively. These approach goals all represent adaptive goals that operationalise the need for seeking competence and are primarily concerned with goals that orient students towards academic achievement, in contrast to goals that orient students away from academic achievement.
2.3.6 Multiple goals

Two contrasting goals, mastery and performance goal orientations, have been the main focus of research studies examining the differences in students’ achievement behaviour. The majority of these studies have adopted correlation and regression techniques to determine how scores on each motivation goal scale affect scores on other criterion measures (e.g., Duda & Nicholls, 1992; Meece et al., 1988; Nicholls et al., 1985; Nolen, 1988; Pintrich & De Groot, 1990). Such research implicitly assumes of students, the independent pursuit of either a mastery goal or a performance goal (Meece & Holt, 1993). Few studies have sought to investigate the impact of individuals’ pursuit of multiple goals, on achievement (Steinberg, Singer, & Murphy, 2000).

Recently, however, researchers have acknowledged the possibility of students pursuing multiple goals (Ainley, 1993; Barron & Harackiewicz, 2001; Dowson & McInerney, 2001; Harackiewicz et al., 2002; Lemos & Goncalves, 2004; Lemos, 1996; Linnenbrink, 2005; Thomas & Barron, 2006; Urdan et al., 1993). That is, mastery and performance goals are not conceptualised as dichotomous but, rather as interacting simultaneously and varying in salience depending on task structure, the school environment, and the broader social and educational context (McInerney, Roche, McInerney, & Marsh, 1997; see e.g., Meece, 1991; Meece & Holt, 1993; Pintrich & Garcia, 1991; Wentzel, 1991a). In educational and sporting domains the conclusion has been that “optimal motivation was promoted by emphasising task goals and minimising ego goals” (Thomas & Barron, 2006, p.115). This conceptualisation of mastery and performance goals has been labelled the mastery goal perspective by a number of researchers (see for example Harackiewicz et al., 2002).

Research conclusions have progressed from the mastery goal perspective to consider the adaptive qualities of performance approach goals and whether optimal motivation can be achieved with the simultaneous pursuit of mastery and performance approach goals (Hodge & Petlichkoff, 2000; Sideridis, 2005; Thomas & Barron, 2006). This conceptualisation of simultaneously pursuing mastery and performance goals refers to the multiple goals perspective. Various patterns of relations between goals have
emerged in studies; further research is warranted to investigate and explain these patterns.

Results from Steinberg et al.’s (2000) study demonstrated that an individual pursuing mastery and performance goals simultaneously, attained greater sporting achievement compared with individuals adopting a single goal orientation. Concurrent pursuit of mastery and performance approach goals was found to be endorsed by high school students with a positive “present self-concept” (Anderman et al., 1999). Although the endorsement of a performance approach goal as beneficial may still be fiercely contested by some researchers, current studies extend the debate as to whether simultaneous adoption of performance approach and mastery goals is most adaptive (Linnenbrink, 2005).

Researchers assert that when examining the simultaneous pursuit of mastery and performance goals, students’ social goals should also be included (Blumenfeld, 1992; Dowson & McInerney, 2004; McInerney et al., 1998; Urdan & Maehr, 1995; Wentzel, 1994). Contemporary studies have examined the possibility of students adopting multiple goals, and a few have investigated the simultaneous interaction between mastery, performance and social goals (e.g., Dowson & McInerney, 1996a; Harackiewicz & Linnenbrink, 2005; Linnenbrink, 2005; McInerney et al., 1997; McInerney & Swisher, 1995). Urdan and Maehr (1995) believed that examining social goals within the framework of goal theory would provide a more thorough understanding of motivation and achievement in schools.

This study concurs with Urdan and Maehr (1995) and proposes that social goals in combination with academic goals can provide further insight into student achievement-related behaviour and academic achievement. Social dimensions of a school are assumed to interact with both mastery and performance goals and may be profoundly influential in affecting students’ attitudes toward schooling implicitly and learning explicitly (McInerney & McInerney, 1998). A number of recent studies have examined a goal model which considers the simultaneous interaction between academic goals and social goals (e.g., Dowson & McInerney, 1996b; McInerney & Swisher, 1995; McInerney et al., 1997). This conceptualisation of motivation is referred to as the personal investment theory of motivation. This approach considers
the possibility of students adopting multiple goals as well as the potential interaction between a variety of fundamental goals for students in school-related situations.

The goal structures identified within the personal investment model include task (mastery) goals, ego (performance) goals, social goals, and extrinsic rewards. Task goals within this framework refer to individuals experiencing adventure/novelty and striving for excellence. Ego dimension within this framework emphasises competition and power as motives. Social goals comprise affiliation and social concern, while extrinsic rewards refer to recognition and external incentives such as financial rewards (Maehr, 1984; Maehr & Braskamp, 1986; McInerney & Sinclair, 1991).

Maehr and Braskamp’s (1986) Personal Investment (PI) theory predated goal theory and built upon the earliest conceptualisations of achievement motivation. PI incorporated into its initial conception not only a multiple goal perspective (mastery and performance goals) but broadened the perspective to include social goals. Maehr and McInerney (2004) contend that PI is effectively a more complex integrative model which has the potential for far richer and more sensitive sources of information on determinants for motivated behaviour.

Essentially mastery, performance, and social goals from the Personal Investment model have been integrated to form a more inclusive multiple goal perspective in the present research study. Research provides strong evidence that students simultaneously pursue multiple goals (Lemos, 1993, 1996; Urdan & Maher, 1995). How these three goals (mastery, performance, and social goals) interact in achievement-related situations warrants investigation.

Recent research has commenced examining how students coordinate multiple goal pursuits and what strategies they employ to deal with managing multiple goals. In particular, Argyle, Furnham, and Graham (1981) define three central relationships among goals that provide an explanation for how goals may interact with one another.

- *Independence*, which relates to goals that neither facilitate nor impede upon each other,
• *instrumentality*, which relates to goals that facilitate each other, and
• *interference*, which relates to goals that impede or interfere with other goals.

Argyle et al.’s (1981) explanation of goal interaction has been superseded by Barron and colleagues’ (Barron & Harackiewicz, 2001; Thomas & Barron, 2006) comprehensive hypotheses on how goals potentially could relate.

Various patterns of results from research examining multiple goals have led to the formulation of more comprehensive hypotheses that build upon the initial explanations proposed by Argyle et al. (1981). Barron and colleagues (Barron & Harackiewicz, 2001; Thomas & Barron, 2006) argue that four hypotheses require testing in order to confirm or reject the benefits of multiple goals.

- an *additive goal hypothesis* maintains that a mastery and performance goal each have independent, positive effects for attaining a single achievement outcome,
- an *interactive goal hypothesis* maintains that, despite their independent effects, mastery and performance goals interact simultaneously such that individuals high in both mastery and performance goals are advantaged,
- a *specialised goal hypothesis* maintains that mastery and performance goals have various individualised effects on differing outcomes, and
- a *selective goal hypothesis* maintains one goal is more suitable for adoption given the context and idiosyncrasies of an individual. Individuals have the ability to shift goals in a situation and this is viewed as advantageous. A selective goal effect addresses Person X Context interactions (Thomas & Barron, 2006).

Only a few methodologically sound studies exist, that employ regression, structural equation modelling or cluster analysis to examine both independent and interactive goal effects. Of these, a small proportion advocate that mastery goals alone account for advantageous outcomes (e.g., Meece & Holt, 1993; Pintrich & Garcia, 1991). A more significant proportion advocate that the simultaneous pursuit of both mastery goals and performance goals accounts for more advantageous outcomes (e.g., Ainley, 1993; Barron & Harackiewicz, 2000; Harackiewicz et al., 1998; Harackiewicz,
Barron, Tauer, Carter & Elliot, 2000; Harackiewicz, Barron, Tauer & Elliot, 2002; Pintrich 2000c; Sideridis, 2005). For example, Harackiewicz et al. (2000) found in a longitudinal study that college students’ performance goals predicted student academic achievement, and mastery goals were found to be unrelated to achievement, whereas they predicted interest. In this example, instrumentality is evident since the two goals facilitate each other and they combine to provide optimal motivation and performance. Harackiewicz et al. (2000) concluded that students who pursued both goals were most likely to attain success in college.

Although the interaction among mastery and performance goals has been examined in the literature, there remains no conclusive position on how social goals interact with mastery and performance goals (Hicks, 1996; Hicks & Murphy, 1995; Hicks, Murphy, & Patrick, 1995). This study extends previous research as it examines the largely unexplored interaction between academic goals and social goals, and their effect on important educational outcomes, including students’ academic self-concept and academic achievement.

2.3.7 Motivational goals across time

In order to address the complex nature of academic motivation, it is necessary to examine the effects of motivation across time (Meece, Wigfield, & Eccles, 1990; Pokay & Blumenfeld, 1990). Little is known about the development of motivation across time (Anderman et al., 1999). Pokay and Blumenfeld (1990) provide evidence to suggest that motivation and achievement alter as a function of time. Schunk (2000) acknowledges the complex nature of motivation and advocates the need for more research to examine the long-term effects because the findings would contribute to useful implications for learning and teaching.

Bong (1996) recommends the use of repeated measures or longitudinal designs in order to examine the changing relations between motivation and academic achievement. The present study aims to contribute to the developing understanding of motivation across time by examining the stability of students’ academic and social goals and their interactive effects across three waves of data.
2.3.8 Sex differences

Contemporary studies have begun to investigate relations between students’ sex and their goal orientations (e.g., Anderman & Young, 1994; Kaplan & Maehr, 1996; Midgley & Urdan, 1995). Despite this research, the literature is ambiguous regarding whether, or how, sex differences may influence students’ motivation and achievement (Cole et al., 2001; Meece & Jones, 1996; Midgley, Arunkumar, & Urdan, 1996).

Of the limited research examining sex differences with respect to goal content, males have most often been associated with competitive or performance goals, whereas females have been associated with striving for affiliation or social goals (Giota, 2002; Wentzel, 1989). Concurring with these findings, Meece and Holt (1993) disclosed that males favoured competition and performance goals, whereas females tended to favour learning and mastery goals. A similar pattern of sex differences was substantiated with the work of Ve (1991). In general, Ve (1991) states that those who pursue performance goals have a desire to compete with others at school in order to obtain a good job, and those who pursue mastery and social goals focus on personal demand and social responsibility in order to learn at school so as to make a contribution to society as a valued member. These findings, according to Ve, are an indication of the motivation and ambition of females to comply with social norms or ideals (i.e., females enter the public forum and focus on the wellbeing of others) while males have a predisposition which is more technical (or more specialised) and their preference for pursuing goals is for more personal interest. Interestingly, Henderson and Dweck (1990) presented contrary results: they found that females were more inclined to employ extrinsic or performance goals.

Sex differences arise for students who endorse social goals (Hicks, 1996; Hicks & Murphy, 1995; Hicks et al., 1995). Ryan et al. (1997) found sex differences between adolescents’ social goals in their research study on goals and their relation to help-seeking behaviours. Although their definition of social goals relates to engaging for both academic and social purposes, whereas this study narrows the focus to academic purposes exclusively, their findings provide some insight into gender differences. Females in their study reported higher levels of value and desire for intimacy in peer relationships while males reported high levels of social status goals. They concluded
that since males in their study also reported higher on performance goals, males are more concerned with public image status than females. Patrick et al. (1997) demonstrated the adaptive nature of social goals when they reported that social goals for females influenced their feelings of competence beyond previous experiences of success.

Other research on sex differences suggests that males are less likely to acquire maladaptive attributions and inferior perceptions of academic competency (Zusho & Pintrich, 2001). These results are intriguing, given that females are more likely to pursue mastery goals which have been associated with adaptive motivational behaviours while performance goals, which are more commonly pursued by males, are associated with maladaptive motivational behaviours (DeShon & Gillespie, 2005; Ryan et al., 1997; Seifert, 2004). Questions remain about these disparities between males and females, so researchers need to pursue answers to the nature of sex differences when they arise, and as to whether these differences are authentic or rather are artefacts of methodology (Pajares & Valinate, 1999). Therefore a fundamental criterion for research on student motivation is to ensure instruments applied to measure motivation are well validated and are tested for sex invariance before judgements about sex differences are made.

Notwithstanding the significance of research examining effects of sex on goal orientations, studies of this nature have frequently overlooked the importance of examining the underlying factor structure of the instrument utilised in the study (Green, Martin, Marsh, & McInerney, 2006). Consequently it is assumed that the factor structure of the given instrument is equivalent for the various groups under investigation (i.e., males and females).

When interpreting results from studies examining sex differences, it is necessary to consider whether the research findings reflect a difference of degree on these dimensions or difference of kind (Martin, 2004). Most studies examining effects of sex on multiple dimensions of motivation are based around mean levels which only explicate whether motivation is higher for females than for males, or vice versa. Hence, differences of degree focus on the extent to which females are higher or lower than males on various motivational constructs.
With most research focusing on differences of degree, scant attention has been paid to sex differences of kind. Differences of kind determine whether the factor structure of a given instrument measures the same components of motivation with equal validity for males and females. Differences of kind examine whether qualitative differences exist between males and females such that they respond fundamentally differently to particular facets of motivation. Of central importance is whether the instrument utilised has the same underlying meaning for both males and females. Therefore, it is recommended that before examining differences of degree, researchers should first determine whether there are differences of kind.

Distinctions between differences of degree and differences of kind have significant implications for educators and researchers. For instance, if the difference between males and females is primarily a difference of degree, then educators may assume interventions and programs focusing on males are also appropriate for females. In contrast, if the difference is primarily a difference of kind, then programs aimed at males and females need to be qualitatively and fundamentally distinct, not only in intensity and duration, but also in “orientation, construction, and application” (Martin, 2004, p.133).

Hattie (1992) and Marsh (1993a) advise against comparing groups across sex unless adequate support for the invariance of factor structure across sex is demonstrated. Although these researchers refer specifically to self-concept, their results may be generalised to all educational measures including motivation (Marsh, 1993a). So, unless differences of kind are examined and found to be insignificant, it is unjustifiable to make comparisons between males and females, much less to draw conclusions about male and female levels of motivation.

Implications of research that exclusively attends to differences of degree and overlooks differences of kind are that it may mistakenly form judgements about sex differences that are unfounded. It is therefore unjustifiable to compare motivational responses between males and females unless there is adequate support for invariance across sex. For these reasons, it is important to determine whether any instrument measuring students’ motivational goals is equally valid for males and females.
2.3.9 Developmental and age differences

Minimal research has been conducted on age-related longitudinal developments of childrens’ goal orientations (Eccles et al., 1998), primarily because of the assumption that goals are a function of contextual and environmental factors (Zusho & Pintrich, 2001). More emphasis has been placed on the nature of the context and how contextual characteristics modify goal adoption than on understanding how children’s goal adoption may alter with age. Nevertheless, assumptions regarding goal adoption and both cognitive and contextual factors have emerged in studies such that mastery goals are believed to become less dominant as children grow and develop while performance goals become more salient as children move from primary school to secondary school (Dweck, 1999; Dweck & Leggett, 1988). Evidence pertaining to this pattern of goal adoption is from studies showing how secondary classrooms become more focused on competitive goal structures that promote the adoption of performance goals, relative to primary classrooms that emphasise mastery goal structures over performance goal structures (Eccles et al., 1998; Maehr & Middgley, 1996).

Emergence of goal orientation is not apparent until late childhood (Leicester, Kavussanu, & Delwyn, 2000) because its emergence is dependent on cognitive maturity; a prerequisite for goal development is the capacity to distinguish effort from ability. Nicholls and Miller (1983, 1984) show that children are incapable of differentiating between ability and effort until late childhood, around 12 years of age; consequently, high ability is equated with high effort at a young age. This finding may provide some evidence for why competence is not critical for young children’s self-esteem (Harter, 1990a) albeit judgements of competence in domains of importance predict self-esteem in both children and adolescents (Harter, 1993).

Researchers continue to deliberate over the conceptualisation of whether goals are stable or unstable. DeShon and Gillespie (2005), in their comprehensive review of goal theory, highlight substantial conceptual discrepancies among researchers as to whether goals remain stable across various domains, situations, and time, with time denoting potential developmental and age differences. Questions concerning whether goal orientations should be considered as a trait or state remain hotly contested. The “trait” definition refers to goal orientations as a personality variable
and this dispositional trait is manifested by consistent behavioural patterns in achievement situations. The “state” definition refers to goal orientations as person and situation-specific (Person X Situation interaction) such that individual differences and salient contextual factors influence goal adoption.

Trait conceptualisations of goals are perceived to be stable because of the small number of changes to goal adoption over long periods of time, whereas state conceptualisations of goals are perceived to be unstable because of the impact of situational cues which result in changes to goal adoption. The large majority of studies conceive goal orientations as a stable characteristic of an individual (see for example Ames & Archer, 1987; Bell & Kozlowski, 2002; Fisher & Ford, 1998). A smaller, yet significant number of studies conceive goal orientations to be a combination of both personal and situational factors (see for example Bandalos, Finney, & Geske, 2003; Breland & Donovan, 2005; Elliot & Thrash, 2002).

Mangos and Steele-Johnson (2001) report the large number of researchers that believe goal orientations become somewhat stable for older children. Their research demonstrates that as children age, they have a predisposition to adopt a particular goal response pattern; however, situational characteristics may result in the individual modifying or reducing the acuteness of the response pattern.

Xiang, Lee, and Bennett’s (2002) results indicate that older students (8th and 11th graders) were more inclined toward performance goals. These results are consistent with research literature that attests performance goals become more salient over the high school years (Chaumeton & Duda, 1988; Harter, 1981; Maehr, 1983; Nicholls et al., 1989). Essentially it is the reward structure of many high school settings that promotes performance goals. Classrooms offer very few rewards, so very few students can earn them; accordingly, any student’s reward is at the expense of others. Often, grades become more salient, opportunities for social comparison processes prevail and competition is enhanced in a high school setting, therefore inducing the pursuit of performance goals.
2.4 Students’ Self-Concept

2.4.1 Introduction to students’ self-concept

Much of the research in the late 20th century has been an investigation of how students form their self-concept (Blatchford, 1992; Keith & Bracken, 1996; Purkey, 1970; Wylie, 1974; 1989). In very general terms, self-concept may be defined as an individual’s self-perception. This perception is formed through “attitudes, feelings, and knowledge about our abilities, skills, appearance, and social acceptability” (Byrne, 1984, p.429). The perceptions held by an individual are derived from experiences with the social environment as information is supplied by significant others in the home, school and community (Hattie, 1992; Swann, 1983).

Social frames of reference indicate to individuals what they are capable of and what qualities they possess in particular situations. For instance, using objective criteria, an individual may conclude that they are accomplished at mathematics but when their frame of reference changes from set criteria to a peer who demonstrates superior mathematics performance, they may form a relatively negative mathematics self-concept. This process of comparison is sometimes referred to as an external frame of reference (Hau, Kong, & Marsh, 2000; Marsh, 1986a). Notwithstanding the importance of external frames of reference in forming self-concepts, individuals also compare self-perceived abilities in one facet (such as mathematics) with self-perceived abilities in another (such as English) and this internal process is the second basis from which self-concept formation occurs. This process of comparison is sometimes referred to as an internal frame of reference (Skaalvik & Skaalvik, 2002).

In considering both an external and internal frame of reference, it is possible that an individual with high ability in both English and mathematics may in fact have a negative self-concept in mathematics because they perceive that they are better at English (Moller, Strewblos, & Pohlmann, 2006). Thus it makes no difference as to whether a student is gifted or challenged. All individuals have high and low self-concepts because they perceive themselves to be better at one subject compared with another (McInerney & McInerney, 2006). Furthermore, self-concept formation is particularly reliant on how these two comparative processes are weighted in the formation of self-concept. Essentially, the internal/external frame of reference (I/E)
model predicts that gifted students will emerge with unrealistically low self-concepts in their weakest academic subjects, whilst poor students will emerge with unrealistically high self-concepts in their strongest academic subjects.

Marsh developed the Internal/External frame of reference model to account for relatively uncorrelated results between mathematics and English self-concepts (Marsh, 1986a). The Internal/External frame of reference model attempts to explain why mathematics and English self-concepts are so distinct from each other while mathematics and English achievement are highly correlated. The external process whereby an individual compares their perceived ability with others leads to substantially positive correlations between English and mathematics achievements but the internal process whereby an individual compares perceived ability in one subject relative to another leads to negative correlations between mathematics and English self-concept. The combined functioning of external and internal processes, reliant on the weighting of each, will lead to the near-zero correlations that prompted the development of the I/E model (Marsh, 1990a; Marsh, Byrne, & Shavelson, 1988; Marsh & Craven, 1997; Skaalvik & Rankin, 1990, 1992, 1995a; Tay, Licht, & Tate, 1995).

Although the I/E model is widely accepted as an explanation for how self-concept is formed, there have been some who suggest that internal comparisons of ability, whereby an individual perceives themselves as more competent in one domain relative to another domain, may not transpire for all individuals (Barker, Dowson, & McInerney, 2006a; Skaalvik & Rankin, 1992). This is because some individuals may perceive themselves to be equally good or bad in two domains. Skaalvik and Rankin (1992) found that subjective judgement of equal ability in two domains was shown to have no negative effects from achievement to non–corresponding self-concept. For this group of individuals there were also significant positive correlations between mathematics self-concept and English self-concept (corresponding with their positive achievement correlations $r = .69$). Future research should further investigate the potential for individuals to rank their perceived ability equally in one subject with another.
2.4.2 Multidimensionality of self-concept

“Another area in academic motivation research where distinction among constructs often gets blurred is that related to the self or to subjective perceptions” (Bong, 1996, p.152). Self-concept researchers distinguish between descriptive/evaluative and affective/motivational facets; but these are differentially categorised by researchers (see for example, Byrne, 1996a; Wigfield & Karpathian, 1991). This study pursues a descriptive/evaluative aspect of self-concept (e.g., “I am good at English”) as opposed to an affective/motivational aspect (e.g., “I am proud of my ability in English”; Rosenberg, 1979; Skaalvik, 1990). Descriptive components are inclusive of roles and characteristics that are socially ranked and valued. For instance, a person may like or detest their perception of themselves in a particular domain. These related feelings associated with descriptive/evaluative aspects give rise to emotional or affective reactions such as pride and humiliation. Thus, motivation to engage (or not) in tasks is significantly impacted by self-perceptions. Research conducted by Skaalvik, Valas, and Sletta (1994) examined the relations between self-perceptions and motivation to engage. Their findings strongly indicate that self-perceptions are predictive of students’ goal orientation.

In a classic review, Shavelson, Hubner, and Stanton (1976) reported that previous research on self-concept had been of a substantive nature, with insufficient attention devoted to methodological issues associated with the construct (Byrne & Worth-Gavin, 1996). Pre-1976 research emphasised a general or global and unidimensional construct, and did not differentiate among self-perceptions in physical, social, academic or other domains (Marsh, Perry, Horsely & Roche, 1995). Predictably, that research revealed inconsistent, confounded and ambiguous findings (Byrne, 1984; Hansford & Hattie, 1982; Shavelson et al., 1976; West, Fish & Stevens, 1980; Wylie, 1974).

Diconcerting findings from the unidimensional conceptualisation of self-concept prompted Shavelson et al. (1976) to define the construct of self-concept as multidimensional. Specifically, they proposed an empirical model describing self-concept as multidimensional and hierarchically ordered. General perceptions of self as a person (i.e., global self-concept) are posited at the apex of the structure. Moving downward, the model becomes increasingly differentiated, with general self-concept
divided into two facets: academic self-concept and nonacademic (i.e., physical, social, emotional) self-concept. These facets are further divided into specific domains (e.g., mathematics self-concept, physical appearance self-concept). Initially there was little empirical support for the Shavelson et al. (1976) multidimensional model of self-concept. However, subsequent empirical studies were overwhelmingly consistent in supporting it (Byrne, 1984; Byrne & Shavelson, 1986; Dusek & Flaherty, 1981; Fleming & Courtney, 1984; Harter, 1982, 1984, 1985; Marsh, 1993a; Marsh, Barnes, & Hocevar, 1985; Marsh & Hocevar, 1985; Marsh & Shavelson, 1985; Shavelson & Bolus, 1982; Soares, 1982; Song & Hattie, 1985; Wigfield & Karpathian, 1991).

Initially Shavelson et al. (1976) postulated that various domains of academic self-concept (i.e., mathematics and English self-concepts) would moderately correlate and could be combined to form a single higher-order facet of academic self-concept, thereby demonstrating both its multidimensionality and hierarchical structure. Specifically, the hierarchical structure of self-concept was derived from the strength of correlations between self-concept facets (Byrne & Worth-Gavin, 1996).

Considering the voluminous literature on self-concept, only a limited number of studies provide evidence for a hierarchical academic self-concept (Barker et al., 2006a; Yeung, Chui, Lau, McInerney, & Russell-Bowie, 2000). To illustrate, after administering two multidimensional self-concept measures, Vispoel (1995) found strong evidence for the multifaceted nature of self-concept but only moderate evidence for a hierarchical structure. Marsh and Shavelson’s (1985) research also supported the multidimensionality of self-concept but support for the hierarchy proved to be more complicated than originally anticipated.

The hierarchy of self-concept remained unsubstantiated due to the unexpectedly weak and sometimes near-zero correlations between English and mathematics self-concept. As discussed above, Marsh reasoned that the weak correlations between mathematics and English occurred because of the internal/external comparison process. Furthermore, the hierarchy proved weak because of the clear differentiation between the two distinct subject domains (English and mathematics); hence, encapsulating different self-concepts across the domains was more problematic than
originally anticipated (Marsh, 1986a; 1990a). To address this, Shavelson and colleagues (1976) revised their initial model of self-concept by proposing two higher-order facets of academic self-concept (mathematics and verbal) instead of one general academic self component (Marsh et al., 1988; Marsh & Shavelson, 1985, 1986b).

Based on the revised self-concept model, Marsh developed the Self-Description Questionnaire instruments (including: preadolescence SDQ I; adolescence SDQII; young adulthood SDQIII; see Marsh, 1990b; 1993b; Marsh & Craven, 1997) which intended to capture the distinct multiple facets of self-concept. Subsequent empirical research is overwhelmingly consistent in supporting the multidimensionality of self-concept (Byrne & Shavelson, 1986; Harter, 1982, 1984, 1985; Marsh, 1993a; Marsh et al., 1985; Marsh & Hocevar, 1985; Marsh & Shavelson, 1985; Wigfield & Karpathian, 1991).

2.4.3 Age effects in self-concept

Shavelson et al. (1976) hypothesised that self-concept becomes increasingly differentiated with age. Empirical research, however, has shown this feature of self-concept to be more complex than initially assumed. Recent progress in the measurement of young children’s self-concept has revealed that children can reliably differentiate between multiple dimensions of self-concept at an earlier age than originally postulated (Byrne, 1996b; Crain, 1996; Craven, McInerney, & Marsh, 2000; Eccles, Wigfield, Harold, & Blumenfeld, 1993; Marsh, Barnes, Cains, & Tidman, 1984; Marsh, Craven, & Debus, 1991). Reports have shown that children’s self-perceptions become increasingly differentiated during primary school years (Harter, 1982; Harter & Pike, 1989), yet appear not to become more differentiated beyond preadolescence (Marsh, 1986b, 1990b). Wigfield and Karpathian (1991), on the other hand, contend that children’s academic self-concept increases with age and becomes more systematically related to their external academic achievement. They argue that “once ability perceptions are more firmly established the relation likely becomes reciprocal: Students with high perceptions of ability would approach new tasks with confidence, and success of those tasks is likely to bolster their confidence in ability” (p.255).
In summary of the research, there is evidence that self-concept of young children is positive until they reach middle childhood when it starts to decline through to at least adolescence then levels out, finally systematically increasing through early adulthood (Craven et al., 2000). The decline of self-concept during preadolescence indicates a curvilinear age effect whereby the decrease in self-concept must reverse at some stage during early or middle adolescence (Marsh, 1989). Substantial empirical support for this conclusion is lacking except in four studies (Marsh, Parker, & Barnes, 1985; Marsh, Smith, Marsh, & Owens, 1988; Piers & Harris, 1964; Simmons, Rosenberg, & Rosenberg, 1973) which support curvilinear age effects. To account for changes to self-concept at various ages, Wigfield and Karpathian (1991) called for models to consider developmental differences. Conclusive findings of age and sex effects on self-concept and academic achievement are lacking. Valentine, Cooper, and Bettencourt (2002) believe the relation between self-concept and achievement may be mediated through academic motivation. They argue that these relational variables may become stronger as school becomes more demanding. Hansford and Hattie (1982) provided empirical support for the moderating effects of age. Notably, the average correlation between self-concept and achievement was reliant upon the age of the sample. Specifically, secondary students revealed the strongest correlation between self-concept and achievement \( (r = .52) \), whereas preschool students revealed the weakest correlation \( (r = .12) \).

English and mathematics self-concepts are proposed to be the most influential factors within a preadolescent student’s academic self-concept (Hay, Ashman, & Kraayenoord, 1997; Marsh & Hattie, 1996). Boersma & Chapman (1992) also acknowledge the importance of these two subject domains. The present study investigates self-concepts in the domains of English and mathematics for adolescent students over a period of three years.

2.4.4 Gender effects in self-concept for adolescents

Previous research posited no sex differences in overall self-concept at any age level (Piers, 1984; Wylie, 1979). However, when a total score was formed for self-concept, Wylie (1979) noted that sex differences may be overlooked. Piers (1984) acknowledged a growing body of research highlighting sex differences in specific domains of self-concept. For example, by at least middle adolescence, girls have
consistently lower math self-concepts than boys (Byrne & Shavelson, 1987; Marsh, 1989; Marsh et al., 1984; Marsh, Parker, & Smith, 1983; Marsh & Smith, 1987; Meece, Parsons, Kaczala, Goff, & Futterman, 1982; Skaalvik & Rankin, 1994; Wigfield & Eccles, 1994). Furthermore, research conducted by Dusek and Flaherty (1981) and Marsh et al. (1984) found counter-balancing sex differences in specific domains (some favouring boys and others girls), to show stereotypic gender differences. Accordingly, in high school girls tend to have lower levels of self-concept in mathematics relative to boys (Meece et al., 1982).

When gender differences are identified in mathematics self-concept, they usually favour boys (Eccles et al., 1993; Johnsson-Smaragdi & Josson, 1995; Manger & Eikeland, 1997; Marsh, Smith, et al., 1988; Skaalvik & Rankin, 1994). Eccles, Adler, and Meece’s (1984) results suggest it is unclear as to whether girls have a higher verbal self-concept relative to boys. Several studies have failed to report gender differences in verbal self-concept (Eccles et al., 1993; Skaalvik & Rankin, 1994). One explanation for these findings, is that boys are more confident about their abilities in general compared with girls, so boys may have higher self-concepts in domains predominantly perceived as male areas (e.g., mathematics), but not necessarily lower self-concepts than girls in domains perceived as predominantly female (e.g., verbal; Skaalvik, 1997b).

However, some research exists that claims girls have higher verbal self-concepts. For example, Stevenson & Newman (1986) found that tenth grade boys have lower reading self-concepts than girls. Interestingly, responses across three different instruments concurred that boys reported having higher mathematics and general self-concepts whilst girls reported higher verbal and academic self-concepts (Marsh, Byrne, et al., 1988).

More recent reviews and studies (e.g., Marsh, Debus, & Bornholt, 2005; Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002; Watt, 2004) replicate the pattern of gender stereotypes found by Marsh and colleagues (Marsh, 1989; Marsh & Craven, 1997). As most of these studies have focused on mean levels of motivation when examining the effects of gender on the multiple dimensions of self-concept, few have tested for differences of kind. Marsh, Tracey, and Craven (2006) believe insufficient
attention has been paid to gender differences in the factor structure of self-concept, which Martin (2004) refers to as differences of kind. Differences of kind are examined in this study as they are integral to determining whether the factor structure of the given instrument measures the same components of self-concept with equal validity for males and females.

2.5 Summary of Chapter

This chapter has proposed an integrative model of student motivation, which explains the purpose for combining students’ goal orientations and academic self-concept into a more comprehensive model. It was proposed that students’ goal orientations and academic self-concept are interrelated and, when examined together, can provide a more thorough and complete explanation of student achievement than either set of variables taken alone. Arising from this review was a discussion on the multidimensional nature of students’ goals and academic self-concept. The intent of the next chapter is to examine the potentially hierarchical structure of students’ goal orientations and academic self-concept.
CHAPTER 3
HIERARCHICAL STRUCTURE OF GOAL ORIENTATIONS
AND ACADEMIC ACHIEVEMENT

3.1 Examining the Multidimensional and Hierarchical Structure of
Students’ Goals

The examination of multiple goals (mastery, performance and social) allows for scrutiny of the individual goals, and some (first-order) interactions between them. An exclusive focus on goals at the first-order level, however, prevents investigation of the potential hierarchical structure of these goals and the full scope of (first- and second-order) interactions between them (McInerney, Marsh, & Yeung, 2003) and results in a fragmented and superficial view of student motivation. In contrast, examining a higher-order factor structure for goal orientations should enable a “common quality” of different goal orientations to be extrapolated, which quality represents a pooled or generalised notion of purposes for motivation, and which may be useful for explaining and predicting achievement outcomes. Positing a higher-order may also assist in accounting for how students coordinate multiple goals (Lemos & Goncalves, 2004).

Only a handful of recent studies have examined a possible hierarchy of students’ goals (Elliot, 2006; Elliot & Church, 1997; Elliot & McGregor, 1999; McInerney et al., 2003). Conceptualisations of the hierarchy in these studies differ in structure from each other and differ from the model in the present study. For instance, Elliot and colleagues integrated achievement motives (e.g., fear of failure and need for achievement) with goal orientations by postulating in their hierarchical model that achievement motives are antecedents of achievement goal pursuits. That is, the fear of failure and the need for achievement energises individuals and determines whether individuals are oriented towards either adaptive or maladaptive possibilities. In
Elliot and McGregor’s study (1999, p.628) “achievement motives are hypothesised to have distal (indirect) influence, and achievement goals a proximal (direct) influence on achievement relevant outcomes, and these motives and goals are viewed as working in tandem to regulate achievement behaviour”.

Instead of employing superior statistical procedures such as confirmatory factor analyses to test their model, Elliot and Church (1997) employed simultaneous regression analyses. Also deemed problematic in their hierarchical model is the conceptualisation of goals, which are construed as midlevel cognitive representations because they assume that individuals adopt either an adaptive or maladaptive approach. This assumption disregards much of the literature on multiple goal pursuits since it is possible for individuals to adopt conflicting goals simultaneously (Dowson & McInerney, 2001; Pintrich et al., 1993).

This study acknowledges the dichotomy of performance goals into approach and avoidance orientations but limits its focus to goals that orient individuals towards academic engagement. Unlike mastery, performance approach, and social goals, performance avoidance goals focus on avoidance of demonstration of low competence which often leads to poor academic engagement. Consequently, the hierarchical structure for this study emphasises only the approach forms of goal orientation, specifically: mastery goals, performance approach and social goals. No studies have attempted to explain adaptive multiple goal orientations as comprising mastery, performance approach and social goals until this study. It is hypothesised that, underlying all three adaptive goals is the purpose for achievement, but that the specific reason or content of these goals differs. Consequently the higher-order factor relates to purposes for achievement in academic tasks and the first-order discriminates the specific reasons.

This study builds on previous research by retaining a hierarchical model of students’ approach goals, and integrating it with a hierarchical model of students’ academic self-concept. Specifically, the higher-order models in this research posit a higher-order factor labelled “Purposes for achievement”. Thus, in the overall hierarchical structure, the distinguishing feature of each goal at the first-order level is its specific content, such that each individual goal represents a different purpose for
achievement. The overarching construct, in contrast, represents the fact that each goal is a purpose for achievement, regardless of its particular content. In this way, the model represents the opportunity to validate the theoretical structure of goal theory as a whole, which suggests that individual goals are integrated by their common definition as “Purposes for achievement”, but differentiated according to the different content of these purposes.

Figure 3.1 depicts the hierarchical structure discussed above. It shows that the associations between each of the first-order goals and the second-order factor “Purposes for achievement” have yet to be extensively explored in the literature. Moreover, because this higher-order factor has yet to be empirically tested, the structural inter-relationships between the first-order factors, specifically mastery, performance, and social goals, require investigation. Furthermore, even where correlations between multiple goals have been examined (e.g. Elliot, 2006; Elliot & Church, 1997; Pintrich, 2000b; Urdan, 1997), the ability of these correlations to imply the hierarchical structure suggested by goal theory has rarely been investigated (McInerney et al., 2003).

![Figure 3.1. Hierarchical representation of students’ goals](image-url)
3.2 Examining the Multidimensional and Hierarchical Structure of Students’ Academic Self-concept

Shavelson et al. (1976) proposed a multidimensional, hierarchical model of self-concept that fundamentally impacted on research on self-concept (Marsh & Hattie, 1996). Subsequent research has demonstrated this hierarchy to be fruitless because the weak correlations among the specific facets of self-concept (e.g., social, academic, physical, emotional) were in fact highly differentiated. According to Marsh and Shavelson (1985), in late adolescence there is even less evidence of a hierarchical organisation of self-concept. This is primarily due to subjects studied at high school being so distinct from each other, that attempting to represent self-concept in vastly different school subjects is problematic. Instead, Wigfield, Eccles, and Pintrich (1996) in their review of research, acknowledge a pattern of self-concept development from differentiated and hierarchical to differentiated into entirely distinct entities, and this pattern appears most strongly during adolescence (Skaalvik, 1997).

Predominant focus on the multidimensionality of self-concept in contemporary research has led to a lack of attention towards general self-concept and self-esteem in educational research (Skaalvik, 1997a). Moreover, despite the overwhelming number of studies reporting a weak hierarchy, there have been some exceptions where researchers have provided evidence for a hierarchy of academic self-concept. For instance, El-Hassan (2004) found support for a hierarchical structure of self-concept for adolescence since his findings provided evidence that academic self-concept was represented by English and mathematics self-concept. Positive correlations between English self-concept and mathematics self-concept were reported by Yeung et al., (2000) indicating that a higher-order factor represented these two distinct yet related self-concepts. Skaalvik and Rankin (1992) attest that when positive correlations between English and mathematics self-concepts are reported, this is an indication that not all students make internal comparisons whereby they judge their competence in one subject to be better than in another. Hence, positive correlations indicate that individuals may judge themselves as having equal ability in both subject domains.
Interactive effects of domain-specific self-concepts, their structural relationship to global self-concept, and the impact of this entire hierarchical structure have not been typically tested (although see Marsh & Yeung, 1998a; Lau, Yeung, Jin & Low, 1999, for some recent exceptions to this generalisation). An aim of this study is to test and evaluate an a priori hierarchical confirmatory factor analysis model that posits one higher-order factor (academic self-concept) that is consistent with the design of the SDQ and the Shavelson et al. (1976) model on which it was based. This study extends previous research by examining this hierarchical structure of self-concept alongside the hierarchical structure of goals.

Figure 3.2 is a pictorial representation of the literature reviewed above, and demonstrates that the multidimensional nature of self-concept is widely supported but the hierarchical structure needs further investigation.

![Figure 3.2. Hierarchical representation of students’ academic self-concept](image)

Few researchers have explored relations between self-concept and goals (although see Anderman et al., 1999; Martin & Debus, 1998; Skaalvik, 1997a; and Skaalvik et al., 1994; for some exceptions to this generalisation). Of these studies, most have been limited to an investigation of mastery and performance goals with self-concept, and did not include a hierarchical structure for either goals or self-concept. Within this context, the purpose of the present study was to build upon previous work by providing a measurement framework within which the interaction of multiple goals, domain-specific self-concepts, and their higher-order factors may be examined simultaneously.
3.3 Summary of Chapter

This chapter presented the potential for students’ goals and academic self-concept to be represented as multidimensional and hierarchically structured. This study confirms that few goal theory researchers have evaluated a hierarchical model of achievement goals. It proposes a hierarchy comprising multiple approach goals that focus on the differentiated purposes for achievement. In addition to the goals hierarchy was the proposed higher-order structure of self-concept that evaluates the potential for students’ academic self-concepts to be represented by two distinct subject domains, English and mathematics.

The first two chapters of the literature review have addressed the multidimensional and hierarchical structure of students’ goals and academic self-concept. The subsequent chapters of the literature review (Chapters Four and Five) focus on the independent and combined effects of goals and academic self-concept on academic achievement.
CHAPTER 4
RELATIONS BETWEEN GOALS AND ACADEMIC SELF-CONCEPT WITH ACADEMIC ACHIEVEMENT

4.1 Goals and Academic Achievement

Research on goal theory consistently maintains that mastery goals orientations may be robust predictors of academic success (Pintrich & Schunk, 1996). Since students have been shown to adopt multiple goal orientations, current research has begun to explore the independent and interactive effects of these goals on outcome measures such as academic performance and achievement (Barron & Harackiewicz, 2000; Harackiewicz et al., 2002; Hidi & Harackiewicz, 2000; Pintrich, 2000a).

Consistently, research on goal theory maintains mastery goals are associated with favourable cognitive, affective, and behavioural outcomes (Barker, Dowson, & McInerney, 2002; Harackiewicz et al., 2002). Intriguingly, the results from studies that examine the direct relationship between mastery goals and academic achievement and performance attainment show lack of a strong relationship between mastery goals and academic achievement (Meece et al., 2006). Meece et al. (2006) and Linnenbrink (2005) believe the form of measurement for academic achievement may be a reason for the absence of a clear relationship with mastery goals. They argue that measures of achievement are not designed to assess processes that align with a mastery goal such as deep understanding, challenge or complexity. When studies have assessed challenge, complexity and personal value, the correlation between academic achievement and mastery goals has been strongly positive (see for example Grant & Dweck, 2003).
Of the studies that have found a relationship between mastery goals and academic achievement, results have varied. Results reveal inconsistent findings such that some indicate a positive relationship between mastery goals and academic performance (Sideridis, 2004; Tanka & Yamauchi, 2001; Vansteenkiste, Simons, Lens, Soenens, & Matos, 2004) while the remainder report null results (Brett & VandeWalle, 1999; Lee, Sheldon, & Turban, 2003; Malka & Covington, 2005; Skaalvik, 1997b).

One study that reported the positive effects of mastery goals on academic achievement was that of Finney, Pieper, and Barron (2004). Their results concluded that mastery goals significantly predicted end of semester grades. Also reporting positive effects between mastery related behaviours and academic achievement was a study conducted by Aunola, Leskinen, and Nurmi (2006). They examined intrinsic motivation of primary aged students. Of particular importance is their finding that intrinsic motivation predicted mathematics performance. Their longitudinal data demonstrated that the higher the level of intrinsic motivation students reported, the more superior level of mathematical performance they exhibited later on. Positive relations between mastery goals and achievement have also been reported in non-academic domains. In a sports setting, individuals in the pursuit of a mastery goal performed better overall compared with individuals in the pursuit of a performance goal (Burton, 1989; Hall, 1990).

Previous research on relations between performance goals and academic achievement has revealed some ambiguous findings, since half of the existing studies examining performance goals report positive relations on measures of interest and achievement (Bouffard et al., 1998; Pintrich, 2000c; Urdan, 2004; Wolters, 2004; Wolters, Yu, & Pintrich, 1996), whereas the remaining half report negative and null effects (Elliot & Church, 1997; Kaplan & Maehr, 1999). Only Linnenbrink (2005) has reported negative relations between performance approach goals and academic achievement. Urdan (1997, p.108) questions whether performance goals are always “bad” and, importantly, whether this goal pursuit is unhealthy for all students all of the time.
Potentially adverse consequences of pursuing a performance approach goal are ardently contested and have evoked a lively debate between Midgley and her colleagues (Kaplan & Middleton, 2002; Midgley et al., 2001) and Harackiewicz, Barron, Pintrich, et al. (2002). Harackiewicz et al.’s perspective is that performance approach goals have either null or positive effects on motivation and achievement whereas Midgley et al.’s perspective is that the effects of a performance approach goal depend on previous record of achievement, age, perceived ability, and the cultural characteristics of an individual (Urdan & Mestas, 2006). Variation of performance approach goals and their effect on motivation and achievement warrants further consideration.

Inconsistent findings of performance goal studies may be a function of researchers not differentiating between performance approach and performance avoidance goals in their studies. Since contemporary research on goal theory began to dichotomise performance goals into performance approach and performance avoidance, more consistent results have emerged that demonstrate the deleterious effects of performance avoidance goals and the positive effects of performance approach goals (Harackiewicz, Barron, Tauer, & Elliot, 2002; Pajares & Valiante, 2001; Zusho, Pintrich, & Cortina, 2005).

Harackiewicz et al. (2000) examined performance approach goals over time and illustrated that performance approach goals predicted academic grades over a two-year period for college students. These results confirm that performance approach goals are critical to the success of college age students. Moller and Elliot (2006) reveal in their review of achievement goals that performance approach goals emerge as the strongest and most consistent positive predictor of performance attainment relative to other achievement goals. They highlight studies conducted which document improvements to exam performance for college aged students (Elliot & McGregor, 2001) and increases in mathematics exam performance for adolescent students who pursue performance approach goals (Cury et al., 2006).

Roeser et al. (1996) found that performance goals were positively correlated to academic self-efficacy and grade point average. Performance approach goals were associated positively with achievement (Elliot et al. 2005; Sideridis, 2005). Dweck
and Leggett (1988) and Nicholls (1984, 1989) obtained results which confirm students who are high in ability and oriented toward performance goals may have enhanced motivation and increased level of performance, as it is hypothesised these students may demonstrate their superior ability (Urdan, 1997). High levels of intrinsic motivation were affiliated with teaching practices that fostered performance goals (Harackiewicz & Elliot, 1993).

Limited research has been conducted on the simultaneous pursuit of multiple goals and their combined effect on academic achievement. Meece and Millers’ (1996) findings of students’ learning goals shifting toward work avoidant goals are consistent with Martin and Debus’ (1998) research, which examined students’ pursuit of dual motivational goals (including ego-orientation and task-orientation) on student performance. It was found that students who were highly motivated according to both goals performed poorly, relative to students who pursued one goal.

Unlike academic goals (e.g., mastery and performance goals), social goals are referenced directly to academic tasks and referenced to the individuals or groups associated with the academic tasks (Dowson, 1999; Dowson & McInerney, 2003). Social reasons for trying to achieve in academic situations are the dominant concerns for individuals pursuing social goals (McInerney et al., 1997; Urdan & Maehr, 1995). Few direct links between social goals and academic achievement have been established in the literature (Urdan & Maehr, 1995). Nonetheless, there is reason to suspect that social goals may be linked to achievement, either by supporting the positive effects of other goals on achievement, or ameliorating their negative effects (Barker, Dowson, & McInerney, 2005a).

Wentzel is one of the few researchers who has investigated social goals and performance attainment and who has demonstrated that social goals are integrally related to academic performance (Wentzel, 1993; 1996). In particular, student willingness to pay attention and cooperate during academic tasks has been shown to sustain efforts to achieve academically (Wentzel, 1996).
Social goals, as defined in the present study, were found in Dowson’s (1999) study to enhance English achievement both directly and indirectly through cognitive and metacognitive strategy use. The reverse was true for social goals and mathematics achievement. A negative direct effect between social goals and mathematics achievement was reported but an indirect effect through cognitive and metacognitive strategies outweighed this negative direct effect, such that the overall effect of students’ social goals on mathematics achievement was both positive and significant. It appears from these results that social goal pursuits for learning enhance achievement in English and, when accompanied with students’ strategic approaches to learning, can enhance mathematics performance.

Dated research had found it difficult to establish links between measures of achievement motivation and academic achievement. However, more recent research has provided stronger evidence validating relations between goal orientations and academic success (Harackiewicz, Barron, Tauer, et al., 2002). Furthermore, when investigating recent theoretical advances to theory it is necessary to employ new research methodologies. Hence, testing the multiple goal perspective requires hypothesis generation beyond the mastery and performance goal dichotomy. Additionally, research testing the multiple goal perspective should investigate the independent and interactive effects of mastery, performance, and social goals on various outcomes (Harackiewicz, Barron, Pintrich, et al., 2002). Examining all three goals provides a richer explanation for achievement-related behaviour. Although this study focuses on approach forms of motivation exclusively, and expands the multiple goal perspective to include social goals, it does examine the effects of all three positively oriented goals on academic achievement.
4.2 Academic Self-Concept and Academic Achievement

Numerous studies show persistent correlations between academic achievement and academic self-concept (Brookover & Passalaqua, 1981; Brookover, Paterson, & Thomas, 1962; Byrne, 1996b; Byrne & Worth-Gavin, 1996; Jones & Grieneeks, 1970; Marsh, 1993b; Marsh & Craven, 1997; Marsh & Yeung, 1997a; Maruyama, Rubin, & Kingsbury, 1981; Mujis, 1997; Skaalvik, 1990; Skaalvik & Rankin, 1990, 1995a, 1995b; Skaalvik et al., 1994). Academic achievement in specific domains is more highly correlated with academic self-concepts in the same domain (for example, English achievement and English self-concept).

A number of empirical studies have attempted to demonstrate how self-concept (differentiated into academic and non-academic self-concept) correlates in school-age children with other school variables such as achievement. Positive self-concept is assumed to be predictive of academic success whilst negative self-concept is assumed to be predictive of poor academic achievement (Purkey, 1970; Rosenberg & Gaier, 1977).

4.2.1 Causal ordering of academic self-concept and academic achievement

Numerous studies have attempted to answer one of the most vexing questions proposed in academic self-concept research: the causal orderings of academic self-concept and academic achievement. Researchers debate the causal ordering of academic self-concept and achievement (Shavelson & Bolus, 1982) and suggest that the ordering is yet to be clearly defined (Anderman et al., 1999; Pottebaum, Keith, & Ehly, 1986). Wigfield et al. (1996) consider that a conclusive model substantiating the causal direction of academic self-concept and academic achievement will be difficult to prove.

Various patterns of causation are argued by the researchers. Some argue that achievement affects self-concept (skill-development model), others maintain self-concept affects achievement (self-enhancement model), and still others assert achievement and self-concept affect each other (reciprocal relationship model). “The results have been contradictory” (Mujis, 1997, p.265). The controversy between the proponents of these models of self-concept and academic achievement is of practical
and theoretical importance. Surprisingly, few empirical studies have examined the patterns of causation (Helmke & van Aken, 1995). The majority of studies that have been conducted have implemented inappropriate designs for interpreting causal interpretations, for example, cross-sectional designs (Guay, Marsh, & Boivin, 2003). In a comprehensive review of the literature, Byrne (1984) presented a list of recommended prerequisites for studies examining the causal predominance of academic achievement and self-concept. Noted in the list was (a) the importance of substantiating a statistical relationship between the academic achievement and self-concept, (b) establishing clear time precedence in longitudinal studies, and (c) testing for causal flow using techniques such as confirmatory factor analysis. Studies that fulfil the above prerequisites are discussed below, with reference to the variety of proposed models.

The skill-development model maintains that past achievement, whether successful or unsuccessful, influences the formation of self-concept but self-concept does not influence achievement (Valentine & DeBois, 2005). Underpinning the skill-development model are principles of reflective appraisals (Rosenberg, 1979), social comparisons (Festinger, 1954), and internal/external frames of reference (Marsh, 1986a). These theoretical principles, although distinct, commonly predict that individuals’ comparisons with significant others in relation to academic achievements cause changes to an individual’s self-concept. Newman (1984) found support for the skill-development model of causality since his results indicated a causal predominance of academic achievement over academic self-concept. Newman argued that changes in self-concept were a consequence of improvements in academic achievement. Interestingly, however, a re-analysis of Newman’s data by Marsh (1988) denoted findings which showed the opposite; that is, academic self-concept influenced subsequent academic achievement.

Self-enhancement programs (see Scheier & Kraut, 1979) speculate that an improvement in self-concept will lead to improved academic performance (Helmke & van Aken, 1995) and that achievement does not influence self-concept. This model stemmed from self-consistency theory (Jones, 1973), which predicts that students with poor self-concepts avoid achievement-related situations that may modify their self-concept and for this reason they minimise effort to perform well.
The importance of protecting the self from consequences of failure has long been emphasised in research (Beery, 1975; Covington, 1984, 1992, 1997). Failure is often interpreted by individuals as indicative of low ability and, since ability is associated with self-worth, failure significantly impacts self-worth. Acknowledging self-worth theory and links to attribution theory, students with low expectations of success often impede successful performance by enabling avoidance type strategies that negatively impact on achievement and eventually demolish the desire to learn. Conversely, students with high self-concepts approach achievement-related situations that may modify their self-concept and for this reason they maximise efforts to perform well. Specifically, the self-enhancement model holds that positive self-beliefs promote increased levels of achievement. The self-enhancement model supports interventions and school reforms that are aimed at improving students’ self-concept because from this model’s perspective, they will result in improvements to students’ academic achievement (DuBois, 2001; Kahne, 1996).

Perhaps a more realistic compromise between the skill-development model and self-enhancement model is a reciprocal-effects model. The reciprocal-effects model potentially accounts for evidence supporting both of the above sets of causal orderings (skill-development and self-enhancement models). Marsh (1984) proposed such a reciprocal-effects model, which claims academic self-concept and academic achievement are mutually reinforcing and changes in one will produce changes in the other.

Marsh and Yeung (1997b) supported this relationship in their examination of the causal ordering of self-concept and achievement but found only one of four effects of prior self-concept on subsequent achievement was statistically significant. Marsh (1987) believes the form of measurement for academic achievement determines the strength of the relationship between self-concept and achievement. Paths from self-concept to achievement are strongest when achievement is measured from school-based assessment tasks, whereas the path is weaker for low-stakes standardised tests, where students are availed of few opportunities or incentives to study for these tests. Consequently, attributes such as study practices, effort, and persistence are unlikely to influence test performance. Conversely, these attributes are likely to be employed for school-based examinations which impact upon test performance. School grades
therefore typically take into account these attributes (e.g., students are penalised for incomplete assignments or late submissions, careless mistakes, but rewarded for diligence and hard work). Effects of self-concept on subsequent achievement should therefore be stronger when achievement is determined by high-stakes school grades rather than low-stakes standardised tests (Marsh, 1993b; Marsh & Yeung, 1997b; 1998b; but also see Helmke & van Aken, 1995).

In this review of existing research on causal ordering of self-concept and academic achievement it is apparent that many studies focus on the more general academic self-concept rather than examining the specific facets of academic self-concept (for example, English self-concept and mathematics self-concept) and their effect on specific domains of academic achievement. Even fewer studies have tested causal ordering of these variables for non-English speaking students. Future research would welcome cross-cultural causal models to examine the generalisability of causation in non-Western countries. Marsh and Craven (2006) highlight the need for researchers of causal ordering effects of self-concept and academic achievement to examine moderating and mediating variables. They also encourage researchers to evaluate the adequacy of the self-development, self-enhancement, and reciprocal-effects model using their prototype model. This prototype model, as well as recent advances in conducting analyses of causal ordering, is described in detail in the relevant methodology chapter.

4.2.1.1 Developmental effects on the pattern of causal ordering

Research on self-concept and academic achievement has predominantly focused on answering the vexed question of the causal ordering of these constructs. As reviewed above, a number of competing models are proposed to explain the relations. Recently a developmental perspective has accounted for mixed causality findings by suggesting that as children age and develop, their perceptions of self, which become more differentiated, result in changes to the causal flow (Chapman & Tunmer, 1997; Guay et al., 2003; Jacobs et al., 2002; Skaalvik & Hagtvet, 1990; Wigfield & Karpathian, 1991).
Developing understandings of competence continually change during early and late childhood (Marsh & Shavelson, 1985). Compared with younger children, older children have more negative self-concepts which are more highly correlated with external academic outcomes. Consequently, as children develop, their appraisals of academic self-concept become more reliable and stable and less positive, such that they begin to correlate with teacher ratings (Marsh & Craven, 1997; Marsh, Craven, & Debus, 1998; Wigfield et al., 1997).

Processes of ageing and development also influence children’s appraisals as they begin to systematically relate to external outcomes, and these judgements of relative strength and weakness meld into their self-concept. Progressive differentiation of multiple dimensions of self, plateaus during preadolescence when social comparison processes and cognitive maturity are adequately developed. This pattern of differentiation led to the formation of the differential distinctiveness hypothesis (Marsh & Ayotte, 2003). Essentially, this theoretical model explains how facets of self-concept become increasingly defined as children develop. Emergence of this developmental pattern has led researchers to propose that young children’s academic achievement affects their academic self-concept (which explicitly denotes application of the skill-development effects model of causation) but, as children grow older, the causal flow changes to a reciprocal-effects model (whereby not only does academic achievement affect academic self-concept but academic self-concept affects subsequent achievement). It has been speculated that by late adolescence, self-concept of ability may actually become predominant over academic achievement (Skaalvik, 1997a).

Valentine and colleagues (2001; Valentine & DuBois, 2005; Valentine, DuBois, Cooper, 2004) considered the potential moderating effects of age in their meta-analysis of tests of the reciprocal-effects model using self-beliefs and academic achievement. Although their research encapsulates a more general self construct, their results provide insight into the possible effects of age on this construct and academic achievement. Valentine (2001) predicted the relationship between self-beliefs and achievement would be weaker for primary-school aged students and stronger for middle and high school students but his findings determined that age and school level were unrelated to the effects of academic self-beliefs on academic
achievement. A meta-analysis led Valentine to conclude that there was insufficient evidence to support the hypothesis that relations between self-beliefs and achievement vary as a function of age.

Complicating conclusions from the developmental perspective are very recent findings that ascertain young children’s self-concept is differentiated at an earlier age than previously reported (Marsh & Craven, 2006; Marsh et al., 2005; Marsh, Ellis, & Craven, 2002; Marsh, Tracey, & Craven, in press). Serious implications arise with recent developments in the measurement of young children’s self-concept and affiliated findings that demonstrate that children as young as four can differentiate among the multiple dimensions of self. Marsh et al. (1999) contend that although progressively with age, academic achievement and academic self-concept relate more strongly, there is insufficient evidence to establish whether causal relations between these variables alter with age or if the differences indicate underlying processes or researchers’ inability to accurately measure these constructs with younger children (Marsh, Trautwein, Lüdtke, Köller, & Baumert, 2005). Notably, conclusions from the developmentalists regarding causal relations between self-concept and achievement, which postulate a skill-development model for younger children, may now be premature due to more reliable and valid measures being established which were developed after many of these causal studies. However, for adolescents reciprocal-effects causal ordering remains the preferred explanation (Marsh & Craven, 2006).

4.3 Summary of Chapter

Chapter 4 reviewed the literature on relations between goals and academic achievement and academic self-concept and academic achievement. Research shows a weak relationship between mastery goals and academic achievement; however, performance goals have been shown to relate more strongly to academic achievement. There are no conclusive findings on relations between social goals and academic achievement because very few studies have examined this relationship. In contrast, relations between academic self-concept and academic achievement have been extensively researched. Studies have extended beyond correlations to examining the vexed question on causal ordering of the variables. There is a strong
argument that during adolescence, the relationship between academic self-concept and academic achievement is reciprocal (Marsh & Craven, 2006).

Chapter 5 proceeds with a review of the literature on relations between goal orientations and academic self-concept. The research findings reviewed in Chapters 4 and 5 are utilised to form hypotheses on how goals and academic self-concept relate, to affect subsequent academic achievement.
CHAPTER 5
CAUSAL RELATIONS

The previous chapter demonstrated that substantial research has been conducted on the relations between self-concept and academic achievement, as well as relations between goal orientations (mastery goals and performance goals) and academic achievement (Gottfried, Fleming, & Gottfried 2001; Marsh & Craven, 2005). Regrettably, few direct links between social goals and academic achievement have been established in the literature (Urdan & Maehr, 1995). Few studies have attempted to relate both goal theory, confined to mastery and performance goals, to academic self-concept and academic achievement, and even fewer studies have assessed the causal ordering of these variables on academic achievement. Direct evidence of causal ordering of goals (of any kind), self-concept (in any domain) and achievement is almost absent. However, based on the few correlational studies available and findings from experimental studies it is feasible to form hypotheses for how these variables may be causally related. Consequently, relations established in the literature between academic self-concept and students’ goals are reviewed and studies that relate to similar constructs (e.g., self-efficacy, self-esteem, intrinsic motivation) have also been included in this review. These research findings are then utilised to form hypotheses of competing models of causality which are later empirically tested.

5.1 Relations Between Goals and Academic Self-concept

Studies have repeatedly shown strong relations between students’ academic self-concept and a variety of motivational indicators. Some examples include students’ ratings of effort (Skaalvik & Rankin, 1995a), teachers’ ratings of level of engagement, persistence in classroom activities (Skaalvik & Rankin, 1996a), and measures of intrinsic motivation (Meece et al., 1988). Specific to the limited
research on the relations between goal theory and self-perceived abilities, mastery goals and performance goals have been found not to correlate significantly with self-perceived abilities, or the relations have been found to be weak (Ames & Archer, 1988; Nicholls, 1989; Nicholls et al., 1985).

Significant correlations of self-perceived ability with mastery goals are more frequently positively associated (Meece et al., 1988; Nicholls, 1989; Duda & Nicholls, 1992; Skaalvik & Rankin 1994, Skaalvik, 1996). Specifically, Wolters et al. (1996) showed that students high in mastery goals but low in performance goals were the highest in self-efficacy, task value and strategy use. Research shows inconsistent relations between performance goals and students’ self-perceived abilities. For example, Ames and Archer’s (1988) and Schunk and Swartz’s (1993) studies reported relatively weak correlations between perceived ability and performance goals. In contrast, Nicholls’ (1989) findings indicated positive correlations between the two variables.

Pajares et al. (2000) revealed that task goals were associated positively with self-efficacy and self-concept, whereas performance approach goals were associated negatively with self-concept. Relations between self-perceptions and intrinsic motivation have been demonstrated to increase across school years (Bouffard, 2000). Bouffard’s finding is consistent with researchers who contend that students’s self-perceptions of competence and intrinsic motivation fuel each other along the school years (Skaalvik & Rankin, 1995a; Stipek, 1992).

Students who acknowledge higher feelings of efficacy toward their schoolwork endorsed mastery goals and perceived the learning environment as fostering mastery goals (Ames & Archer, 1988; Midgely, Anderman, & Hicks, 1995; Park, Pintrich, & Midgley, 1992). Conversely, those students were less likely to adopt performance goals and perceived the learning environment as de-emphasising performance goals (Ames & Archer, 1988; Midgely, Anderman, & Hicks, 1995; Park, Pintrich, & Midgley, 1992).
Dweck and colleagues have theorised that students who pursue performance goals are more vulnerable to changes in their self-esteem because their self-worth is contingent on external validation (Burhans & Dweck, 1995; Dweck, 1999; Molden & Dweck, 2000; Mueller & Dweck, 1998). Linkage between self-esteem and performance goals, as well as self-esteem and mastery goals, was directly examined by Robins and Pals (2002). They hypothesised that since the pursuit of a performance goal elicits a vulnerability to helplessness, then these individuals are more likely to experience shame and distress in academic settings and should experience more negative effect. They hypothesised that, conversely, the pursuit of a mastery goal will elicit feelings of determination and inspiration so these individuals should experience more positive effects. Consistently with these predictions, their findings show that students pursuing performance goals were more likely to be distressed and upset, relative to those who pursue a mastery goal. They also acknowledged the positive effect of pursuing a mastery goal because these individuals were more likely to feel determined, enthusiastic, excited and strong. Interestingly, Robins and Pals (2002) used growth curve modelling to examine the cumulative implications of these variables for self-esteem over the long-term. On average, their results showed that students in pursuit of a mastery goal had relatively higher self-esteem than performance oriented individuals and were on an upward trajectory relative to performance oriented individuals, this disparity increasing over four years.

Kaplan and Maehr (1999) conducted a study that was underpinned by Anderman and Maehr’s (1994) theoretical model, which proposes that goals (task and ego goals) and self-processes (academic self-efficacy) mediate between students’ perceptions of the school environment (emphasising either task or ego goals) and affective (attitudes and effect) and behavioural (learning strategies, choice and preferences) outcomes. Results stemming from this study showed the adaptive nature of task goals and the questionable nature of ego goals. In sum, schools that emphasise task goals influence students’ adoption of task goals and this goal pursuit positively relates to self-efficacy and GPAs. Findings for ego goals were not as ubiquitous as those for task goals. Kaplan and Maehr’s results from hierarchical multiple regression on goal orientations as predictors of academic self-efficacy, showed positive but
nonsignificant relations between adopting an ego goal and predicting academic self-efficacy. This result was replicated for African and Euro-American students.

Caution is warranted when interpreting and generalising findings from Kaplan and Maehr’s two process models, primarily due to the small sample and the inability of the models to reach criterion values for the goodness of fit indices. Overall findings suggest that school task goal emphasis and academic self-efficacy combined, cause students to adopt task goals. This pattern however does not appear for ego goals, as the relation between ego goal adoption and self-efficacy was unrelated for Euro-Americans but negatively related for African Americans. Data for this study was collected on one occasion and is correlational in nature, such that interpretations of processes involved are limited. Studies that collect data across multiple waves can provide insight into the causal predominance of these variables and the processes involved so as to make predictions for how these constructs relate across time.

Boekaert (1993) developed a model of effective-learning processes which proposes that self appraisals of ability to meet demands of a task give rise to positive or negative emotions, depending on whether the appraisal is positive or negative, and these effects predict task related behaviour. When an individual perceives an important task as demanding and considers themselves as capable of meeting the task requirements, intense positive emotions arise, accompanied by mastery oriented self regulatory processes. Alternatively, when an individual construes an important task as demanding and perceives themselves as incapable of meeting the task requirements, intense negative emotions arise which are accompanied by the deployment of coping strategies or stress reduction approaches. Based on Boekaert’s model, positive perceptions of ability may lead individuals to pursue mastery goals, while poor perceptions of ability may lead individuals to pursue performance goals, and these are more likely to be performance avoidance goals than performance approach goals as the focus is on avoiding failure.

Extrapolated from Treasure and Biddle’s (1997) findings on goal orientations and self-esteem were results showing task goals predicted global self-esteem both directly and indirectly through self-perceived ability and physical self-worth. Interestingly, perceived ability mediated the effects of ego orientation on physical
self-worth. Overall they contended that, for elementary aged children, task goals appear to facilitate physical self-worth and global self-esteem. Unlike Treasure and Biddle who found only task goals predicted self-esteem, Kavussanu and Harnisch (2000) found ego goals also predict self-esteem. In particular, these researchers found that students with high ability perceptions who pursued either a task goal or ego goal had higher self-esteem. Kavussanu and Harnish (2000) explained that ego goals have adaptive motivational patterns similar to task goals and these patterns are most similar for individuals with high ability perceptions.

5.1.1 Mastery goals and academic self-concept
Studies indicate that the effect of academic achievement on motivation is mediated through academic self-concept (Norwich, 1987; Skaalvik & Rankin, 1995a, 1996). Ames’ (1990) experimental research found that after one year, students encouraged to foster mastery goals demonstrated stronger preferences for challenging tasks, greater propensities to apply effective cognitive strategies, enhanced intrinsic motivation, and higher self-concepts of ability. The present study suggests, therefore, that manipulating mastery goals may result in more positive self-concepts and academic cognition.

In pursuing issues on classroom contexts, Aunola et al., (2006) found that levels of intrinsic motivation for mathematics increased in classrooms where the teacher acknowledged the development of self-concept as an integral pedagogical goal. Importantly, the results from this study highlight that the pedagogical goals reported by teachers (which included enhancing self-concept) also impact the development of their students’ intrinsic motivation, and that intrinsic motivation predicted mathematics performance outcomes for the future.

Kaplan and Maehr (1999) found that holding task goals was a significant positive predictor for measures of wellbeing and Grade Point Average (GPA). Among high school aged students, MacIver, Stipek, and Daniels (1991) found a causal relationship between academic self-concept and intrinsic motivation. They showed that self-perceptions of ability predicted directional changes in intrinsic motivation. Skaalvik and Rankin (1996) also identified indirect and direct effects of persistence and engagement in classroom tasks (i.e., mastery goal-type behaviours) on
achievement, with the indirect effect of mastery goals being mediated through self-concept of ability.

According to Marsh’s internal/external frame of reference model, it is likely that mastery goals relate closely to internally referenced processes. An internal frame of reference relates to individuals comparing their own perceived ability in one subject domain with their perceived ability in another domain. Mastery oriented individuals focus on effort, and on seeking competence. They are self focused, so that improvement and competency is judged on the basis of their own previous achievements rather than on their own achievement relative to others. It appears that mastery goals are closely associated with the processes that align with Marsh’s internal frames of reference.

5.1.2 Performance goals and academic self-concept

Research studies that examine performance goals and their relationship with self related constructs have reported mixed findings. A valid explanation for inconsistent results of the relations between academic self-concept and performance goals may be attributed to difference in measurement (Skaalvik, 1997a). Research considering the dichotomy of performance goals into performance approach and performance avoidance may hypothesise academic self-concept to be positively associated with performance approach and negatively associated with performance avoidance.

Students oriented toward either a performance approach or avoidance goal are concerned with how well others are performing relative to oneself. Students with a predisposition to focus on comparisons and who hold low ability perceptions may attempt to avoid looking stupid, predicting a negative correlation between ability perceptions and performance avoidance goals. In contrast, it may influence students with high ability perceptions to attempt to outperform others, predicting a positive correlation between ability perceptions and performance approach goals. Congruent with this explanation, self-perceived abilities have been found to relate positively with performance approach goals and negatively with performance avoidance goals (Skaalvik, 1996b; Skaalvik, 1997c; Skaalvik & Rankin, 1994).
Elliot and Moller (2003) reviewed studies that examined the effects of performance goals on self-efficacy. These researchers found no research reporting negative effects but 4 studies which reported null effects (i.e., Middelton & Midgely, 1997; Middelton & Midgely, 2002; Pajares, Brittner, & Valiante, 2000; VandeWalle, Cron, & Slocum, 2001). Overwhelmingly, 10 studies reported positive relations between performance approach goals and self-efficacy (i.e., Bong, 2001; Church, Elliot, & Gable, 2001; Elliot & Church, 1997; Pajares et al., 2000; Skaalvik, 1997c; Sideridis, in press; Smith, Duda, Allen, & Hall, 2002; Smith, Sinclair, & Chapman, 2002).

The direct relationship between performance goals and self-concept was investigated by Conway and Howell (1989). Specifically they examined positive bias in the recall of self-referent words under performance orientation and non-performance orientation conditions. Results attest that individuals conditioned to a performance goal recalled significantly more self-referent words than non-performance conditioned individuals. Conway and Howell (1989) postulated that performance oriented individuals access a more positive self-schema, which was argued to be attributable to either (a) impression management in the face of a threat to the self-concept (Singer & Salovey, 1988) or (b) a sense of challenge that activated positive cognitive information (Smith & Ellsworth, 1985).

Although yet to be empirically tested, theoretically there is a strong link between performance goals and external comparisons from Marsh’s frames of reference model. According to Marsh’s internal/external frame of reference model, it is likely that performance goals relate closely to externally referenced processes. An external frame of reference relates to individuals comparing their own perceived ability in one subject domain with their classmates’ performance in the same subject. Similarly, performance oriented individuals are motivated to achieve by making external comparisons in an attempt to outperform others and to demonstrate their ability relative to others. They are others-focused, so success is judged on the basis of their perceived ability relative to their classmates’ abilities. Performance goals are closely associated with external comparisons, which are used to form academic self-concepts. This could explain why in the reported research, performance goals more often relate positively to self-concept.
5.1.3 Social goals and academic self-concept

This researcher of the present study is not aware of any studies that examine relations between academic self-concept and social goals (as defined in this study), other than the research conducted by the researcher and her colleagues (see for example, Barker, Dowson, & McInerney, 2004a, 2004b, 2006a, 2006b). Barker and colleagues exclusively examined correlations between students’ mathematics and English self-concepts and social goals and showed that social goals positively and strongly relate to mathematics self-concept but that the correlation for English self-concept is weaker. Strong relations between mathematics self-concept and social goals could arise as a result of external comparisons by students. Similarly to performance goals, social goals are also externally referenced. External comparisons may be more salient in mathematics due to the evaluative and competitive nature of the subject (Aunola et al., 2006).

Despite the lack of research on social goals and academic self-concept, there is a study that has researched social goals and self-efficacy (Patrick et al., 1997). Since the social goals and self construct examined in Patrick et al.’s (1997) research are similar but not identical to those investigated in this study, it is important to review this research and subsequently make some inferences regarding how social goals and academic self-concept may be related.

Patrick et al. (1997) highlight the importance of social goals as they influence students’ academic efficacy. Their findings indicate that social responsibility goals and social intimacy goals are related significantly to academic efficacy. Motivational theorists need to seriously consider the contribution that students’ social goals make to their beliefs about achievement behaviour at school because Patrick et al. provide empirical evidence that students’ evaluations of ability to complete academic tasks are related to their motivation to be socially responsible. These results signify the value of pursuing research that considers social goals in relation to academic aspects of school, not simply researching social relationships. Patrick et al. recommend that researchers “pay greater attention to students’ social relationships, beyond noting generally that school is a social place” (p.120).
The literature reviewed thus far provides strong evidence for an integrative model of student motivation by showing how each of the constructs relates with the other. Chapter 4 commenced with a review of the literature that highlighted the relationship between students’ multiple goals and academic achievement as well as the relationship between academic self-concept and academic achievement. Reviewed in this chapter, was the relationship between self-concept and students’ goal orientations. Findings from all of these studies have been considered in the formation of three competing hypothesised models of causation. These hypothesised models are justified below and addressed in the hypothesis chapter that follows.

5.2 Rationale for Competing Models of Causality

5.2.1 Causal ordering 1: Goals, self-concept, and achievement
Correlations between self-concept and goal orientations provide important information about their relationship but do not provide evidence for how they are causally related. A rationale for how goals could potentially be causally predominant over academic self-concept in affecting academic achievement is considered below.

5.2.1.1 Mastery goals, self-concept, and academic achievement
Nicholls (1984a) argued that the different achievement goals adopted by individuals influence conceptions of competence and govern the degree of success within an achievement setting. Since goals affect learning and performance, it is likely that they also contribute to adolescents’ wellbeing. Behavioural, coping and emotive processes are all influenced by the various goal pursuits. For example, mastery goals differ from performance goals in the degree to which students evaluate events in relation to the self, especially to one’s perceived competence (Kaplan & Maehr, 1999).

In an achievement-related context, students may construe a task to be competitive and the main objective of outperforming others is construed to be the purpose for achievement. That is, success is determined upon social comparisons. In terms of developing a positive self-concept, this perception about the task is unquestionably hazardous, since outperforming others is a limited commodity. Only a few students will experience success since most end up “losers” to some degree, a factor that
probably influences their sense of self. Covington (1992) highlights that even “winners”, to maintain their position, may resort to cognitive and behavioural processes that are counter productive to long-term growth and wellbeing. So, the goals pursued by individuals influence perceptions of ability, especially when not all individuals experience success.

Ames (1990) conducted a study in which a goal theory perspective was fostered by teachers at a primary school. A vast number of strategies representative of a mastery goal were adopted by classroom teachers. After one year of implementing the advised strategies, students demonstrated enhanced preference for challenging tasks, applied more effective cognitive strategies, were more intrinsically motivated and had higher self-concepts of ability. Results from Ames’ study demonstrate that a classroom setting that fosters a mastery goal orientation can induce a positive self-concept.

Similar findings to Ames were evident in the experimental study conducted by Schunk (1996). In that study, fourth grade students learning six mathematics fractional skills were conditioned to either a mastery goal orientation or a performance goal orientation. Before each of the six lessons, the teacher varied the instructions such that the mastery condition were informed to try and learn how to solve the fraction problems, while the performance condition were informed to try and solve the fraction problems. After six days of conditioning, the students were asked to judge their ability to solve mathematics fraction problems. Students conditioned to the mastery goal orientation reported higher self-efficacy and correctly solved more problems than did the students conditioned to the performance goal orientation. These results assume that the goal pursued by a student affects important educational outcomes including students’ self-efficacy and performance attainment.

Students approaching a task with a mastery goal deploy adaptive patterns of behaviour such as engaging in deep cognitive processing strategies, including linking new material with previous knowledge and attempting to understand complex tasks (Anderman & Maehr, 1994; Dowson & McInerney, 2003). These students may perceive themselves as more capable, due to their effective employment of learning
strategies and, hence, this may positively affect their academic self-concept and academic achievement. More research findings on achievement motivation demonstrate that mastery oriented students are more likely to succeed than to fail (Sideridis, 2004; Vansteenkiste et al., 2004). It is reasonable, therefore, to hypothesise that these students have positive self-concepts due to more frequent experiences of success. Students with positive self-perceptions persevere when confronted with challenging tasks, and eventually succeed (Assor & Connell, 1992; Bandura, 1986; Berry & West, 1993; Boggiano, Main & Katz, 1988; Bouffard, 2000; Bouffard-Bouchard & Pinard, 1988; Entwistle, Alexander, Pallas & Cadigan, 1987; Harter, 1990a, 1992). Since these students more readily have positive self-concepts, it is also likely they experience increased academic performance. These motivational properties of self-concept have been substantiated in research studies that find a positive self-concept leads to increases in academic attainment (DuBois, 2001; Kahne, 1996; Marsh & Craven, 2005).

Mastery oriented individuals focus on the intrinsic value of a task whereas performance oriented individuals derive their motivation from an investment of self-esteem (Plant & Ryan, 1985). Success for mastery oriented individuals derives from effort, whereas for performance oriented individuals success is based on ability levels (Skaalvik, 1997c; Treasure & Roberts, 1994; Walling & Duda, 1995). Failure for mastery individuals tends not to be attributed to lack of ability, and from a self-concept perspective, these individuals are not particularly vulnerable to threats to their self-concept. It can be further proposed that, because of this invulnerability, mastery oriented individuals are more inclined to invest effort through the adoption of effective learning strategies to assist them in achieving. That is, the pursuit of a mastery goal impacts positively on an individual’s self-concept, which consequently enhances their achievement.

Contrary to many studies examined above, Meece and Miller (1996) reveal that increases in students’ learning goals were not associated with enhanced ability perceptions. As expected, they found a significant decline of ability competence for students who became less learning oriented and more work avoidant but, interestingly, students who demonstrated minimal change in their learning orientations reported the highest level of confidence in their abilities. These findings
are puzzling, since mastery goals were associated with a positive self-concept but, when higher levels of mastery goals were identified, levels of self-concept remained steady and did not lead to significant positive changes in self-concept.

In the event that a mastery oriented individual fails at a given task, then the feedback is interpreted as diagnostic rather than reflecting lack of ability. Failure does not hold ability-related implications for individuals who pursue a mastery goal, so they are less vulnerable to threats to their self-concept and are more likely to preserve their perceptions of ability. In summary, individuals who pursue a mastery goal perceive themselves as more capable, primarily because they have a greater propensity to apply effective cognitive strategies and invest effort to complete tasks. These qualities of a mastery goal can result in individuals’ forming more positive evaluations of themselves.

In consideration of the above findings, it is hypothesised that the pursuit of a mastery goal influences self-concepts in academic domains such as mathematics and English, which in turn predict students’ academic achievement in the respective domains.

5.2.1.2 Performance goals, self-concept, and academic achievement

Some research on achievement motivation demonstrates that performance oriented students are less likely to succeed academically (Barker et al., 2002). When performance oriented individuals fail, they are more vulnerable to changes to their self-concept. They attribute poor performance to lack of ability, and since perceptions are formed through attitudes, feelings, and knowledge about skills (Byrne, 1984), these individuals’ self-concepts more readily fluctuate. It is reasonable to hypothesise, therefore, that these students have lower self-concepts. Students with negative self-perceptions give up when confronted with challenging tasks and are more likely to fail (Assor & Connell, 1992; Bandura, 1986; Berry & West, 1993; Boggiano et al., 1988; Bouffard, 2000; Bouffard-Bouchard & Pinard, 1988; Entwistle et al., 1987; Harter, 1990, 1992). Research on low self-concept has been demonstrated to affect academic achievement adversely.
It is important to note, however, that evidence shows performance goals are not necessarily inimical to successful functioning in an educational setting. In a review of achievement motivation research, Harackiewicz et al. (1998) reported performance goals were adaptive in terms of cognitive engagement, self-regulation, learning strategies and performance (see also Harackiewicz, Barron, Carter, Lehto & Elliot, 1997; Midgley & Urdan, 1995; Roeser et al., 1996; Skaalvik 1997c, 1997b). Harackiewicz et al. (1998) highlighted that the extent to which performance goals are adaptive or maladaptive is largely dependent upon the educational setting. For instance, Harackiewicz and colleagues demonstrated that competitive settings for those high in achievement orientation can beneficially affect performance goal oriented individuals through their motivation and performance (Elliot & Harackiewicz, 1994; Epstein & Harackiewicz, 1992). Although a performance goal can be adaptive, a performance oriented individual grounds success and failure essentially in terms of ability (see Middleton & Midgley, 1997). Therefore, if a performance goal oriented individual regularly outperforms their peers, then they are likely to compare and evaluate themselves positively and this can lead to the development of a positive self-concept.

5.2.1.3 Social goals, self-concept, and academic achievement
Social goals are a relatively recent topic for investigation so there are few studies that examine the effects of social goals on other important variables (although see Hicks et al., 1995; and Ryan et al., 1997; for two exceptions). Of the limited research relating to social goals, it has been shown that students’ preference for working with peers can heighten motivation, which supports and extends learning (Eccles et al., 1998; Zusho & Pintrich, 2001). Perhaps working with friends and facilitating others provides positive exchanges for students pursuing a social goal. Students may receive recognition of their assistance from their teachers as well as from their peers. These positive interactions and experiences could contribute to the formation of a positive self-concept. On the other hand, facilitating others may elicit unhealthy comparisons between peers and induce negative exchanges. Furthermore, the preoccupation with facilitating others may detract from the importance of attaining competence and understanding for themselves, leading to the decline of their own self-concept. It is therefore hypothesised that the pursuit of a social goal causes changes to self-concept, and these changes could be either negative or positive. The
direction of change to one’s self-concept will depend on the quality of the interactions as well as the recognition received.

In consideration of the above discussion, it is hypothesised that students’ goal orientations influence self-concepts in academic domains such as English and mathematics; these in turn predict students’ academic achievement in the respective domain. Figure 5.1 depicts this causal relationship. According to the domain-specificity of self-concept, specific subject domains (e.g., mathematics self-concept) correlate most strongly with academic achievement from the same subject domain (e.g., mathematics achievement; Byrne & Worth-Gavin, 1996). This study also proposes that student goal orientations affect students’ mathematics and English self-concepts, which in turn predict their achievement in corresponding subject domains.

![Figure 5.1. Goal orientations causally predominant. MAS = Mastery goal, PER = Performance goal, SOC = Social goals, ESC = English self-concept, MSC = Mathematics self-concept, EACH = English achievement, MACH = Mathematics achievement, T1 = Time 1, T2 = Time, T3 = Time 3.]

5.2.2 Causal ordering 2: Self-concept, goals, and achievement

In contrast to the above proposed causal ordering of goals and self-concept and their effect on academic achievement, the following section proposes a rationale for the causal predominance of self-concept over goals.
5.2.2.1 Self-concept, mastery goals, and academic achievement

Valentine and DuBois (2005) acknowledge in their review of research on self-beliefs the importance of examining moderating variables in an effort to further explain how self-beliefs and academic achievement are related. They provide an example of how positive academic self-beliefs may increase academic motivation, which in turn may improve academic achievement. Valentine and DuBois (2005) encourage investigators to “include these variables more frequently when studying the relationship between self-beliefs and achievement” (p. 72). This section will examine research that provides evidence for the causal predominance of self-concept over goals.

A general consensus in contemporary motivational research is that low self-perceptions of ability have dire consequences for motivation, such that these beliefs detrimentally influence task engagement, effort expenditure, and persistence in the face of difficulty (Graham & Weiner, 1996; Skaalvik, 1997a). For instance, Skaalvik et al. (1994) demonstrated that perceptions of self predicted students’ goal orientation.

Self-perceived abilities have been reported to relate systematically with measures of intrinsic motivation (Gottfried, 1990; Harter & Connell, 1984; Meece et al., 1988; Skaalvik & Rankin, 1996a). The outcome of academic achievement on motivation has been demonstrated in a sparse number of studies, to be mediated through academic self-concept (Norwich, 1987; Skaalvik & Rankin, 1995a, 1996a). MacIver et al. (1991) proposed a causal relationship between self-perceived abilities and intrinsic motivation. The MacIver et al. (1991) findings indicated self-perceived abilities predicted the directional change of intrinsic motivation. Skaalvik & Rankin (1996a) identified an indirect and direct effect of persistence and engagement in classroom tasks on achievement; the indirect effect was mediated through self-concept of ability.

A high self-concept of ability may be a favourable precondition for the initiation and persistence of effort in learning and achievement situations (Helmke, 1989, 1991, 1992). Evidence shows that mastery oriented students have a strong “sense of
competence and self-determination that gives rise to mastery goal pursuit” (Seifert, 2004, p.346). These individuals believe they are masters of their own fate because they are confident in their own capabilities (high self-concept). Accordingly, mastery oriented individuals believe they are competent and demonstrate a strong sense of control, primarily as a result of their healthy attributions. These individuals often attribute successes to internal causes such as ability and effort (Krause, Bochner, & Duchesne, 2006; Woolfolk, 2006). Weiner (2000) argues that internal and external causes are closely related to self-esteem so, when an individual attributes success to internal factors, success will contribute to feelings of pride and increased motivation.

It appears that a mastery pattern of behaviour is driven by a strong sense of self (Seifert, 2004). Therefore, it is reasonable to hypothesise that students with a high self-concept will orientate themselves towards a mastery goal. For instance, a positive mathematics self-concept has been shown to relate to students’ perseverance when confronted with challenging tasks (Berry & West, 1993; Bouffard, 2000).

5.2.2.2 Self-concept, performance goals, and academic achievement

Individuals of low self-concept have a predisposition to threats to their self-worth (Martin, 1998; Thompson, 1994) and are more inclined than individuals higher in self-concept to engage in strategies that verify and reinforce their low self-concept (Baumeister, Tice, & Hutton, 1989). Often associated with performance goals is the deployment of less sophisticated strategy use and a “tendency not to process information related to success” (Seifert, 2004, p.346). It could be argued then, that individuals low in self-concept deploy behaviour patterns associated with a performance goal such as showing preference for simple and less complex tasks, displaying withdrawal of effort if there is a chance of failure, and demonstrating lack of enthusiasm when completing tasks (Ames, 1992; Dweck & Leggett, 1988; Nicholls, 1989).

Performance oriented individuals attribute their successes and failures to external and uncontrollable factors in an attempt to maintain positive ability perceptions (self-concept), but maintaining this positive sense of self does not always seem to be the case for performance oriented individuals, as evidenced in Seifert’s (2004) research. He found that performance oriented individuals often perceive themselves as less
competent and make more negative self-statements. A performance pattern of behaviour can be driven by poor sense of self, so students with a low self-concept may avoid critical learning situations which could threaten their self-concept, hence may show less effort at school and, as a result, adopt a performance goal.

It is also feasible that a performance pattern of behaviour would be driven by a strong sense of self. Individuals who maintain a high ability perception by regularly outperforming their peers may in fact make positive self-statements. If these individuals regularly demonstrate their high ability relative to others, and form a positive self-concept as a result of their frequent success, it is likely that these students will value tasks that provide opportunities to reference themselves to others and continue to pursue a performance goal.

Skaalvik et al. (1994) demonstrated that perceptions of self predicted students’ goal orientation. For instance, an individual with a high self-concept may focus on outperforming others, which would predict a positive path between self-concept and performance approach goals. Supporting this prediction is the research that has found positive correlations between academic self-concepts and performance approach goals (see for example Nicholls, 1989). Hence, a performance pattern of behaviour can also be driven by a positive sense of self.

5.2.2.3 Self-concept, social goals, and academic achievement

It is hypothesised that social goals emerge principally as a consequence of academic self-concept. According to this model, developing a strong self-concept will affect subsequent social goal pursuits. A proportion of the literature on social goals highlights the benefits of working with peers, especially for adolescents since they are more inclined to prefer working and assisting their peers to complete tasks (Ellis, Marsh, & Craven, 2005). If students evaluate themselves positively, and are encouraged to develop enhanced self-concepts, then it is likely that these students will feel more confident in their ability, and will be more likely to pursue a social goal because they feel confident in helping their peers.
In accordance with the literature, it is hypothesised that students’ mathematics and English self-concepts influence goal orientations which, in turn, predict student academic achievement. Figure 5.2 depicts this causal flow.

![Diagram](image)

*Figure 5.2. Domain-specific self-concepts causally predominant. MAS = Mastery goal, PER = Performance goal, SOC = Social goals, ESC = English self-concept, MSC = Mathematics self-concept, EACH = English achievement, MACH = Mathematics achievement, T1 = Time 1, T2 = Time, T3 = Time 3.*

### 5.2.3 Causal ordering 3: Reciprocal Causality

The final rationale for the potential causal flow of goals and self-concept is the reciprocal-effects model. This alternative model is perhaps a compromise between the two earlier proposed models since it provides evidence supporting both competing causal flows discussed in the above two sections. The section below proposes a rationale for the reciprocal-effects model.

#### 5.2.3.1 Reciprocal relationship between goals, self-concept, and academic achievement

Self-concept researchers distinguish the self-concept-motivation relationship implicitly and explicitly. For example, the widely used SDQ instrument has mathematics and verbal self-concept scales which integrate measures of self-perceived ability and motivational/emotional items (Skaalvik, 1997a). A few studies have demonstrated through factor analysis that the self-concept and motivation items form separate scales, yet remain strongly correlated (Barker et al., 2006a; Skaalvik &
Rankin, 1996a; Tanzer, 1996). Perhaps goals influence self-concept over time but self-concept also influences goal pursuits over time.

Contradictory evidence in the literature dealing with the causal ordering of goals, self-concept, and achievement suggests that there may be no clear-cut causal ordering of these variables; that is, self-concept and goals may be reciprocally or non-recursively related. Such a relationship would potentially account for evidence for both sets of ordering in the literature. For this reason, it is proposed that a reciprocal relationship between goals and academic self-concept ought to be investigated as an alternative to the two causal orderings proposed above. Figure 5.3 assumes students’ domain-specific self-concepts affect subsequent academic achievement and that this is mediated through the goal orientations, and that students’ goal orientations affect subsequent academic achievement and this is mediated through domain-specific self-concepts.

![Diagram](image)

*Figure 5.3. Reciprocal-effects model of goals and self-concept affecting subsequent academic achievement. MAS = Mastery goal, PER = Performance goal, SOC = Social goals, ESC = English self-concept, MSC = Mathematics self-concept, EACH = English achievement, MACH = Mathematics achievement, T1 = Time 1, T2 = Time, T3 = Time 3.*
A central aim of this study is to investigate the relationships between students’ domain-specific self-concepts and goal orientations and examine how these two sets of motivational variables interrelate to affect academic achievement. Thus, this research study hypothesises three competing models of causality:

a) goal orientations affect academic self-concepts, which affect subsequent academic achievement,

b) academic self-concepts affect goal orientations, which affect subsequent academic achievement and,

c) goal orientations, academic self-concepts and academic achievement affect each other such that they are reciprocally related over time.

5.3 Summary of Chapter

This chapter has substantiated relations between students’ goal orientations and academic self-concept, and the form and nature of these relationships were examined. Additionally, goal orientations and domain-specific self-concepts were examined in terms of how they directly and indirectly relate to academic achievement. A series of three competing models which derives from the conceptual review of the relations between each factor, has been presented. These three hypothesised competing models are explored in the empirical components of this study. The following chapter draws together and discusses research issues associated with these models in preparation for their subsequent statistical evaluations.
CHAPTER 6
HYPOTHESES AND RESEARCH QUESTION

6.1 Overview

Although students’ goal pursuits and academic self-concept are interrelated and have been implicitly linked, few research studies have examined the relation between them and even fewer studies have investigated their combined effect on academic achievement (Skaalvik, 1997a, 1997b). This study is designed to examine the causal relations among students’ adaptive goal orientations, students’ academic self-concepts and academic achievement in mathematics and English domains. Employing substantially improved methodologies to examine these relations, this study avoids methodological limitations from previous research by:

(a) utilising a measurement instrument that operationalises students’ goals as multidimensional and comprising academic goals as well as social goals,
(b) utilising a multidimensional self-concept measurement instrument with demonstrated construct validity,
(c) combining the General Achievement Goal Orientation Scale (GAGOS) and Academic Self-Description Questionnaire II (ASDQII) instruments with the purpose of providing a more integrative model of student motivation,
(d) targeting two domain-specific facets of academic self-concept rather than poorly-defined global measures of self-concept,
(e) comprising a large sample size and,
(f) following recent guidelines proposed by Marsh et al. (1999) for analysing longitudinal causal structural equation models and applying Marsh and Craven’s (2006) evaluation procedures to assessing these models, thereby applying a rigorous research design.
The purpose of this chapter is to present: a) the statement of the problem to be investigated; b) the aims of this study; c) the specific hypotheses and the research question that will be tested; and d) rationales for each hypothesis and research question, in the context of extant research literature. Hypotheses are posed where previous research provides evidence for predictions. The research question is posed where previous research results do not inform directionality of predictions.

### 6.2 Statement of the Problem

Are high school students’ academic achievements in English and mathematics affected by both students’ approach goals and academic self-concepts such that: (a) approach goals affect subsequent domain-specific self-concepts which then influence subsequent academic achievement or; (b) domain-specific self-concepts affect subsequent approach goals which then influence subsequent academic achievement or; (c) approach goals, domain-specific self-concepts and academic achievement affect each other such that they are reciprocally related?

### 6.3 Aims

Utilising recommended research methodologies, this study aims to:

1. Test whether approach achievement goals can be conceptualised as comprising mastery, performance and social goals and test whether these goals are multidimensional and hierarchically structured for high school students.
2. Test whether academic self-concept can be conceptualised as comprising English self-concept and mathematics self-concept and test whether academic self-concept is multidimensional and hierarchically structured for high school students.
3. Test whether the models detailed in Aims 1 and 2 remain invariant across sex such that differences of kind are investigated.
5. Test causal relations between students’ approach goals, domain-specific self-concepts and academic achievement in mathematics and English, thereby testing whether: (a) goal orientations (mastery, performance, and social goals) affect academic self-concepts (mathematics and English self-concepts), which in turn influence subsequent academic achievement in two corresponding academic domains (mathematics and English achievement), (b) academic self-concepts affect subsequent goal orientations, which in turn influence subsequent academic achievement and, (c) goal orientations, academic self-concepts and academic achievement are all mutually reinforcing such that they are reciprocally related over time.

6.4 Statement of Hypotheses

6.4.1 Hypothesis 1: Measurement of students’ goals and academic self-concept
This study examines academic goals and social goals as well as English and maths self-concepts within the context of the one instrument. It is hypothesised that: (a) despite being combined in the one measurement instrument, the General Achievement Goal Orientation Scale (GAGOS) and the Academic Self Description Questionnaire II (ASDQII), will maintain scale independence; (b) students’ multiple approach goals, as operationalised in the GAGOS, are represented by mastery goals, performance approach goals, and social goals, thereby demonstrating their multidimensionality; and (c) academic self-concept can be represented by two distinct subject domains, English and mathematics, thereby demonstrating the multidimensional nature of students’ academic self-concept.

6.4.1.1 Rationale for Hypothesis 1a
Drawn from their original instruments, the GAGOS and ASDQII, have been combined with the purpose of forming an integrative instrument that measures students’ adaptive cognitive dimensions of academic motivation. Specifically, the combined instrument measures both students’ goals and academic self-concept. To determine the validity of combining the GAGOS and ASDQII in the one instrument, it is essential to assess the psychometric properties of these combined measures (items and scales) and demonstrate that academic achievement motivation remains independent from academic self-concept.
Students’ goals and academic self-concept are interrelated. As discussed in the review of the literature, there are two explanations for how they might relate. The first explanation assumes that perceptions of a task (i.e., perceived as competitive or non-competitive) can influence perceptions of self. For instance, if one perceives a task to be competitive in nature, this may cause the individual to form negative self-perceptions of ability (e.g., Harackiewicz et al., 1998). The alternative, but complementary explanation assumes that perceptions concerning “Why am I doing this?” (goal orientation), and perceptions concerning “Can I do this?” (self-concept), may interact reciprocally to influence both academic engagement and academic achievement. For instance, one individual may perceive that the purpose of a task is to demonstrate competitive superiority (i.e., “I am doing this to win”), but be unsure that they have the ability to “win”.

Since students’ goals and self-perceptions are related to task engagement and motivation, it is important to determine whether and how the instruments designed to measure each construct are similar yet distinct. The GAGOS and ASDQII are related, as both instruments measure students’ adaptive cognitive dimension of academic motivation (Martin, 2003). Measurements from both instruments can predict effort expenditure, task choice, strategy use, and persistence (Aunola et al. 2006; Robins & Pals, 2002; Skaalvik et al., 1994). The instruments are distinct such that the ASDQII measures perceptions of self in two academic domains (mathematics and English) whilst the GAGOS measures various purposes for engaging in academic tasks (mastery, performance approach and social orientations). Specifically, the ASDQII pursues a descriptive/evaluative aspect of self-concept that directs respondents to evaluate themselves in mathematics and English domains. Related feelings associated with descriptive/evaluative aspects give rise to affective reactions which impact student engagement. Building on this, the GAGOS measures a variety of purposes for this engagement. Consequently, it is hypothesised that although students’ goals and academic self-concepts are related, the measurements drawn from their original instruments (GAGOS and ASDQII) will remain independent when combined to form an integrative model of adaptive motivation.
6.4.1.2 Rationale for Hypothesis 1b
Research on goal theory continues to evolve and important developments in conceptualising goal pursuits have arisen (Urdan & Mestas, 2006). Researchers have recently argued that social goals warrant inclusion within the goal theory framework because like academic goals (mastery and performance goals) they facilitate individuals to organise and direct behaviour in order to achieve in academic situations (Covington, 2000; Urdan & Maehr, 1995). A distinguishing feature of this study and the related instrument designed to measure students’ multiple goals (GAGOS), is the exclusive focus on adaptive goals. Adaptive goals express students’ varying purposes for engaging in achievement-related situations rather than attending to maladaptive goals that express purposes for avoiding achievement situations. Consequently, multiple adaptive goals in this study comprise mastery goals, performance approach goals, and social goals.

6.4.1.3 Rationale for Hypothesis 1c
Shavelson et al.’s (1976) model of self-concept included the assumption that self-concept is multifaceted and not unidimensional. Data from research studies show distinct partitioning between English and mathematics self-concepts such that demonstrating a general self-concept factor has proved more complex than originally anticipated, leading Marsh and Shavelson (1985) to revise the original model. Relatively recently researchers have designed instruments that measure specific facets of self-concept. Based on the Shavelson model, Marsh designed the SDQ instrument and subsequently the ASDQ instrument with the intent to measure the specific facets of self-concept. The present study utilises the well validated ASDQII instrument and extracts the items that measure high school students’ English and mathematics self-concepts.

6.4.2 Hypothesis 2: Coordination of multiple goals
Given the current surge in literature postulating that students pursue multiple goals (Harackiewicz & Linnenbrink, 2005), it is hypothesised that correlations among the goals will be positive such that: (a) students pursuing performance approach goals will also pursue mastery goals, (b) students pursuing mastery goals will also pursue social goals, and (c) students pursuing performance goals will pursue social goals.
6.4.2.1 Rationale for Hypothesis 2
Current research suggests that students adopt multiple goals; however, debate concerning whether these multiple goal pursuits are beneficial remains largely unanswered (Thomas & Barron, 2006). Traditionally, the multiple goal perspective has exclusively examined the simultaneous interaction of mastery goals and performance approach goals and has overlooked the importance of investigating other significant goal pursuits which impact motivation and achievement. This study includes social goals within the multiple goal perspective. Importantly, goals in this study are adaptive and are positively oriented as they relate to varying purposes for achievement. These approach goals are likely to interact positively and can provide insight into how students are motivated and how they achieve at school.

6.4.3 Hypothesis 3: Stability of students’ goals and academic self-concept
In testing the stability of high school students’ goals and academic self-concept, two hypotheses are considered: (a) students’ goals remain stable across the three waves of data and (b) students’ English self-concept and maths self-concept remain stable across the three waves of data.

6.4.3.1 Rationale for Hypothesis 3
Guay et al. (2003) report that in their study for students in Grades 2 through 4, measures of academic self-concept become increasingly reliable and stable as the children grow older. As children grow older and develop, it appears that their self-concept becomes more stable (Skaalvik, 1997a). Similarly to self-concept, goal pursuits also become increasingly stable as children grow older and develop (Jagacinski, Madden, & Reider, 2001). Although there is an absence of consensus as to whether goal orientations are stable, only a handful of studies have demonstrated the instability of goals (DeShon & Gillespie, 2005), while the vast majority demonstrate goals to be stable across time (Button, Mathiey, & Zajac, 1996).
6.4.4 Hypothesis 4: Hierarchical structure of students’ goals

The three adaptive goals in this study all direct and energise an individual to engage in academic tasks. Although all three are positively oriented, the specific reason or content for each goal varies, such that the purpose for engaging in academic tasks differs among the three adaptive goals. It is hypothesised that students’ goals are hierarchically structured such that a higher-order factor represents purposes for engagement and the first-order factors represent the three varying purposes for engagement. Figure 6.1 depicts the three first-order factors (mastery, performance, and social goals) and one higher-order factor (purposes for achievement).

![Figure 6.1. Hypothesised hierarchical model of approach goals](image)

6.4.4.1 Rationale for Hypothesis 4

Mastery oriented individuals perceive purposes for engaging in academic tasks so as to master a skill or activity in an attempt to seek competence. Performance approach individuals perceive purposes for engaging in academic tasks so as to attain favourable judgements of competence by outperforming others. Social oriented individuals perceive purposes for engaging in academic tasks so as to work with friends or to help their peers complete tasks because they are concerned with social reasons for attempting to achieve in academic situations. Underlying these three adaptive goals is the purpose for engagement in academic situations. Therefore, the higher-order factor for the three adaptive goals encapsulates reasons for engagement. The lower order factors therefore delineate among these varying purposes for engagement. The content and reasons for engagement are distinct for each of these adaptive goals.
6.4.5 Hypothesis 5: Hierarchical structure of students’ academic self-concept

Marsh and Shavelson (1985) revised the original model of self-concept predominantly as a result of the weak hierarchy of self-concept. Comparably with most self-concept research, it is hypothesised that the correlations between English and mathematics self-concept will be weak and may even be negatively correlated, and therefore it is further hypothesised that there will be minimal evidence for a hierarchy of academic self-concept that encapsulates both English self-concept and maths self-concept. Figure 6.2 depicts the two first-order factors (English and mathematics self-concepts) and one higher-order factor (academic self-concept).

![Diagram of hypothesised hierarchical model of academic self-concept](image)

Figure 6.2. Hypothesised hierarchical model of academic self-concept

6.4.5.1 Rationale for Hypothesis 5

In school settings the hierarchy of academic self-concept has been found to be typically weak. This especially applies for domain-specific self-concepts which are very distinct, especially in adolescence, where subject domains are more clearly differentiated. The hierarchy is weak due to low correlations between English and maths self-concept being reported as nonpositive (often near zero). Although it is a reasonable assumption that self-concepts in various domains should be correlated, the evidence for this is weak and has not only led to the revision of Shavelson’s original model but has also directed Marsh to develop the internal/external (I/E) frames of reference comparison process. The I/E model accounts for weak to near zero correlations between English and mathematics self-concepts by suggesting individuals compare their self-perceived skills in one subject with self-perceived skills in another subject and use this internal relativistic impression as a basis for
arriving at self-perceptions of ability in particular domains. Hence, individuals with high ability in English and mathematics will nevertheless have a more negative self-concept in the subject that they perceive themselves to be not as good at. Therefore this study predicts that the correlation between English and mathematics will be weak or even negative.

6.4.6 Hypothesis 6: Invariance across sex
In testing for invariance of students’ goals and academic self-concept across sex, two hypotheses are considered: (a) that the number of underlying factors is equivalent, and (b) that the pattern of factor loadings is equivalent.

6.4.6.1 Rationale for Hypothesis 6
Research studies of students’ goals and academic self-concept frequently report differences of degree between males and females. Before determining differences of degree, however, researchers must test differences of kind, that is, that the factor structure of the given instrument is equivalent for various groups being investigated (e.g., males and females). Green et al. (2006) have demonstrated that males and females do not respond fundamentally differently to key facets of motivation. Marsh et al. (1984) and Marsh et al. (1998) have demonstrated males and females do not respond fundamentally differently to key facets of academic self-concept.

6.4.7 Hypothesis 7: Domain-specificity of academic self-concept and corresponding academic achievement
On the basis of the internal/external frames of reference model, it is hypothesised that academic achievement in each school subject correlates more highly with the corresponding academic self-concept scale than with any other self-concept scale. Two hypotheses are proposed: (a) English self-concept will correlate positively with English achievement and negatively correlate with maths achievement, and (b) Maths self-concept will correlate positively with maths achievement and negatively with English achievement. Figure 6.3 depicts the hypothesised pattern of relations between domain-specific self-concepts in English and mathematics and achievement in the same domains.
6.4.7.1 Rationale for Hypothesis 7

Repeatedly, studies purport to show moderate-to-strong correlations between academic self-concept and academic achievement. These correlations are strongest between matching areas of achievement (e.g., English achievement) with their respective self-concept (e.g., English self-concept), whereas substantially weaker correlations have been found between non-matching areas of academic achievement and self-concept (see for example Marsh, Trautwein, et al., 2004). This pattern of results demonstrates that self-concept is domain-specific with respect to achievement.

Furthermore, support for the internal/external frames of reference model will be evident if paths from maths self-concept to maths achievement and paths from English self-concept and English achievement are substantially positive. This is due to the external comparisons process, where perceptions of good maths skills contribute to better maths self-concept. This external comparisons process also applies to good English skills as they too can contribute to increases in English self-concept. According to the internal comparison process, paths from maths achievement to English self-concept and paths from English achievement to maths self-concept are likely to be negative. Specifically, good maths skills are likely to lead to reduced English self-concepts (once the positive effects of good English skills are controlled). Likewise, good English skills are likely to lead to reduced maths self-concepts.

Figure 6.3. Hypothesised relations between self-concept and academic achievement
6.5 Research Question

The chief aim of this study is to examine the causal relations of students’ goals, academic self-concept and academic achievement. To date, no study examining these variables has employed the prerequisites recommended by Marsh et al. (1999); in fact, few studies examining causal relations among motivational variables have satisfied the essential guidelines. These prerequisites and their application to this study are discussed in Chapter 8 in detail. In satisfying and to some degree exceeding the recent methodological advances in longitudinal panel designs, this study questions: What is the causal ordering of students’ goals, domain-specific self-concepts and academic achievement in English and mathematics? Three alternative explanations for the possible causality of these constructs are discussed below.

6.6 Rationale for Alternative Competing Models of Causality

Relative to the few studies on academic self-concept and students’ goal orientation, most have researched global measures of academic self-concept, not domain-specific self-concepts (i.e., English self-concept and maths self-concept). The researcher of this study is aware of no studies that have investigated causal relations between domain-specific self-concepts and student goal orientations. Therefore, hypotheses proposed have been formulated using available correlational and experimental studies which investigate relations between goal orientations and global academic self-concept and other related self constructs.

6.6.1 Causal ordering 1: Goals, self-concepts, and academic achievement

Mastery oriented individuals view effort as the primary basis of academic outcomes, consequently, their ability remains unthreatened in achievement-related situations (Martin, 1998). These individuals perceive themselves as more competent since they focus on attributes they have control over such as effort, learning strategies, and task mastery. Mastery goals have adaptive qualities which promote challenge and persistence. In accordance with this reasoning, Pajares et al. (2000) found a positive correlation between task goals and self-concept. Mastery oriented individuals’ beliefs and characteristics harvest cognitive growth and development (Seifert, 1997).
Adaptive motivational patterns include adopting greater preference for challenge (Seifert, 1995), using more positive self-statements (Seifert, 1997), employing more strategy use, especially deeper levels of processing (Pintrich & Garcia, 1991), and reporting more positive affect (Seifert, 1995). Consequently, mastery oriented individuals are more willing to select and complete challenging tasks that require the deployment of learning strategies. As a result of exerting effort and engaging in strategy use, these individuals successfully complete tasks and acknowledge their success as a combination of effort and strategy use. Hence, task completion is accompanied by feelings of satisfaction, being proud and worthy, and increased competence (Borkowski, Carr, Rellinger, & Pressley, 1990). These beliefs and behaviours of a mastery oriented individual are self-enhancing and cause increases to self-concept in subject domains where a mastery goal is adopted.

It is projected that the adaptive qualities of a mastery goal enhance feelings of competence and that these increases in self-concept positively cause changes in subsequent academic achievement. Therefore, it is proposed that mastery goals positively influence English and maths self-concepts and these self-concepts positively affect achievement in the corresponding academic domain. It is further predicted that the causal path from mastery goals to English self-concept will be a stronger positive path than the path from mastery goals to maths self-concept. According to this prediction, qualities of a mastery goal are more congruent with the subject domain of English than maths. For instance, English classes tend to be concerned with expressions of opinions and feelings, and tasks are more often cooperatively structured (Dowson, 1999) so that the emphasis is on understanding and appreciating, all of which are concerns for a mastery oriented individual.

Due to the adaptive nature of mastery goals, the causal paths from mastery goals to English and mathematics self-concepts will both be positive. In sum, it is proposed that mastery goals fuel positive changes to English and maths self-concepts through their adaptive form and that these positive self-concepts cause increases in subsequent academic achievement within the corresponding academic domain.
Unlike mastery individuals, performance approach oriented individuals view ability as the primary basis of academic outcomes; consequently, their level of ability is frequently threatened in achievement-related situations (Martin, 1998). On the basis that performance approach individuals consider ability to be the predominant cause of success, these individuals become more vulnerable since they perceive failure as reflecting poor ability. In accordance with this reasoning Pals and Robins (2002) found that performance orientated individuals experience more negative affect. Perceptions of poor ability contribute to the development of low self-concepts. Therefore, it could be proposed that for many performance approach oriented individuals, a performance goal is negatively associated with self-concept. However, most research, with a few exceptions (e.g., Ames & Archer, 1988; Pajares et al., 2000), has reported a positive correlation between performance approach goals and academic self-concept, so the above rationale appears counterintuitive to results of most correlational studies (Hagen, 1994; Shih & Alexander, 2000; Skaalvik, 1997c).

Conversely, a number of performance approach individuals may in fact have a high self-concept (Nicholls, 1989; Skaalvik, 1997a). This is because some students will regularly outperform their peers. Winning and outperforming others is a limited commodity but a few performance approach oriented individuals will experience this form of success. These high achieving performance approach individuals will be less threatened and will thrive in achievement-related situations as they perceive themselves as more capable and possessing high ability. For these individuals, a performance approach goal can fuel increases to their self-concept, which can cause improvements in subsequent academic achievement.

Adoption of a performance goal can be a self-protective process (Seifert, 1997). This self-protective process may result in improvements to one’s academic self-concept. In the case of failure, a performance approach oriented individual is self-protective as they may not exert effort needed to outperform a peer and may cite lack of effort rather than ability as the cause for losing. Thus, the student maintains their sense of self by self-protecting when they attribute losing or not outperforming others to withdrawal of effort (Seifert, 1995). Accordingly, performance approach goals may relate positively to academic self-concept. However this path will not be as strong as it is for mastery goals and academic self-concept.
Recently, performance approach goals have been associated with adaptive motivational patterns such as cognitive engagement (Meece et al., 1988; Wolters et al., 1996), positive affect (Linnenbrink & Pintrich, 2002; Seifert, 1995), employment of learning strategies (Seo & Kim, 2001), and persistence (Elliot & McGregor, 1999; Sideridis, 2005). On the basis of this recent research, it is proposed that performance approach goals positively influence both English and maths self-concepts and that these self-concepts positively influence achievement in the corresponding academic domain. It is further predicted that the causal path from performance approach goals to maths self-concept will be a stronger positive path than the path from performance approach goals to English self-concept. According to this prediction, qualities of a performance approach goal are more congruent with the subject domain of maths than English. For instance, maths requires more individualistic approaches to learning, which centre on accuracy. There are more opportunities for social comparisons, as material is often quantitatively measured through tests (Aunola et al., 2006; Dowson, 1999). These class structures promote performance approach goals as they emphasise social comparison and these individuals enjoy and take pleasure in competing (Linnenbrink & Pintrich, 2002).

Due to the adaptive motivational patterns associated with performance approach goals, the causal path from performance goals to English self-concept will be positive but weaker than the causal path from performance goals to maths self-concept. In sum, it is proposed that performance approach goals fuel positive changes to English and maths self-concepts through their adaptive form and these positive self-concepts cause increases in subsequent academic achievement within the corresponding academic domain.

Social goals in this study focus on working with peers and align closely with social affiliation goals and social concern goals which have been shown to relate strongly with mastery goals (Anderman & Anderman, 1999; Hinkley et al., 2001). In order to work cooperatively and to assist peers, it is essential that social oriented individuals seek understanding and task mastery. Therefore, social oriented individuals view effort as a significant determinant for understanding. Social oriented individuals engender adaptive qualities which promote effective approaches for learning (Dowson, 1999). It is projected that these adaptive qualities, in addition to them
observing peers’ appreciation and improvement, lead to enhanced feelings of competence which cause increases in English and maths self-concepts. Increases in English and maths self-concepts cause increases in subsequent achievement in the corresponding academic domain. Therefore, it is proposed that social goals are positively associated with both English and maths self-concepts and these self-concepts positively influence achievement in the corresponding academic domain.

6.6.2 Causal ordering 2: Self-concepts, goals, and academic achievement

In contrast to the above causal ordering model, it is plausible that self-concept is predominant and its effects on achievement are mediated through the adopting of achievement goals. For example, Elliot and colleagues (Elliot & Church, 1997; Elliot & Harackiewicz, 1996) projected that perceived competence be treated as an antecedent of achievement goals rather than as a moderating variable. Dai (2000) assumes that self-perceptions of competence regulate goal adoption, regardless of the individuals’ level of achievement. This research demonstrates that academic self-concept drives students’ selection of goal adoption.

It is hypothesised that a high maths or English self-concept will cause students to pursue a mastery goal. Seifert (2004) found that a strong sense of competence causes students to adopt motivational patterns consistent with a mastery goal pursuit. Having a high self-concept in English or maths facilitates effective thought processes (Seifert, 2004). These positive thoughts concerning competence encourage an individual to believe they are masters of their own fate and have control over their learning and effort expenditure. Accordingly, mastery oriented individuals engage in tasks to seek further mastery and competence. They employ effective learning strategies and value tasks for interest's sake. Helmke (1989, 1991, 1992) acknowledges that a high self-concept is a favourable antecedent for the initiation of persistence and effort for learning. Well documented in the literature is the influence of self-concept and self-efficacy on effort expenditure (Dai, 2000). Each of these characteristics, specifically, positive thoughts, effort expenditure, and control processes, explicates features of a mastery goal. In accordance with this reasoning, academic self-concept has been found to relate positively with mastery goals (Duda & Nicholls, 1992; Skaalvik, 1996).
It is further predicted that the causal path from English self-concept to mastery goals will be stronger than the causal path from maths self-concept to mastery goals. This argument is parallel to that proposed above for the first hypothesised competing model. Specifically, the subject domain of English is more congruent with features of a mastery goal. Mastery goals are heightened in contexts where individuals are encouraged to understand, and where social comparisons are reduced. In English classes mastery goals are regularly fostered since the focus is on expressing opinions and feelings, and tasks are more often open ended and structured to be cooperative (Dowson, 1999).

It is argued above that students’ English and maths self-concepts will cause students to pursue mastery goals. It is further hypothesised that a mastery goal pursuit will cause improvements to subsequent academic achievement in both English and mathematics domains. This reasoning is supported by research studies that find positive correlations between mastery goals and academic achievement (Church et al., 2001; Kaplan & Maehr, 1999). Dowson (1999) found stronger positive correlations between mastery goals in English than maths achievement. On the basis of this research, it is proposed that the causal path from mastery goals to maths achievement will remain positive but be weaker than the path from mastery goals to English achievement.

It is hypothesised that high and low maths or English self-concepts cause students to pursue performance goals. A performance pattern of behaviour may be driven by a strong sense of self as well as a poor sense of self. A student with a strong sense of self has high ability perceptions and these students are attracted to opportunities to display their ability relative to others. Furthermore, these individuals strive to outperform their peers as they perceive their ability to be high and gravitate toward pursuing performance approach goals. Due to their high self-concepts, they value tasks that provide opportunities to reference themselves to others. Skaalvik (1997c) demonstrated performance approach goals positively correlated with self-perceived abilities and reasoned that individuals with high ability perceptions focus on outperforming others. Hence, a performance approach pattern of behaviour can be driven by a strong sense of self. It is therefore proposed that the path from English and maths self-concept to performance goals will be positive.
A student with a poor sense of self may have low ability perceptions and these students may be driven to adopt performance goals due to the appealing self-protective processes associated with a performance goal. Self-protective processes such as reducing effort, employing maladaptive learning strategies and displays of helplessness when faced with the possibility of losing, are characteristic of a performance approach goal (Kaplan & Midgely, 1997; Martin, 1998; Seifert, 1997). Thus, a student with a low self-concept pursuing a performance goal self-protects by withdrawal from the task. It is hypothesised that a performance pattern of behaviour can be driven not only by a strong sense of self but by a poor sense of self also.

It is further predicted that the causal path from maths self-concept to performance goals will be stronger than the causal path from English self-concept to performance goals. This argument is parallel to that proposed above for the first hypothesised competing model. Specifically, the subject domain of maths is more congruent with features of a performance goal. Performance goals are heightened in contexts where the emphasis is on accuracy, individualistic approaches to learning are fostered and social comparisons occur. In maths classes performance goals are fostered since the focus is on obtaining the correct answer and there are more opportunities for social comparisons (Aunola et al., 2006; Dowson, 1999).

Recent research provides strong evidence that a performance approach goal governs adaptive motivational patterns (Elliot & Church, 1997; Harackiewicz, Barron, Pintrich, et al., 2002; Kaplan & Middleton, 2002; Midgley et al., 2001). Additionally, studies have shown positive associations between performance goals with outcomes closely related to achievement such as academic self-efficacy, GPAs, and test scores (Church et al., 2001; Harackiewicz, Barron, Carter, Lehto, & Elliot, 1997b; Midgely et al., 1995; Skaalvik, 1997a; Wolters et al., 1996). In addition to predicting that maths and English self-concepts cause students to adopt performance goals, it is also predicted that performance approach goals increase subsequent academic achievement. Although there are inconsistent findings reporting negative and null effects of performance goals on achievement, more recent research which dichotomises performance goals into approach and avoidance, predominantly shows the positive effects of performance approach goals on academic achievement (Harackiewicz et al., 2000; Roeser et al., 1996; Sideridis, 2005; Skaalvik, 1997a).
It is predicted that the pursuit of social goals emerges primarily as a consequence of students’ maths and English self-concepts. It is proposed that positive feelings of self in a subject domain increase the likelihood that a student will adopt a social goal. When a student has a high self-concept, they may choose to invest in a task for the purpose of facilitating their peers’ understanding and to work cooperatively with them to help them understand. Various forms of social goals, associated with helping peers and facilitating peers’ understanding (e.g., social concern), have been shown to relate strongly with mastery goals (Hinkley et al., 2001). Akin to mastery goals, social goals represented in this study are proposed to engender adaptive qualities such as investment in effort, with the central purpose of applying this acquired understanding to assisting peers with task requirements. If students feel confident in their ability then they will be more inclined to pursue social goals because they believe they have the capacity to facilitate their peers’ achievement. In accordance with this reasoning, self-concepts in maths and English cause students to pursue social goals.

Scarcely apparent in the research on social goals is the link with academic performance (Dowson, 1999; Wentzel, 1996). Wentzel (1993, 1996) proposes that social goals are integrally linked to academic achievement. One study that directly associated social goals and academic self-concept was research performed by Dowson (1999). Dowson reported a negative direct effect between social goals and mathematics achievement; however there was an indirect effect through cognitive and metacognitive strategies which outweighed the negative direct effect such that the overall effect of students’ social goals on maths achievement was both positive and significant. Based on these findings, it is hypothesised that the path from students’ social goals will be negative such that social goals will cause decreases to subsequent mathematics achievement. The reverse was true for social goals and English achievement in Dowson’s study. He found social goals increased English achievement both directly and indirectly through cognitive and metacognitive strategy use. Based on these findings, it is hypothesised that the path from students’ social goals to English achievement will be positive, such that social goals will cause increases to subsequent academic achievement.
6.6.3 Causal ordering 3: Reciprocal causality

The third and final causal ordering concedes that there may not be any clear cut ordering of goals (mastery, performance, and social), self-concept (maths and English), and academic achievement. It is proposed that the variables are reciprocally or non-recursively related such that both causal relationships hypothesised above would potentially explain the longitudinal causal relations among the variables. Reciprocal causality assumes that specific goal pursuits affect academic achievement over time, and that this relationship is mediated through domain-specific self-concepts and equivocally, domain-specific self-concepts affect academic achievement over time and this relationship is mediated through specific goal pursuits.

The pivotal research question for this study is concerned with the possible causal ordering of students’ goals, academic self-concept and academic achievement. A limited number of studies have shown how goals and self-concept relate with each other and a larger number of studies report how each construct relates to academic achievement. The vexed question as to how these constructs relate and importantly how they relate over a period of three years is directly investigated in this study. Since there has been a limited number of studies that considered the mediating effects of goal orientations on domain-specific self-concept and academic achievement, and a minimal number of studies have studied the mediating effects of domain-specific self-concept on goal orientations and academic self-concept, a number of competing models have been proposed to explain the possible relations. These three competing models, as detailed above comprise: (a) goal orientations affect domain-specific self-concepts, which affect subsequent academic achievement; (b) domain-specific self-concepts affect goal orientations, which affect subsequent academic achievement; and (c) goal orientations, domain-specific self-concepts and academic achievement affect each other such that they are reciprocally related over time.
6.7 Summary of Chapter

This chapter presented seven hypotheses and a research question. In general the hypotheses relate to the potential multidimensionality and hierarchical structure of goal orientations and academic self-concept and whether they remain invariant across sex. The research question investigates how goals and self-concept are causally related over time to affect academic achievement. The following chapters address each of the hypotheses and research question.
CHAPTER 7

METHOD ORIENTATION: SAMPLE, PROCEDURE, MATERIAL, AND ANALYSES

This chapter presents an overview of the characteristics of the participants, an outline of the survey procedure, a description of the survey, and a brief orientation to the statistical procedures used to analyse the data. More specific details of the sample composition appear in the following chapters.

7.1 Sample and Procedure

In the first year of the study, respondents were students in Years 7, 8, and 9 from nine high schools in rural and urban New South Wales, Australia. These schools are broadly representative of the diverse school settings in that State. In general, the respondents represented a multicultural background of Australian Aboriginal, Anglo-Australian, Middle Eastern, Asian and European origins. Details of the location, number of students and percentage for each of the nine schools are presented in Table 7.1.

Table 7.1

 Origins of Respondents

<table>
<thead>
<tr>
<th>School</th>
<th>Locality</th>
<th>Number of respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SW Sydney</td>
<td>190</td>
<td>18.9</td>
</tr>
<tr>
<td>2</td>
<td>SW Sydney</td>
<td>185</td>
<td>18.5</td>
</tr>
<tr>
<td>3</td>
<td>SW Sydney</td>
<td>78</td>
<td>7.8</td>
</tr>
<tr>
<td>4</td>
<td>SW Sydney</td>
<td>33</td>
<td>3.3</td>
</tr>
<tr>
<td>5</td>
<td>SW Sydney</td>
<td>177</td>
<td>17.7</td>
</tr>
<tr>
<td>6</td>
<td>East Sydney</td>
<td>49</td>
<td>4.9</td>
</tr>
<tr>
<td>7</td>
<td>Western NSW</td>
<td>16</td>
<td>1.6</td>
</tr>
<tr>
<td>8</td>
<td>Western NSW</td>
<td>79</td>
<td>7.9</td>
</tr>
<tr>
<td>9</td>
<td>Western NSW</td>
<td>194</td>
<td>19.4</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1001</td>
<td>100</td>
</tr>
</tbody>
</table>
Surveys were administered to students with intact class groups or, where numbers were small, as in the rural centres, in full school groups. Ethical procedures to conduct the study were followed: permission was obtained from the Department of Education and Training (DET) and the University of Western Sydney’s Human Ethics Committee. Informed consent forms were completed by parents of the students, and all students were told that their completion of the survey was voluntary. Students were briefly informed of the purpose for the survey, but specific issues of interest to the researcher were not disclosed to the students. Students were informed that the researcher was interested in what they liked and disliked at school with the view to assisting educators improve student motivation. This standardised explanation of the purpose, as well as instructions for how to complete the survey, were delivered before each session. The survey was read aloud to the students to
(a) ensure that most participants completed the survey within the time allotted,
(b) overcome the reading and language difficulties of some students,
(c) ensure consistency with the procedure from school to school, and
(d) assist students with learning difficulties. At each session there were at least two research assistants present to assist the students completing the surveys, but school teachers were not involved in the administration of the survey. Researchers collected the surveys from all students before they left the room.

7.2 Materials

Aside from the demographic and background details, items on all subscales were responded to using a 5-point Likert-type rating scale (1 = Strongly disagree; 5 = Strongly agree).

7.2.1 Achievement Motivation

Central to the purpose of the present study was an exploration of three positively oriented goals (mastery, performance, and social goals). These goals are “positively oriented” in the sense that they express students’ purposes for achieving, rather than their purposes for avoiding achievement (such as is the case with work-avoidance and often performance-avoidance goals). Thus, the present study was primarily concerned with students’ goals that orient students towards academic achievement, in
contrast to goals that orient students away from academic achievement. For this reason, avoidant-type goals were not included in this study. An additional purpose for focusing upon positively oriented goals was to avoid methodological complexities. Negative items and negative constructs, especially when used alongside positive items and constructs can lead to difficulties in model construction and validation (e.g., through the presence of negative item method factors; Marsh, 1994; 1996).

The nature of students’ motivation was evaluated using the GAGOS developed by McInerney (2001). Recently designed, this instrument was developed for a specific purpose. The GAGOS was initially designed to scrutinise goal theory as it applies to achievement motivation. A rationale for, and relevant history of the GAGOS is furnished below.

Although studies examining goal theory typically validate hypothesised models using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), this type of analysis does not demonstrate whether the measures truly capture mastery, performance and social motivation. Type and level of motivation are typically inferred from items and clusters of items (scales). In addressing these concerns, McInerney developed the GAGOS.

The GAGOS measures three general goal orientations (general mastery, general performance and general social goals). Rather than inferring motivation, as is the approach of other motivation instruments, the GAGOS intentionally denotes the term “motivated” at the beginning of each item stem (i.e., I am most motivated when…). Respondents subsequently acknowledged whether they were most motivated in a mastery, performance or social goal situation. The term “motivation” was explained to students at the commencement of the survey. The explanation referred motivation to feeling energised and being enthusiastic. Although a recent instrument, the GAGOS has demonstrated sound psychometric properties (Barker et al., 2004; Barker, Dowson, & McInerney, 2005b; Barker, McInerney, & Dowson, 2002; Barker, McInerney, & Dowson, 2003). As DeShone and Gallespie (2005) highlight in their expansive review of goal theory research, the large proportion of studies that use self-developed measures especially designed for their particular research study
are almost always unvalidated. This validation process can not be underestimated for the GAGOS. Specifically, the GAGOS comprises five items measuring general mastery, eight items measuring general performance, five items measuring general social goals, five items measuring global motivation and three items measuring valuing motivation. The present study is concerned with the relations between academic self-concept and three specific goal constructs. These were extracted from the GAGOS instrument, are described below and presented in Table 7.2.

7.2.1.1 Mastery goals
Mastery goals are self-referenced and have been defined as “striving for competence defined in terms of learning and improvement” (Harackiewicz & Linnenbrink, 2005, p.76). Sample GAGOS items for mastery goals are “I am most motivated when I see my work improving” and “I am most motivated when I solve problems”. Items were therefore generated for the GAGOS mastery goal scale that broadly surveyed ways in which a mastery goal orientation might be reflected, such as acquiring new knowledge and skills to solve problems (Harackiewicz et al., 2002). All five items were similarly phrased, as all stems commenced with “I am most motivated when”.

7.2.1.2 Performance goals
Unlike mastery goals, which are self-referenced, performance goals are referenced relative to others such that they are externally referenced. It is no surprise that performance goals have been defined as aiming to “gain favourable judgements of their competence by performing as well as they can compared to others” (Barron & Harackiewicz, 2001, p.706). Sample GAGOS items for performance goals are “I am most motivated when I am competing with others” and “I am most motivated when I am doing better than others”. Items were therefore generated for the GAGOS performance goal scale that broadly surveyed ways in which a performance goal orientation might be reflected, such as competing with others, seeking public approval, doing well relative to others and seeking rewards (Harackiewicz & Linnenbrink, 2005).

7.2.1.3 Social goals
Social goals encompass an inclusive paradigm and have therefore been defined as “social purposes that students may perceive for engaging in academic work” (Urdan
& Maehr, 1995, p.213). Sample GAGOS items for social goals are “I am most motivated when I am helping others” and “I am most motivated when I work with others”. Items were therefore generated for the GAGOS social goal scale that broadly surveyed ways in which a social goal orientation might be reflected, such as in seeking to help others and showing empathy for the interest of others.
Table 7.2  
*Items from the Achievement Motivation Subscales*

<table>
<thead>
<tr>
<th>Subscale</th>
<th>GAGOS Identifier</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastery goals</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Numerical</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Identifier</td>
<td></td>
</tr>
<tr>
<td>MAS27</td>
<td>“I am most motivated when I see my work improve”</td>
<td></td>
</tr>
<tr>
<td>MAS32</td>
<td>“I am most motivated when I am good at something”</td>
<td></td>
</tr>
<tr>
<td>MAS37</td>
<td>“I am most motivated when I solve problems”</td>
<td></td>
</tr>
<tr>
<td>MAS42</td>
<td>“I am most motivated when I am becoming better at my work”</td>
<td></td>
</tr>
<tr>
<td>MAS50</td>
<td>“I am most motivated when I am confident that I can do my school”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Performance goals</td>
<td></td>
</tr>
<tr>
<td>PER58</td>
<td>“I am most motivated when I receive rewards”</td>
<td></td>
</tr>
<tr>
<td>PER62</td>
<td>“I am most motivated when I receive good marks”</td>
<td></td>
</tr>
<tr>
<td>PER72</td>
<td>“I am most motivated when I am noticed by others”</td>
<td></td>
</tr>
<tr>
<td>PER78</td>
<td>“I am most motivated when I am competing with others”</td>
<td></td>
</tr>
<tr>
<td>PER83</td>
<td>“I am most motivated when I am in charge of a group”</td>
<td></td>
</tr>
<tr>
<td>PER90</td>
<td>“I am most motivated when I am praised”</td>
<td></td>
</tr>
<tr>
<td>PER95</td>
<td>“I am most motivated when I am doing better than others”</td>
<td></td>
</tr>
<tr>
<td>PER98</td>
<td>“I am most motivated when I become a leader”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social goals</td>
<td></td>
</tr>
<tr>
<td>SOC35</td>
<td>“I am most motivated when I work with others”</td>
<td></td>
</tr>
<tr>
<td>SOC55</td>
<td>“I am most motivated when I am in a group”</td>
<td></td>
</tr>
<tr>
<td>SOC67</td>
<td>“I am most motivated when I work with friends at school”</td>
<td></td>
</tr>
<tr>
<td>SOC101</td>
<td>“I am most motivated when I am helping others”</td>
<td></td>
</tr>
<tr>
<td>SOC108</td>
<td>“I am most motivated when I am showing concern for others”</td>
<td></td>
</tr>
</tbody>
</table>
7.2.2 Academic self-concept

Recent research on the multidimensionality of self-concept focuses on domain-specific self-concepts (Lau et al., 1999). Marsh’s (1989) Self-Description Survey (SDQ) measures students’ self-concept in a variety of non-academic and academic domains. The SDQ comprises seven non-academic scales (e.g., physical appearance and physical ability) and three academic scales (e.g., mathematics, verbal and general school self-concepts). Marsh and colleagues (Marsh, 1989; Marsh, Relich, & Smith, 1983) designed the SDQII survey in order to examine adolescents’ multidimensional self-concept between the ages of 12 and 18 years (Gonzalez-Pienda et al., 2002). Based on the SDQII, Marsh (1990c) developed the Academic Self-Description Questionnaire II. The ASDQII examines academic self-concepts in specific domains, including English and mathematics. The full ASDQII comprises 136 items that measure a variety of domains, but this study focuses on English and mathematics self-concept. Five items measured English self-concept (e.g., “I am good at English”) and five items measured math self-concept (e.g. “I am good at mathematics”). The ten ASDQII items are presented in Table 7.3.

7.2.2.1 English self-concept

English self-concept was assessed from a descriptive/evaluative aspect (e.g., “I am good at English”) as opposed to an affective/motivational aspect (e.g., “I am proud of my ability in English”; Rosenberg, 1979; Skaalvik, 1990). Descriptive components relate to perceptions of self in particular domains that are formed from roles and characteristics that are socially ranked and valued. The items from the ASDQII for English self-concept reflect self-conceptions of students’ English abilities.

7.2.2.2 Mathematics self-concept

Parallel with the English self-concept subscale, mathematics self-concept assesses descriptive/evaluative aspects (e.g., “I am good at mathematics”) that relate to perceptions of self in the domain of mathematics. The items from the ASDQII for mathematics self-concept reflect self-conceptions of students’ mathematical abilities.
Table 7.3

*Items from the Academic Self-concept Subscales for English and Mathematics*

<table>
<thead>
<tr>
<th>Subscale</th>
<th>ASDQII Identifier</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numerical Identifier</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>English self-concept</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESC1</td>
<td></td>
<td>“I am good at English”</td>
</tr>
<tr>
<td>ESC2</td>
<td></td>
<td>“I have always been good at English”</td>
</tr>
<tr>
<td>ESC3</td>
<td></td>
<td>“Work in English is easy for me”</td>
</tr>
<tr>
<td>ESC4</td>
<td></td>
<td>“I get good marks in English”</td>
</tr>
<tr>
<td>ESC5</td>
<td></td>
<td>“I learn things quickly in English”</td>
</tr>
<tr>
<td><strong>Mathematics self-concept</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSC1</td>
<td></td>
<td>“I am good a mathematics”</td>
</tr>
<tr>
<td>MSC2</td>
<td></td>
<td>“I have always been good at mathematics”</td>
</tr>
<tr>
<td>MSC3</td>
<td></td>
<td>“Work in mathematics is easy for me”</td>
</tr>
<tr>
<td>MSC4</td>
<td></td>
<td>“I get good marks in mathematics”</td>
</tr>
<tr>
<td>MSC5</td>
<td></td>
<td>“I learn things quickly in mathematics”</td>
</tr>
</tbody>
</table>

### 7.3 Data Analyses and Model Assessment

Data were analysed using SPSS for Windows® (Pedhazur & Pedhazur-Schmelkin, 1991) and LISREL® 8.54 (Jöreskog & Sörbom, 1989a; 2003). Reliability estimates of the scales were examined using Cronbach’s alpha. Most analyses entailed confirmatory factor analysis (CFA) and structural equation modelling (SEM) using LISREL, which determines how closely a sample covariance matrix compares with a hypothesised matrix (Kelloway, 1998). Models were estimated using Maximum Likelihood Estimation (MLE). MLE is one of seven choices for parameter estimation provided by LISREL, is the default method of estimating structure (path) coefficients in SEM and the most commonly used (Anderson & Gerbing, 1988; Kelloway, 1996). MLE has been utilised in this study because it is both efficient and an unbiased estimator for continuous latent variables. MLE formulates estimates based on maximising the probability (likelihood) that the observed covariances are drawn from a population assumed to be identical to that reflected in the coefficient
estimates. Hence, MLE selects estimates which have the greatest probability of replicating the observed data (Pampel, 2000). MLE is known to be consistent and asymptotically efficient. In using MLE, all parameters are estimated simultaneously (Kelloway, 1998).

Due to the large numbers of parameters to be estimated in the causal models, and the consequent necessity for a large sample size in order to increase the reliability of the parameter estimates, Full Maximum Likelihood Estimation (FIML) was conducted. Arbuckle (1996) and Enders and Bandalos (2001) contend that FIML is a superior method for treating missing data. An underlying assumption of FIML is that absent data is missing completely at random. However, this was not applicable to all cases in this study’s data set. For instance, a number of schools were unable to provide any achievement data across one or more data collection points. Therefore, an important consideration when conducting FIML is the nature of the missing data. It would be inappropriate to provide replacement values for such missing cases due to the lack of information for these cases in the data set. Consequently, listwise deletion was employed for these cases and then FIML was conducted to replace subsequent missing values for other variables.

After conducting FIML, the raw data was inputted into PRELIS® (Jöreskog & Sörbom, 1988; 2003) with the purpose of producing a covariance matrix to conduct analyses using LISREL. To determine goodness-of-fit for the models a number of alternate indices were proposed. These indices are flagged in this section and discussed in the following chapter. A useful index is the Tucker-Lewis Index (TLI). The TLI is relatively independent of sample size and enforces a penalty with the addition of variables to a given model (Marsh, Balla, & Hau, 1996; McDonald & Marsh, 1990). Concurring with these authors, the Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA) are also considered as valuable measures of goodness-of-fit. Ideally, the TLI and CFI should be equal to or above .9. Recently it has been proposed, however, that the .90 criterion may tend to over-reject acceptable models (Hu & Bentler, 1995). Consequently, TLIs and CFIs in the high .80s have been deemed acceptable. Values of .05 up to .08 for the RMSEA are indicative of a reasonable fit (Byrne, 1998; Raykov & Marcoulides, 2000).
7.4 Brief orientation to CFA and SEM

According to Byrne (1998), in CFA the researcher postulates relations between observed measures and underlying factors a priori, based on knowledge of theoretical structures. The validity of a solution based on this hypothesised factor structure is then statistically tested. In the CFA models performed in this study, it was hypothesised that:

a) each measured variable would have a non-zero loading on the factor it was designed to measure and a zero loading on all other factors,

b) the factors in all cases would be correlated,

c) and the error terms—known as uniquenesses—for each measured variable would be uncorrelated.

Furthermore, using CFA procedures, higher-order factors can be generated so that underlying first-order factors can be represented by a higher-order factor. Higher-order factors account for covariances between a range of first-order factors. Figure 7.1 depicts a CFA structure in which a higher-order factor is represented by two first-order factors for which there are five indicators each.

SEM refers to the causal relationships among latent factors generated in the CFAs (see Figure 7.2). In SEM a series of interrelated regression equations based on the proposed model estimate the fit between the data and the model. As with CFAs, goodness of fit indices aid in the evaluation of model fit. The typical SEM model represents a one-step (simultaneous) analysis which takes into account the interactive effects of all relationships among variables in the analysis. Recently there have been developments in the application of SEM for the analysis of longitudinal panel designs which apply specifically to this study. In line with these developments, Longitudinal Structural Equation Modelling (LSEM) should ideally involve:

a) latent constructs being inferred on the basis of multiple indicators;

b) controlling for method-halo effects associated with the same measure collected on multiple occasions by correlating uniquenesses;

c) gathering data on three or more occasions and establishing clear time intervals of approximately one school year, or preferably more, between collection occasions;
d) commencing with CFA models to evaluate measurement issues and then progressing to a full-forward SEM model, and
e) using a large and diverse sample size to substantiate the use of SEM and the generality of the findings.

Figure 7.3 depicts LSEM with three waves of data for two variables.

*Figure 7.1. Pictorial representation of a higher-order factor structure*
Figure 7.2. CFA/Measurement component and structural component of SEM
Figure 7.3. Causal ordering of two variables over three waves
7.5 Summary of Chapter

This chapter presented an overview of the characteristics of the participants and outlined the survey and its implementation. This chapter also provided a brief orientation to statistical procedures to be conducted, and presented an overview of the indices that will be employed to evaluate how well each hypothesised model fits the data. The following chapter presents a detailed overview of the research program and highlights recent advances in analysing longitudinal structural equation models that have been applied to the present research study.
CHAPTER 8
METHODOLOGICAL CONSIDERATIONS

The intent of this chapter is to present an overview of the research program. It highlights recent advances in analysing longitudinal structural equation models and demonstrates how relevant guidelines have been applied to the present research study. Section 8.1 presents ten recommended guidelines proposed by Marsh et al. (1999) for analysing causal relations between self-concept and academic achievement, most of which apply to the present study. Section 8.2 presents a prototype proposed by Marsh and Craven (2006) for evaluating causal models that facilitate researchers in forming judgements concerning the causal flow of hypothesised models. These guidelines and the prototype are then directly related to the analyses conducted in the present research study and are examined below.

8.1 Advances to Analysing Longitudinal Structural Equation Models

A primary goal of this research is to examine the causal ordering of students’ motivational goals, domain-specific self-concepts and academic achievements. Critiques and reviews of causal ordering studies involving academic self-concept have led to advances in both analyses and methodological approaches such that a clear set of guidelines has been formulated (Guay et al., 2003). Many studies that examine causation of self-concept and academic achievement are problematic because they have not applied these necessary statistical criteria. Byrne (1984), in a review of literature, noted that studies are unsuited to interpreting causal ordering unless they

- demonstrate a statistical relation between the constructs,
- establish precedence of time, and
• test causal models using sophisticated analyses such as structural equation modelling.

Subsequent research has led to further refinements to analysing longitudinal causal ordering (see for example Marsh et al., 1999) and to the formation of a prototype model (see for example Marsh and Craven, 2006) for evaluating the causal relations between self-concept and academic achievement.

Significant methodological advances in the analysis of longitudinal structural equation modelling have been led by Marsh et al. (1999). Due to these advances, earlier research has become obsolete and precludes conclusive findings on causal relations between self-concept and achievement. To avoid future methodological pitfalls, Marsh et al. (1999) recommend ten guidelines for an ideal study that supersedes earlier methodologies. These researchers are aware of no studies that fulfil all the guidelines, and pragmatically suggest that fulfillment may never be attained. The ten recommended guidelines are now discussed with reference to their application in the present study.

1. Latent constructs (e.g., self-concept) should be inferred by at least three items to the respective factor. Although it is ideal to have at least three indicators per factor, obtaining multiple indicators for achievement nevertheless remains problematic. Difficulties arise with achievement data because typically schools use a total achievement test score, whereas researchers would benefit from constructing multiple indicators instead of utilising total scores. School grades assessing progress or comprehensive examinations allow for the construction of multiple indicators; however, schools often report only a final school grade, which makes obtaining multiple measures difficult. Marsh et al. (1999) advise against general measures of achievement and self-concept, and endorse domain-specificity for both measures.
In this study goal orientations were inferred by at least four indicators and the domain-specific self-concepts were all inferred by five indicators. Achievement data in this study were only inferred by one indicator, due to schools’ inability to provide achievement scores in addition to achievement ranks. Consequently, English achievement and mathematics achievement in this study were inferred by ranks exclusively.

2. Building on the concern for multiple indicators is the need to address method-halo effects. Method-halo effects relate to parallel measures collected on multiple occasions. For instance, participants are provided with the same survey items on multiple occasions. These parallel items are likely to be correlated, and consequently the model should specify these relations. If they remain unspecified, then systematic positive biased estimates of stability may result (Marsh & Hau, 1996). Therefore a strong recommendation for avoiding method-halo effects is to correlate uniquenesses between the repeated measures.

Chapter 11 directly addresses method-halo effects by comparing a model with correlated uniquenesses with a model specifying no correlated uniquenesses, to demonstrate the impact of method-halo effects on parallel measures collected across different points in time. Thereafter, all analyses involving multiple measures on multiple occasions include correlated uniquenesses, as recommended by Marsh et al. (1999).

3. Despite no decisive conclusions on the frequency of collecting data and the optimal intervals between each collection point, Marsh et al. (1999) recommend collecting data on at least two occasions (e.g., a two-wave study) with a data span of more than one school year between each collection point.

Data were collected for the present study across three time waves, with a data span of one year between each collection point. This should provide adequate time for the relations between the constructs to demonstrate potential changes.
Longitudinal causal ordering should proceed in four distinct phases. The first phase involves basic confirmatory factor analyses for each wave of data, to resolve measurement issues. Phase 2 entails testing more complicated CFAs which involves simultaneously examining relations of all variables across all data waves. The purpose of this large CFA is to examine relationships among the variables across the various time waves but also to address remaining measurement issues. Phase 3 entails testing a full-forward model which specifies correlations among factors within parallel waves, in addition to all paths from all constructs in each wave to all constructs in subsequent waves freely estimated. Finally, Phase 4 entails testing a full-forward model and exploring alternative SEM models. The role of a researcher, according to Marsh et al. (1999), is to investigate alternative leads and offer defensible explanations for these.

These four sequential phases of analyses have been applied to this study. A rationale for these phases of analyses, specific details on how the analyses were conducted, the results and discussion of them are comprehensively examined in the relevant chapters. Phases 1 and 2 relate to the measurement model because they focus solely on the links among factors and their measured variables. Phase 1 corresponds with Chapters 9 and 10, while Phase 2 corresponds with Chapter 11. A general discussion of the results from the straightforward and more complicated measurement models follows in Chapter 12.

Phases 3 and 4 relate to full structural equation models because they comprise both a measurement model and structural model where the structural model specifies relations among the latent variables themselves (Byrne, 1998). Chapter 14 examines the full-forward model from Phase 3 and the alternative nested models from Phase 4.

Although unrelated to Marsh and Byrne’s fourth guideline, but related to the measurement model of goals and domain-specific self-concepts, an additional analysis was conducted after Phases 1 and 2. This additional measurement model tested the potential for a hierarchical representation of goals and academic self-concept, since the researcher was interested in exploring the structure of goals and self-concept. Accordingly, Chapter 13 examines the possibility of a hierarchical representation of students’ goals and academic self-concept following Phase 2, which
tests the complex measurement model, and precedes Phase 3, which examines the structural components of the model.

4. Generality of findings can only be achieved with a substantially large and diverse sample. Sufficient sample size and diversity also provides the freedom to explore an extensive range of models that can be compared and contrasted.

A substantial sample size of 535 respondents was utilised to examine the measurement and structural models.

5. To address caveats in research that predominantly focus on global measures of self-concept or specific measures of self-concept within a domain (e.g., English self-concept and achievement), there is an appeal to extend research to include more than one academic domain into the research (e.g., English and mathematics self-concept and English and mathematics achievement).

This study directly addresses the sixth guideline as the measurement and structural models include domain-specific self-concepts in English and mathematics and corresponding domain-specific academic achievement in the same domains.

6. It is necessary for future research to attempt to explain how self-concept influences subsequent achievement through examining intervening variables that may mediate the effect of prior self-concept on academic achievement. For instance, Harter (1986) demonstrated that increases in self-concept led to increases in motivation which contributed to better achievement outcomes. Unfortunately, this research preceded current advances in structural equation modelling. Consequently, Marsh et al. (1999) believe future studies should investigate a broad array of variables related to educational psychological constructs that may mediate the effect of self-concept on subsequent achievement.
This study directly addresses the seventh guideline since one of the three proposed competing models tests whether self-concept and academic achievement is mediated through goal orientations. Additionally, the study investigates whether this causal flow is a better representation of the data compared with the two alternative models.

7. In addition to exploring issues of mediation, it is valuable to assess moderating variables. Unlike mediating variables, which assume that underlying processes of self-concept contribute to changes in achievement, moderating variables (also referred to as background variables) refer to individual differences that interact with self-concept and the manner in which they influence academic achievement. While substantial work has been conducted on moderating variables and their influences on mean levels of self-concept, little research attempts to explain whether relations between self-concept and achievement vary as a function of the background variables of gender, age, ethnicity, culture, educational status etc. Therefore researchers should determine whether self-concept and the manner in which it influences achievement is a function of moderating variables.

The present study only examines mediating variables, not moderating variables, and therefore does not apply Marsh and Byrne’s eighth recommendation for future research directions.

8. Measures of academic self-concept become increasingly defined as children age and develop, such that they are able to differentiate between self-concepts in specific domains. Interestingly, competency and affect components of self-concept appear to be indistinguishable because they remain highly correlated. A number of researchers (e.g., Marsh, Craven, & Debus, 1999) contend that the competency component of self-concept is more likely to correlate highly with performance attainment (e.g. test scores and grades) whereas the affective component is more likely to correlate highly with coursework selection and to influence preferences for subjects to be studied. A new direction for the self-concept researcher is to evaluate the validity of separating these two components and to determine their alignments with
alternative motivational theories for which related distinctions are of central importance and can be tested.

The ninth guideline is not applicable to the present study examining causal relations between goals and domain-specific self-concepts and their combined effect on academic achievement. Therefore this recommended new direction has not been addressed in this study.

9. Contending with the distinction between competency and affect is the developmental perspective on this issue. Supporters of the developmental perspective propose that children’s appreciation of competence varies as a function of age. Research demonstrates that, compared with older children, younger children exhibit inflated positive self-concepts that are less likely to be dependent on external academic outcomes (Wigfield & Karpathian, 1991). As a consequence, the causal flow for young children aligns with the skill development model of causation. “Once ability perceptions are more firmly established the relation likely becomes reciprocal: Students with high perceptions of ability would approach new tasks with confidence, and success on those tasks is likely to bolster their confidence in their ability” (Wigfield & Karpathian, 1991, p.255). Marsh and Byrne support extant findings of a reciprocal effect for older children but challenge them in respect of the feasibility of reciprocal effect sizes being larger for younger children also and this is justified by the instability and the continual formation of these constructs over time. Marsh et al. (1999) believe new alternative methods of analyses may be required to pursue developmental perspectives. For instance, they advocate longitudinal data that spans more than 1 to 3 years and propose multicohort-multioccasion designs, which may be a better method, so as to take advantage of the cross-sectional (multiple age cohorts) and longitudinal (multiple occasion) data that is available within the same study (see for example Guay et al., 2003).

Despite agreeing with the importance of testing developmental perspectives, this study only meets some of the necessary criteria to test this. In particular, the sample size, although large and diverse, could not be split for the purpose of testing
multicohort-multioccasion because of the substantial number of paths to be estimated in the hypothesised models.

8.2 Model Evaluation

In order to assess the full-forward model proposed in Marsh and Byrne’s fourth guideline, Marsh and Craven (2006) describe a prototype causal ordering model procedure (Figure 8.1) to facilitate researchers in their evaluation and judgements of causal ordering. This procedure is explained below.

Common to the self-enhancement, skill-development and reciprocal effects models is that all three predict that the path of each T1 variable on the parallel T2 and T3 variables is substantially positive (solid gray horizontal paths in Figure 8.1). Discrimination among the three models occurs with the cross-paths relating prior achievement to subsequent self-concept and vice versa.

The skill-development model can be identified by three paths from prior achievement to subsequent academic self-concept (three paths represented by dashed black lines in Figure 8.1) which are all positive. Identifiably, the path from T1 achievement to T2 academic self-concept and the path from T2 achievement to T3 academic self-concept are both predicted to be significantly positive. Since the effects of T1 achievement to T3 academic self-concept are likely to be ameliorated due to the mediated effect through T2 constructs, the path from T1 achievement to T3 academic self-concept is considered less important.

The self-enhancement model can be identified by three paths from prior academic self-concept to subsequent achievement (three paths represented by solid black lines in Figure 8.1), all of which are positive. Identifiably, the path from T1 academic self-concept to T2 achievement and the path from T2 academic self-concept to T3 achievement are predicted to be significantly positive. Since the effects of T1 academic self-concept to T3 achievement are likely to be ameliorated due to the mediated effect through T2 constructs, the path from T1 academic self-concept to T3 achievement is considered less important.
The reciprocal effects model can be identified by including the positive paths from both the skill-development model and self-enhancement model. In sum, paths leading from prior achievement to subsequent academic self-concept (skill-development) and prior academic self-concept to subsequent achievement (self-enhancement) will all be positive. The ameliorating effects from the other two models also apply to the reciprocal effects model, since the effects of T1 constructs on T3 constructs are mediated through the T2 constructs.

Although the procedure described above applies to causal relations between academic self-concept and academic achievement, parallel procedures were applied when examining paths in the full-forward model from the present study. Specifically, Chapter 14 applies these procedures when evaluating the full-forward model, which includes goals, domain-specific self-concepts, and academic achievement.
8.3 Overview of Analyses

Primarily this study aims to examine the causal ordering of students’ goal orientations, domain-specific self-concepts and academic achievement. Recent recommendations for analysing and evaluating causal ordering in studies were reviewed above and have been applied, where relevant, to this study. Below is an overview and rationale for how analyses proceeded in the present research study.

The phases applied to this study comprise:

Phase 1: Conduct straightforward CFA models to address measurement issues. Data from each collection point should be tested independently in a CFA model and potential measurement errors should be resolved at this phase.

Phase 2a: Conduct more complicated CFA models, comprising all variables across all waves so as to examine simultaneous interactions among the variables. This phase also provides another opportunity to address measurement errors that may arise, before moving on to structural models. It has been demonstrated that potential problems and their solutions are typically more easily resolved for CFA models than for SEM models (Marsh et al., 1999).

Phase 2b: Conduct higher-order analyses to examine the potential for students’ mastery, performance, and social goals to be represented by a higher-order factor related to purposes for achievement and examine the potential for students’ English and mathematics self-concepts to be represented by a higher-order factor related to academic self-concept.

Phase 3: Conduct a full-forward SEM model where all possible paths are estimated. Coincidentally, the full-forward SEM model corresponds mathematically with the large CFA model from Phase 2.

Phase 4: Conduct a test where alternative causal SEM models are compared with the full-forward model from Phase 3. Testing alternative models entails constraining certain paths in the full-forward model. The alternative models are nested within the full-forward model, which can be used as a point of comparison with the purpose of determining which model explains the data best.
The above phases based on recommendations from Marsh et al. (1999) have been sequentially addressed in the chapters that follow. Table 8.1 presents a synopsis of the analyses conducted in this study.
Table 8.1

Synopsis of Analyses

<table>
<thead>
<tr>
<th>PHASE</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1: Confirmatory Analysis</td>
<td>Conduct simple CFA models to resolve potential measurement problems before pursuing more complicated SEM models.</td>
</tr>
<tr>
<td></td>
<td>Examine the psychometric properties of the combined GAGOS-ASDQII instrument.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter and Data Wave</th>
<th>Numerical Identifier and Sample</th>
<th>Model Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 9- Wave 1</td>
<td>Focus Sample</td>
<td><strong>M1aT1</strong> Hypothesised (5 factor) model for the full set of 28 items</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>M1bT1</strong> Null (no factor) model for the full set of 28 items</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>M2aT1</strong> Refined (5 factor) model with the revised set of 23 items</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>M2bT1</strong> Null model with the five poorly fitting items from M1aT1 deleted</td>
</tr>
<tr>
<td></td>
<td><em>Independent Sample</em></td>
<td><strong>M3aT1</strong> Refined model for the independent sample</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>M3bT1</strong> Null model for the independent sample</td>
</tr>
<tr>
<td></td>
<td><em>Focus Sample</em></td>
<td><strong>M4aT1</strong> Refined model for males</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>M4bT1</strong> Null model for males</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>M4cT1</strong> Refined model for females</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>M4dT1</strong> Null model for females</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>M5T1</strong> M4aT1 true test of invariance across sex</td>
</tr>
<tr>
<td>Chapter 10 - Wave 2</td>
<td><em>Focus Sample</em></td>
<td><strong>M2aT2</strong> Refined (5 factor) model with the revised set of 23 items</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>M2bT2</strong> Null model</td>
</tr>
<tr>
<td></td>
<td><em>Independent Sample</em></td>
<td><strong>M3aT2</strong> Refined model for the independent sample</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>M3bT2</strong> Null model for the independent sample</td>
</tr>
<tr>
<td></td>
<td><em>Focus Sample</em></td>
<td><strong>M4aT2</strong> Refined model for males</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>M4bT2</strong> Null model for males</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>M4cT2</strong> Refined model for females</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>M4dT2</strong> Null model for females</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>M5T2</strong> M4aT2 True test of invariance across sex for the refined model</td>
</tr>
</tbody>
</table>
Chapter 10 - Wave 3  

**Focus Sample**  
M2aT3  
Refined (5 factor) model with the revised set of 23 items  
M2bT3  
Null model with the five poorly fitting items from M1aT1 deleted  

**Independent Sample**  
M3aT3  
Refined model for the independent sample  
M3bT3  
Null model for the independent sample  

**Focus Sample**  
M4aT3  
Refined model for males  
M4bT3  
Null model for males  
M4cT3  
Refined model for females  
M4dT3  
Null model for females  
M5T3  
M4aT3 true test of invariance across sex for the refined model  

<table>
<thead>
<tr>
<th>PHASE</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 2a: Complicated CFAs</td>
<td>Conduct more complicated CFAs to further address potential measurement problems. Examine the multidimensionality and stability of students’ goals and academic self-concept across three waves.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter and Data Wave</th>
<th>Numerical Identifier and Sample</th>
<th>Model Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 11 - Waves 1-3</td>
<td><strong>Focus Sample</strong></td>
<td></td>
</tr>
<tr>
<td>M6</td>
<td>Refined model with no correlated uniquenesses</td>
<td></td>
</tr>
<tr>
<td>M7</td>
<td>M6 with correlated uniquenesses</td>
<td></td>
</tr>
<tr>
<td>M8</td>
<td>M7 True test of invariance across sex</td>
<td></td>
</tr>
<tr>
<td>M9a</td>
<td>Refined model with the addition of achievement ranks</td>
<td></td>
</tr>
<tr>
<td>M9b</td>
<td>M9a True test of invariance across sex</td>
<td></td>
</tr>
<tr>
<td>PHASE</td>
<td>PURPOSE</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>Phase 2b: Higher-order Confirmatory Factor Analysis</td>
<td>Conduct higher-order analyses to examine the potential hierarchical representation of students’ goals and academic self-concept.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter and Data Wave</th>
<th>Numerical Identifier and Sample</th>
<th>Model Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 13 - Wave 1</td>
<td>Focus Sample</td>
<td>Hypothesised 23 item 2 factors</td>
</tr>
<tr>
<td></td>
<td>M10aT1</td>
<td>Null model</td>
</tr>
<tr>
<td></td>
<td>M10bT1</td>
<td>M9aT1 true test of invariance across sex</td>
</tr>
<tr>
<td></td>
<td>M10cT1</td>
<td></td>
</tr>
<tr>
<td>Chapter 13 - Wave 2</td>
<td>M10aT2</td>
<td>Hypothesised 23 item 2 factors</td>
</tr>
<tr>
<td></td>
<td>M10bT2</td>
<td>Null model</td>
</tr>
<tr>
<td></td>
<td>M10cT2</td>
<td>M9aT2 true test of invariance across sex</td>
</tr>
<tr>
<td>Chapter 13 - Wave 3</td>
<td>M10aT3</td>
<td>Hypothesised 23 item 2 factors</td>
</tr>
<tr>
<td></td>
<td>M10bT3</td>
<td>Null model</td>
</tr>
<tr>
<td></td>
<td>M10cT3</td>
<td>M9aT3 true test of invariance across sex</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PHASE</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 3: Structural Equation Modelling</td>
<td>Conduct a full-forward SEM model where correlations among factors within the same wave, as well as paths from all constructs in each wave to all constructs in subsequent waves are freely estimated.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter and Data Wave</th>
<th>Numerical Identifier and Sample</th>
<th>Model Description</th>
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</thead>
<tbody>
<tr>
<td>Chapter 14 - Waves 1-3</td>
<td>Focus Sample</td>
<td>Full-forward SEM model</td>
</tr>
<tr>
<td></td>
<td>M11</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>PHASE</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 4: Structural Equation Modelling</td>
<td>Conduct tests where alternative causal SEM models are compared with the full-forward model from Phase 3. Testing alternative models entails constraining certain paths in the full-forward model. The alternative models are nested within the full-forward model and therefore can be used as a point of comparison. Parameter estimates and fit indices are compared between the full-forward model and alternative models.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter and Data Wave</th>
<th>Numerical Identifier and Sample</th>
<th>Model Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 14 – Waves 1-3</td>
<td>Focus Sample</td>
<td>Alternative causal model with Self-concept T1, Goals T2 and achievement T3</td>
</tr>
<tr>
<td></td>
<td>M12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M13</td>
<td>Alternative causal model with Goals T1, Self-concept T2, and achievement T3</td>
</tr>
</tbody>
</table>
8.4 Summary of Chapter

This chapter provided a review and rationale for how causal ordering analyses should proceed. In this study it was argued that analyses should proceed with an examination of the integrative measurement model of student motivation and advance to full structural models. The following chapter provides specific details of the demographics and composition of the schools and participants involved and then addresses measurement issues of the integrative model of student motivation by examining the psychometric properties of the survey instruments used in this study.
CHAPTER 9
CONFIRMATORY FACTOR ANALYSES TIME 1

The results in this chapter are based on the Time 1 data and are presented in three sections. Section 9.1 presents the methodology of and results from analysis of the focus sample for the first wave of data using the combined GAGOS–ASDQII instrument. The focus sample comprised students for whom three waves of data, including achievement ranks, were available. The central objective of this component was to examine the psychometric properties of both students’ goals as defined by the GAGOS and students’ academic self-concept as defined by the ASDQII when combined in the one instrument. An important goal was to determine whether the combined instruments provide a reliable and valid measure. Also of significance in this section was the refinement of items, particularly for the recently designed GAGOS, whereas the ASDQII has been well established in research studies and proven to be psychometrically sound.

Section 9.2 of the methodology and results presents findings of the refined instrument with the focus sample and then replicated with an independent sample. Unlike the focus sample, achievement ranks were unavailable for respondents from the independent sample. The central objective of this section was to cross-validate the model to avoid the possibility of capitalising on chance variation within a sample due to post-hoc model modifications.

Section 9.3 presents a test for factor invariance across sex for the refined model with the focus sample group. The central goal of this section was to assess whether males interpret motivation and self-concept differently than do females.
9.1 Testing and Refining the Combined GAGOS-ASDQII Instrument

The first phase of the study was to determine the psychometric properties of the focus sample using the combined GAGOS–ASDQII. Although research has been conducted on relations between (a) academic achievement motivation and academic achievement and (b) academic self-concept and academic achievement, there have been few studies that combine all three variables: academic achievement motivation, academic self-concept and academic achievement. As a consequence of combining these variables, it is essential to determine whether the psychometric properties of these measures (items and scales) drawn from their original instruments remain independent when used in the one instrument. Hence the purpose was to examine whether the combined instrument reliably and validly measures the underlying constructs.

Unique to this study is the inclusion of social goals into the goal theory framework. This theoretical conceptualisation requires empirical support. Specifically, the author wished to examine whether multiple goals (mastery, performance and social goals) represent three distinct goals that delineate different purposes for achievement. In addition, the author also wished to examine whether academic self-concept could be represented by two specific domains (mathematics and English).

9.2 Method

9.2.1 Sample

This research was part of a larger scale study. Although a total of 9 Australian high schools were involved over the three waves, not all of these data were available for LSEM analyses. The focus sample was selected from schools which provided complete data over three years. An independent sample was formed from the four schools that provided incomplete data required for the LSEM (i.e., achievement ranks were unavailable). Table 9.1 presents the composition of the focus and independent samples. Consistently with other longitudinal designs, there was a problem with the attrition of the sample over time. Almost half of the sample was lost when only 5 of 9 schools provided achievement ranks for all three waves.
Consequently the focus sample comprised 535 secondary students in Year 7 ($n = 195, 36\%$), Year 8 ($n = 179, 34\%$) and Year 9 ($161, 30\%$) from five high schools (Schools 1, 2, 3, 4, and 6). More than half of the respondents ($n = 315, 59\%$) were male, 220 were female (41\%). The mean age of respondents was 13.0 years (SD = 1.0). The composition of the independent sample is described in more detail in the later section on cross-validation.

Table 9.1

Sample Composition

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T1</td>
<td>T2</td>
<td>T3</td>
</tr>
<tr>
<td>Focus Sample</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 7</td>
<td>195 (36%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 8</td>
<td>179 (34%)</td>
<td>195 (36%)</td>
<td></td>
</tr>
<tr>
<td>Year 9</td>
<td>161 (30%)</td>
<td>179 (34%)</td>
<td>195 (36%)</td>
</tr>
<tr>
<td>Year 10</td>
<td>161 (30%)</td>
<td>179 (34%)</td>
<td></td>
</tr>
<tr>
<td>Year 11</td>
<td></td>
<td>161 (30%)</td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>535</td>
<td>535</td>
<td>535</td>
</tr>
<tr>
<td>Ratio male/female</td>
<td>59/41</td>
<td>59/41</td>
<td>59/41</td>
</tr>
<tr>
<td>Age – mean</td>
<td>13.0</td>
<td>14.3</td>
<td>15.1</td>
</tr>
<tr>
<td>Age – std dev</td>
<td>1.0</td>
<td>1.0</td>
<td>0.9</td>
</tr>
</tbody>
</table>

Independent Sample

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T1</td>
<td>T2</td>
<td>T3</td>
</tr>
<tr>
<td>Year 7</td>
<td>182 (39.1%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 8</td>
<td>167 (35.8%)</td>
<td>182 (39.1%)</td>
<td></td>
</tr>
<tr>
<td>Year 9</td>
<td>117 (25.1%)</td>
<td>167 (35.8%)</td>
<td>182 (39.1%)</td>
</tr>
<tr>
<td>Year 10</td>
<td>117 (25.1%)</td>
<td>167 (35.8%)</td>
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</tr>
<tr>
<td>Year 11</td>
<td></td>
<td>117 (25.1%)</td>
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</tr>
<tr>
<td>Number</td>
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<tr>
<td>Ratio male/female</td>
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<td>31/69</td>
<td>31/69</td>
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<tr>
<td>Age – mean</td>
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<td>14.3</td>
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</tr>
<tr>
<td>Age – std dev</td>
<td>0.9</td>
<td>1.0</td>
<td>0.9</td>
</tr>
</tbody>
</table>
9.2.2 Overview of analyses for Time 1

CFAs using LISREL (Jöreskog & Sörbom, 1989a; 2003) and Reliability Analyses (Pedhazur & Pedhazur-Schmelkin, 1991) using SPSS were used to determine the psychometric properties of the 28 items of the combined GAGOS–ASDQII scales. The models tested were highly restrictive, since each item was allowed to load exclusively on the factor which it was designed to measure. (The LISREL syntax generated to test the hypothesised and refined first-order measurement models is included in Appendices A and B respectively). Initially, four nested models were tested in a structural approach to determining the properties of the combined scales. These models were:

- Model 1a (M1aT1): the hypothesised (5-factor) model for the full set of 28 items at Time 1.
- Model 1b (M1bT1): the null (no factor) model for the full set of 28 items at Time 1.
- Model 2a (M2aT1): the hypothesised (5-factor) model with the revised set of 23-items at Time 1.
- Model 2b (M2bT1): the null model with the 5 poorly fitting items from M1aT1 deleted at Time 1.

Once a valid and reliable measurement model was established, it was necessary to cross-validate the measurement model. This analysis involved:

- Model 3a (M3aT1): the hypothesised (5-factor) model with the 5 poorly fitting items from M1aT1 deleted at Time 1 for the independent sample.
- Model 3b (M3bT1): the null model with the 5 poorly fitting items from M1aT1 deleted at Time 1 for the independent sample.

When the measurement model demonstrated a good fit to the independent sample it was integral to this study to examine whether the refined measurement model was invariant across sex. This process entailed two steps. The first was to examine the measurement model in two separate tests, first for the male sample and second for the female sample. This process provides an overview of how consistent the models are for males compared with females. The first step of testing invariance involved:

- Model 4a (M4aT1): the hypothesised (5-factor) model with the poorly fitting items from M1aT1 deleted at Time 1 for males.
Model 4b (M4bT1): the null model with the 5 poorly fitting items from M1aT1 deleted at Time 1 for males.

Model 4c (M4cT1): the hypothesised (5-factor) model with the poorly fitting items from M1aT1 deleted at Time 1 for females.

Model 4d (M4dT1): the null (5-factor) model with the poorly fitting items from M1aT1 deleted at Time 1 for females.

The second step after establishing that the separate samples for males and females were consistent was a true test of invariance. This final step involved:

Model 5 (M5T1): test of invariance for the hypothesised (5-factor) model with the poorly fitting items from M1aT1 deleted at Time 1 for males and females.

9.2.3 Overview of confirmatory factor analysis and goodness-of-fit

According to Byrne (1998), in Confirmatory Factor Analyses (CFAs) the researcher, based on a knowledge of theoretical structures, postulates relations between observed measures and underlying factors a priori. The validity of a solution based on this hypothesised structure is then statistically analysed. CFAs permit the researcher to identify the number of factors (or latent variables) measured by a given set of items (or indicators). In addition, the researcher specifies what items load on which factors (Fleishman & Benson, 1987). CFAs provide some indication of how, and to what extent, items or scales (a collection of items) measure a given construct for select groups.

Goodness-of-fit indices are used to determine how closely the matrix of implied variances and covariances compares with the matrix of empirical sample variances and covariances (Kelloway, 1998). Best possible fit for a given data set is obtained when parameter estimates minimise the implied discrepancy between the two matrices. In the present study, a number of parameters were taken into account in establishing goodness-of-fit. Parameter estimates examined were:

a) factor loadings, which specify relations between items and factors;
b) factor correlations, which specify relations between factors;
c) squared multiple correlations which specify the amount of variance associated with each item that may be attributed to underlying factors; and
d) error variances, or uniquenesses, which specify the amount of variance associated with each item not explained by underlying factors. Values obtained for each parameter should be permissible; that is, there should be no impossible values such as negative item or factor variances.

Once the feasibility of the model’s parameters has been determined, overall measures of model fit may be applied. The most traditional measure of a model’s overall fit is the Chi square statistic. This test computes the discrepancy between the matrix of implied variances and covariances to the matrix of empirical sample variances and covariances so as to provide a value for the ratio of the Chi square statistic for a specific model to the degrees of freedom associated with that model (Marsh et al., 1996; Mueller, 1996; Pedhazur & Pedhazur Schmelkin, 1991). Contrary to traditional hypothesis testing, a nonsignificant Chi square indicates that there is no significant discrepancy between the implied covariance matrix and the empirical sample covariance matrix. In other words, the model can reproduce the population covariance matrix adequately (Kelloway, 1998).

Problematic to the Chi square statistic is its sensitivity to increased sample size (Loehlin, 1998). With very large samples, it is possible to obtain a highly significant chi-square which deems the model a poor fit with the data when the opposite may be the case. Given the difficulties with the chi square test, a number of alternate fit indices are used in the present study: the Normed Chi square ($\chi^2$/df), Goodness-of-Fit Index (GFI), Tucker-Lewis Index (TLI), the Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA).

Also deemed problematic with the chi square statistic are the imposed increases to the chi square for model complexity, which can lead to the likelihood of model rejection. To address this, the normed chi square (which involves dividing the chi square statistic by the degrees of freedom of the model) provides a chi square measure per degree of freedom. This division process reduces sensitivity to both sample size and model complexity. Ideally the chi square and degrees of freedom ratio should be larger than 1.0 but smaller than 3.0 (Kline, 1998).
The GFI, TLI, CFI and RMSEA provide appropriate indices to assess overall model fit (Byrne, 1998). Kelloway (1998, p.27) describes the GFI as “a ratio of the sum of the squared discrepancies to the observed variances” since the GFI measures the proportion of the variance and covariance that the hypothesised model proposes to explain. Values above .90 indicate reasonable fit to the data (Loehlin, 1998; Raykov & Marcoulides, 2000).

Null models serve as a valuable baseline for comparing alternative models to assess improvements in fit (Byrne, 1998; Raykov & Marcoulides, 2000). Typically, the researcher compares a baseline model that is represented by a model with no hypothesised factor structure and this baseline model can provide a poor fit to the data. Poor fit can be established in a null model because all variables are typically specified to be uncorrelated (Kelloway 1998). For models hypothesised a priori to have no underlying factor structure, however, null models can provide a good fit to the data. The TLI and the CFI both compare a null model with a hypothesised model. These indices were computed using formulae given in Marsh et al. (1996). The TLI and CFI should ideally be greater than .90 (Hu & Bentler, 1999).

Criterion values for the RMSEA can be set to take into account some error of approximation in the implied population covariance matrix, thus relaxing the stringent requirement that the model holds exactly in the population. The RMSEA should ideally be less than .05. However, values between .05 and .08 indicate reasonable fit (Byrne, 1998).

Although CFAs are labelled “Confirmatory”, typically CFA researchers do not test one model alone (a strictly confirmatory approach), but often make post-hoc adjustments to models in order to make models fit sample data better. Thus, many CFA studies are really quasi-confirmatory or even outright exploratory (Byrne, 1998). In this study a quasi-confirmatory approach was applied only for the first wave of data for the focus sample. However, for the first wave for the independent sample and for the second and third waves, a strictly confirmatory approach was followed for the first-order CFAs. Thus the first-order CFA models for the subgroup at Time 1 and all subsequent waves (Time 2 and Time 3) were estimated
without modification. This strictly confirmatory approach is a feature of this study, and represents a strong test of the factorial validity of the instrument.

### 9.2.4 Item deletion

A chief objective of model testing and refinement was to ensure that the combined GAGOS-ASDQII instrument was robust psychometrically. Items loading on their designated factors were scrutinised to evaluate their contribution to the substantive model for consideration. Items with low factor loadings, high uniquenesses, and relatively high modification indices were identified and potential theoretical explanations for why these items were poorly fitting considered, before the possibility of deletion. Also considered during model testing were the updated standards for causal models proposed by Marsh et al. (1999), which recommend latent constructs being inferred by at least three items per factor but preferably by even more. Therefore it was desirable to fit at least three items for each of the 5-factors.

### 9.2.5 Summary of refinement analyses

The first phase of data analysis was to remove items that were not loading particularly well on hypothesised subscales (Raykov & Marcoulides, 2000). This process involved examining results from (a) the first-order CFA with the combined GAGOS-ASDQII and (b) Cronbach’s alpha coefficients given the removal of each item from the subscale. Cronbach’s alpha tests the extent to which multiple indicators for a latent variable associate with each other. Indicators with a Cronbach’s alpha of .7 judge the set of indicators as a reliable measure. The results of the fit statistics are discussed below and Cronbach’s alpha coefficients are displayed in Table 9.2. Also presented is a comprehensive rationale for retention and removal of items in each of the five subscales.
Table 9.2  
*Item analysis for GAGOS–ASDQII*

<table>
<thead>
<tr>
<th>Item</th>
<th>Alpha with item removed</th>
<th>Alpha with all items present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastery Goals</td>
<td></td>
<td>.69</td>
</tr>
<tr>
<td>I am most motivated when I see my work improve</td>
<td>.60</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I am good at something</td>
<td>.63</td>
<td></td>
</tr>
<tr>
<td><em>I am most motivated when I solve problems</em></td>
<td>.74</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I am becoming better at my work</td>
<td>.61</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I am confident that I can do my school work</td>
<td>.64</td>
<td></td>
</tr>
<tr>
<td>Performance Goals</td>
<td></td>
<td>.81</td>
</tr>
<tr>
<td><em>I am most motivated when I receive rewards</em></td>
<td>.79</td>
<td></td>
</tr>
<tr>
<td><em>I am most motivated when I receive good marks</em></td>
<td>.80</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I am noticed by others</td>
<td>.78</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I am competing with others</td>
<td>.79</td>
<td></td>
</tr>
<tr>
<td><em>I am most motivated when I am in charge of a group</em></td>
<td>.78</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I am praised</td>
<td>.78</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I am doing better than others</td>
<td>.78</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I become a leader</td>
<td>.78</td>
<td></td>
</tr>
<tr>
<td>Social Goals</td>
<td></td>
<td>.74</td>
</tr>
<tr>
<td>I am most motivated when I work with others</td>
<td>.68</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I am in a group</td>
<td>.66</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I work with friends at school</td>
<td>.67</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I am helping others</td>
<td>.73</td>
<td></td>
</tr>
<tr>
<td><em>I am most motivated when I am showing concern for others</em></td>
<td>.73</td>
<td></td>
</tr>
<tr>
<td>English Self-concept</td>
<td></td>
<td>.87</td>
</tr>
<tr>
<td>I am good at English</td>
<td>.83</td>
<td></td>
</tr>
<tr>
<td>I have always been good at English</td>
<td>.85</td>
<td></td>
</tr>
<tr>
<td>Work in English is easy for me</td>
<td>.86</td>
<td></td>
</tr>
<tr>
<td>I get good marks in English</td>
<td>.83</td>
<td></td>
</tr>
<tr>
<td>I learn things quickly in English</td>
<td>.84</td>
<td></td>
</tr>
<tr>
<td>Mathematics Self-concept</td>
<td></td>
<td>.91</td>
</tr>
<tr>
<td>I am good at mathematics</td>
<td>.88</td>
<td></td>
</tr>
<tr>
<td>I have always been good at mathematics</td>
<td>.89</td>
<td></td>
</tr>
<tr>
<td>Work in mathematics is easy for me</td>
<td>.89</td>
<td></td>
</tr>
<tr>
<td>I get good marks in mathematics</td>
<td>.89</td>
<td></td>
</tr>
<tr>
<td>I learn things quickly in mathematics</td>
<td>.89</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* * = item removed following first CFA
9.3 Results

Model 1a T1 (M1aT1) tested the hypothesis of 28 items loading on 5-factors. Figure 9.1 presents the path diagram for the first-order CFA (M1aT1). Specifically, this figure presents three first-order factors inferred from the GAGOS (mastery goals, performance goals, and social goals) as well as two first-order factors inferred from the ASDQII (English self-concept and mathematics self-concept). A total of five items measure students’ mastery goals, eight items measure students’ performance goals, another five items measure students’ social goals, while academic self-concept is measured by ten items, half of which are English self-concept and the remaining half measure mathematics self-concept. Results indicate that the model fits the data marginally well. The RMSEA for example, is greater than .05 but the TLI and CFI are slightly above .9. The Chi square/degrees of freedom ratio for M1aT1 is greater than 3.

The correlations between the variables are presented in Table 9.3. The positive correlation between mastery goals and performance goals (r = .50) suggests that respondents who adopted a mastery goal were likely to adopt a performance goal and this indicates that students can pursue multiple goals. Correlations between performance goals and social goals (r = .43) also support multiple goal pursuit because respondents who adopted a performance goal were also likely to adopt social goals. Mastery goals were more highly correlated with English self-concept than with mathematics self-concept, while the inverse was true for performance goals. Social goals correlated weakly with mathematics self-concept and even more weakly correlated with English self-concept.
Figure 9.1. First-order CFA/Measurement Component for M1aT1. MAS = Mastery goals, PER = Performance goals, SOC = Social goals, ESC = English self-concept, MSC = Mathematics self-concept, T1 = Time 1, T2 = Time 2, T3 = Time 3.
### Table 9.3

**Correlations Among the 5-factors for M1aT1**

<table>
<thead>
<tr>
<th></th>
<th>Mastery goals</th>
<th>Performance goals</th>
<th>Social goals</th>
<th>English self-concept</th>
<th>Mathematics self-concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastery goals</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance goals</td>
<td>.50***</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social goals</td>
<td>.28***</td>
<td>.43***</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>English self-concept</td>
<td>.38***</td>
<td>.19***</td>
<td>.06</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Mathematics self-concept</td>
<td>.20***</td>
<td>.22***</td>
<td>.16**</td>
<td>.19***</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*Note. Coefficients are significant at *p < .05. **p < .01. ***p < .001.*

#### 9.3.1 Justification for item deletion or retention

The performance goal subscale comprised 8 items. Following the first-order CFA, three items (PER58T1, PER62T1 and PER83T1) were removed from the subscale. The first basis upon which these items were dropped from the original subscale was the enhanced reliability given their removal (whereas removal of most other items reduced reliability). A second basis for removal was the conceptual overlap among items. Specifically, item PER83T1 (“I am most motivated when I am in charge of a group”) was similar to another item that related to managing a group (“I am most motivated when I become a leader”) and therefore removed due to conceptual redundancy. Additionally, a number of similar items related to seeking rewards from others from a performance orientation PER90T1 (“I am most motivated when I am praised”), PER58T1 (“I am most motivated when I receive rewards”) and PER62T1 (“I am most motivated when I receive good marks) were considered conceptually redundant and therefore the two weakest items (PER58T1 and PER62T1) were removed. Furthermore, the high modification index (which indicates relationships between uniquenesses and between items, and pinpoints which of these parameters, if freed, would lead to an improved chi square value—Jöreskog & Sörbom, 1989a, 1989b) for the items (PER83T1, PER58T1 and PER62T1) suggested a good degree of overlap.

The mastery goal subscale comprised 5 items. Only one item (MAS37T1) was removed. The first basis upon which the item was considered for deletion was due to the enhanced reliability of the subscale given its deletion. Secondly, the factor loading for the item was comparably low and proved to be a poor item as the squared
multiple correlations revealed that the item explained only 13% of the variance on
the latent construct. The fact that the item proved problematic could be attributed to
the fact that the remaining four items relate to seeking competence and feelings
associated with increasing competence (i.e., improving, being good at something,
becoming better and being confident). In contrast, MAS37T1 relates to solving
problems and appears to be more negatively phrased, compared with the remaining
items from the subscale. Lastly, the modification index revealed that relaxing the
large modification index for MAS37T1 would substantially improve the overall
model fit.

The social goal subscale comprised 5 items. Although there were two poorly fitting
items from the subscale (SOC101T1 and SOC108T1), only one was removed, since
it is preferable to maintain more than three items per subscale (Marsh et al., 1999).
The first basis upon which to address item deletion was enhanced reliability. Both
items provided equal improvement to the subscale reliability with deletion. The
second basis was to examine factor loadings. Both items revealed factor loadings
below .5. Examination of the modification indices demonstrated that the largest
modification index was associated with SOC108T1. Hence, this item was deleted
from the subscale. Perhaps this item was misinterpreted by respondents, as they may
have misunderstood the phrase “showing concern for others”. The phrase may be
open to different interpretation as to how one actually demonstrates “concern for
others”.

Although most of the factor loadings and $R^2$ were large for each of the subscales,
smaller values were evident for SOC101, indicating this subscale is not as highly
related to its factor as were the other subscales. Even though SOC101 had a weak
factor loading and $R^2$ value, this item was retained for a number of reasons. First, as
identified above, this item was retained to maintain more than three items per
subscale (Marsh et al., 1999). Despite the number of studies that opt for a cut off
level of .5 for factor loadings, researchers have accepted cut off levels for factor
loadings as low as .3 to allow for sufficient numbers of items to be retained (Billings
& Wroten, 1987; Cohen, 1969; Geuens & DePelsmacker, 2002). Some researchers
have published studies showing models that provide a good fit to the data but report
factor loadings as low and lower than .3 (see for example Kim, Cramond, &
Second, SOC101 held an a priori expectation of the theory concerning the factor structure of social goals (see for example Dowson & McInerney, 2004) and although this item had a factor loading of .42 its removal would falsify theoretical expectations of social goals if it were deleted. For instance, parallel social goal items in Dowson and McInerney’s (2004) Goal Orientation and Learning Strategies Survey (GOALS-S) which also related to helping others, had factor loadings ranging from .77 to .88. Removal of this item would be contrary to expectations of theory on social goals.

The ASDQII instrument has been well established in the literature and demonstrated sound psychometric properties when combined with the GAGOS. All 5 English self-concept items and 5 mathematics self-concept items were retained. These items demonstrated high reliability, good factor loadings, low uniquenesses and small modification indices.

### 9.3.2 Confirmatory factor analysis for the refined instrument

Having removed relatively inferior or empirically-redundant items, a CFA was performed on the 23-item, 5 subscale model. All latent constructs comprised at least four items. The resulting model (M2aT1) was tested with the same constraints as M1aT1, that is, the remaining items loading on their “target” factors, with no cross-loadings allowed. This analysis yielded a chi square of 538.08 (df = 220), a TLI of .96, a CFI of .96 and RMSEA of .05. These fit indices demonstrate that the combined GAGOS-ASDQII provided a good fit to the data for the focus sample. The factor loadings and squared multiple correlations ($R^2$) are reported in Table 9.4.

The correlations between the variables are presented in Table 9.5. The same pattern of correlations from the initial a priori hypothesised model appeared in the refined a priori model. Specifically, mastery and performance goals were modestly correlated as were performance goals and social goals. These findings suggest that students pursue multiple goals. Mastery goals were more highly correlated to English self-concept than mathematics self-concept, while performance goals were more highly
correlated with mathematics self-concept than English self-concept. Social goals correlated weakly with mathematics self-concept and even more weakly with English self-concept, although the correlation with English self-concept was nonsignificant. These findings are parallel to the correlations from the initial a priori model (M1aT1).

Table 9.4

*Factor Structure of the M1aT1 and M2aT1 for the 5-Factors*

<table>
<thead>
<tr>
<th>Item</th>
<th>M1aT1 Factor loading</th>
<th>M1aT1 R²</th>
<th>M2aT1 Factor loading</th>
<th>M2aT1 R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAS27</td>
<td>.52</td>
<td>.48</td>
<td>.51</td>
<td>.46</td>
</tr>
<tr>
<td>MAS32</td>
<td>.48</td>
<td>.39</td>
<td>.49</td>
<td>.41</td>
</tr>
<tr>
<td>MAS37</td>
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<td>.13</td>
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<td>removed</td>
</tr>
<tr>
<td>MAS42</td>
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<td>.45</td>
<td>.54</td>
<td>.45</td>
</tr>
<tr>
<td>MAS50</td>
<td>.44</td>
<td>.33</td>
<td>.46</td>
<td>.35</td>
</tr>
<tr>
<td>PER58</td>
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</tr>
<tr>
<td>PER62</td>
<td>.45</td>
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<tr>
<td>PER72</td>
<td>.72</td>
<td>.59</td>
<td>.74</td>
<td>.41</td>
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<td>PER78</td>
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<td>.61</td>
<td>.28</td>
</tr>
<tr>
<td>PER83</td>
<td>.70</td>
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<td>PER90</td>
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<tr>
<td>MSC5</td>
<td>.87</td>
<td>.60</td>
<td>.87</td>
<td>.60</td>
</tr>
</tbody>
</table>
9.4 Model Comparison

Model M2aT1 has different measurement specifications from M1aT1 and therefore a model comparison is challenging, because there is no direct statistical comparison available (Maruyama, 1998). For such models, it is feasible to compare absolute fit indices, for example the Goodness-of-Fit Index (GFI), Chi square statistic, Normed Chi square ($\chi^2/df$), and Root Mean Square Error of Approximation (RMSEA), as well as comparing incremental fit indices such as the Tucker Lewis Index (TLI) and Comparative Fit Index (CFI; Kaplan, 2000). Maruyama (1998) and Kaplan (2000) both acknowledge additional fit indexes that are useful for gauging the rank order for which one model fits better than another. These recommended indexes do not have an ideal value but are used to provide relative ordering for different models that utilise the same data set. These statistics comprise the Akaike Information Criterion (AIC), Consistent Akaike Information Criterion (CAIC), and the Effective Cross Validation Index (ECVI). The model with the lowest AIC, CAIC, and EVCI is deemed to fit the data best because from a predictive viewpoint, the selected model will cross-validate better than the model with higher AIC, CAIC, and EVCI values (Kaplan, 2000).

M2aT1 appears to be a better representation of the data compared with M1aT1. The GFI for M1aT1 did not reach the criterion value .90 (GFI = .86), the RMSEA was larger than .05 (RMSEA = .69) and the normed chi square was greater than 3 ($\chi^2/df = 3.5$) but the remaining values (TLI = .92, CFI = .93) provided an acceptable fit to the data. M2aT1 reached the criterion value for the GFI (GFI = .92) and provided a very good fit to the remaining indices (RMSEA = .05, $\chi^2/df = 2.5$, TLI = .96, CFI = .96). The measures assessing adequacy of the competing models were all smaller for M2aT1 (AIC = 650.08, CAIC = .945.89, and EVCI = 1.22) compared with M1aT1 (AIC = 1331.64, CAIC = 1680.27, and EVCI = 2.49). These indices also favoured M2aT1 as a better representation of the data. In sum, M2aT1 provides a better representation of the data and this was supported by all of the indices referenced above.
Table 9.5

*Correlations Among the 5-factors for M2aT1*

<table>
<thead>
<tr>
<th></th>
<th>Mastery goals</th>
<th>Performance goals</th>
<th>Social goals</th>
<th>English self-concept</th>
<th>Mathematics self-concept</th>
</tr>
</thead>
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<td>Mastery goals</td>
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<td>Performance goals</td>
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<td>1.00</td>
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<td></td>
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<tr>
<td>Social goals</td>
<td>.22***</td>
<td>.36***</td>
<td>.03</td>
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<tr>
<td>English self-concept</td>
<td>.39***</td>
<td>.22***</td>
<td>.14**</td>
<td>.19***</td>
<td>1.00</td>
</tr>
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<td>Mathematics self-concept</td>
<td>.17**</td>
<td>.24***</td>
<td></td>
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</tr>
</tbody>
</table>

*Note.* Coefficients are significant at *p < .05. **p < .01. ***p < .001.

9.5 Cross Validation of the Refined Model

9.5.1 Sample

The 4 schools that were unable to provide achievement ranks for the three waves of data were combined to generate an independent sample. The independent sample comprised 466 secondary students in Years 7 (*n* = 182, 39.1%), 8 (*n* = 167, 35.8%) and 9 (*n* = 117, 25.1%). Respondents were from three high schools in rural NSW (Schools 7, 8, and 9) and one high school in urban NSW (School 5). More than half of the respondents (*n* = 323, 69.3%) were female, 143 were male (3.7%). The mean age of respondents was 12.98 years (SD = 0.89). Table 9.1 presents the composition of the independent sample.

9.5.2 Model cross-validation

A strength of the present study is the use of model cross-validation. This involves collecting data from two samples and using one sample set for model refinement and the other for model testing or confirmation. Cross-validation provides a stringent procedure for preventing the possibility that a solution based on a given sample capitalises on chance relationships (Dimitrov, 2006; Kelloway, 1998).

9.5.3 Confirmatory factor analyses for the independent sample

The CFA conducted involved assessment of the refined model for an independent sample. An identical 23-item, 5-factor structure tested for the focus group was examined using CFA (M3aT1). A chi square of 446.15 (df = 220) was obtained, with a TLI of .96, CFI of .97, and RMSEA of .05. The factor loadings and $R^2$ are...
presented in Table 9.6. Comparative fit indices for all models tested are presented in Table 9.7. These fit indices demonstrate a good fit to the data and substantiate the refined 23-item 5-factor structure.

Correlations between the variables are presented in Table 9.8. Most of the correlations for the independent sample replicate the pattern of correlations for the focus sample. Specifically, mastery goals and performance goals were modestly correlated \((r = .42)\), as were performance goals and social goals \((r = .48)\). Social goals were weakly correlated with English self-concept \((r = .10)\) and mathematics self-concept \((r = .03)\). Mastery goals correlated more highly with English self-concept \((r = .43)\). The only inconsistent relationship for the independent sample compared with the focus group was that performance goals were more highly correlated with English self-concept rather than mathematics self-concept.
Table 9.6

*Factor Loadings and $R^2$ for M3aT1: Independent Sample*

<table>
<thead>
<tr>
<th>Item</th>
<th>M3aT1 Factor loading 23-items</th>
<th>M3aT1 $R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>T1 $\alpha = .76$</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAS27</td>
<td>.52</td>
<td>.48</td>
</tr>
<tr>
<td>MAS32</td>
<td>.40</td>
<td>.27</td>
</tr>
<tr>
<td>MAS42</td>
<td>.64</td>
<td>.56</td>
</tr>
<tr>
<td>MAS50</td>
<td>.54</td>
<td>.47</td>
</tr>
<tr>
<td><strong>T1 $\alpha = .77$</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PER72</td>
<td>.82</td>
<td>.44</td>
</tr>
<tr>
<td>PER78</td>
<td>.76</td>
<td>.37</td>
</tr>
<tr>
<td>PER90</td>
<td>.80</td>
<td>.41</td>
</tr>
<tr>
<td>PER95</td>
<td>.88</td>
<td>.50</td>
</tr>
<tr>
<td>PER98</td>
<td>.68</td>
<td>.30</td>
</tr>
<tr>
<td><strong>T1 $\alpha = .77$</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOC35</td>
<td>.71</td>
<td>.45</td>
</tr>
<tr>
<td>SOC55</td>
<td>.94</td>
<td>.69</td>
</tr>
<tr>
<td>SOC67</td>
<td>.86</td>
<td>.66</td>
</tr>
<tr>
<td>SOC101</td>
<td>.45</td>
<td>.18</td>
</tr>
<tr>
<td><strong>T1 $\alpha = .85$</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESC1</td>
<td>.71</td>
<td>.60</td>
</tr>
<tr>
<td>ESC2</td>
<td>.75</td>
<td>.53</td>
</tr>
<tr>
<td>ESC3</td>
<td>.71</td>
<td>.45</td>
</tr>
<tr>
<td>ESC4</td>
<td>.75</td>
<td>.61</td>
</tr>
<tr>
<td>ESC5</td>
<td>.72</td>
<td>.50</td>
</tr>
<tr>
<td><strong>T1 $\alpha = .89$</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSC1</td>
<td>.81</td>
<td>.64</td>
</tr>
<tr>
<td>MSC2</td>
<td>.89</td>
<td>.59</td>
</tr>
<tr>
<td>MSC3</td>
<td>.93</td>
<td>.65</td>
</tr>
<tr>
<td>MSC4</td>
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<td>.60</td>
</tr>
<tr>
<td>MSC5</td>
<td>.91</td>
<td>.64</td>
</tr>
</tbody>
</table>
Table 9.7
Model Fit Statistics

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\chi^2$/df</th>
<th>TLI</th>
<th>CFI</th>
<th>RMSEA</th>
<th>Model Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1aT1</td>
<td>1199.64</td>
<td>340</td>
<td>3.53</td>
<td>.92</td>
<td>.93</td>
<td>.69</td>
<td>Hypothesised model T1 (28 items) focus sample</td>
</tr>
<tr>
<td>M1bT1</td>
<td>11083.05</td>
<td>378</td>
<td>29.32</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>Null model T1 (28 items) focus sample</td>
</tr>
<tr>
<td>M2aT1</td>
<td>538.08</td>
<td>220</td>
<td>2.45</td>
<td>.96</td>
<td>.96</td>
<td>.05</td>
<td>Hypothesised model T1 (23-items)</td>
</tr>
<tr>
<td>M2bT1</td>
<td>8093.05</td>
<td>253</td>
<td>31.99</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>Null model T1 (23-items) focus sample</td>
</tr>
<tr>
<td>M3aT1</td>
<td>446.15</td>
<td>220</td>
<td>2.03</td>
<td>.96</td>
<td>.97</td>
<td>.05</td>
<td>Hypothesised model T1 (23-items) independent sample</td>
</tr>
<tr>
<td>M3bT1</td>
<td>7065.55</td>
<td>253</td>
<td>27.93</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>Null model T1 (23-items) independent sample</td>
</tr>
</tbody>
</table>

Note. n.a. = not available. TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error Approximation. A null model is a model that specifies no relationship between the variables composing the model. The null model is used as a baseline to compare the hypothesised model (a model in which the relationship between variables has been specified) in the TLI. TLI = \[
\frac{\text{Chi-square}}{\text{degrees of freedom (null model)}} - \frac{\text{Chi-square}}{\text{degrees of freedom (hypothesised model)}}\]
RMSEA = Square Root [\((\text{Chi-square} - \text{degrees of freedom}) / (n-1) \times \text{degrees of freedom}\)]
Table 9.8

*Correlations Among the 5-factors for M3aT1*

<table>
<thead>
<tr>
<th></th>
<th>Mastery goals</th>
<th>Performance goals</th>
<th>Social goals</th>
<th>English self-concept</th>
<th>Mathematics self-concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastery goals</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance goals</td>
<td>.48***</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social goals</td>
<td>.26***</td>
<td>.42***</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>English self-concept</td>
<td>.43***</td>
<td>.26***</td>
<td>.10</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Mathematics self-concept</td>
<td>.21***</td>
<td>.13*</td>
<td>.03</td>
<td>.16**</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*Note.* Coefficients are significant at *p < .05. **p < .01. ***p < .001.

9.6 Testing for Factor Invariance Across Sex

Despite contemporary research on sex differences of students’ goal orientations and academic self-concepts, the literature remains ambiguous regarding whether, or how, sex differences may influence students in these areas. Compounding the ambiguity of sex differences is whether researchers’ findings reflect a difference of degree on these dimensions or difference of kind (Martin, 2004). The vast majority of studies exploring effects of sex on multiple dimensions of motivation usually are based around mean levels (Green et al., 2006). Differences of degree distinguish whether males are higher or lower than females on various motivational constructs. However, inadequate attention has been paid to sex differences of kind which attempt to examine the factor structure to determine whether a given instrument measures the same components of motivation with equal validity for males and females. Research that exclusively attends to differences of degree and overlooks differences of kind may mistakenly form unfounded judgements about sex differences. It may not be justifiable to compare motivation responses between males and females unless there is adequate support for invariance of factor structure across sex. For these reasons, it is important to determine whether the combined GAGOS-ASDQII instrument measures students’ goals and academic self-concepts equally validly for both males and females.
To determine whether the measurement model is applicable across sex, a test of invariance was conducted. It is necessary to determine whether negligible variance arises in the measurement model; otherwise, variation may incorrectly be attributed to the structural model (Marsh et al., 1999). Testing for invariance essentially involves assessing measurement invariance between the unconstrained model (hypothesised model for the focus group) and a model where various parameters are systematically constrained to be equal (across sex groups). If the chi square difference test reveals a nonsignificant difference between the unconstrained model and the constrained-equal model, then the conclusion is that the unconstrained model has measurement invariance (that is, males and females respond uniformly to the instrument).

Before conducting a true test of invariance, it is worthwhile testing one-sample models. For instance, when testing for invariance across sex, it is desirable to test a separate male sample and then test a female sample. The primary purpose of this procedure is to provide an overview of how consistent the results are between males and females (Byrne, 1998; Marsh, 1993c). If the separate analyses reveal minimal differences between males and females, then it is likely that the multi-group test, where parameters are constrained to be equal between males and females, will be invariant. In the case that the separate analyses reveal vastly different models between males and females then it is unlikely the measurement model will be invariant. For this reason, the focus sample was split by sex and a CFA for males \((n = 315)\) and then females \((n = 220)\) was conducted. Table 9.9 presents the findings from the separate CFAs for males and females. Results indicate both separate analyses provide a good fit to the data and suggest potential consistency across sex.
Given that the one-sample models between males and females demonstrated consistency since the chi square and degrees of freedom ratio for both males and females are less than 2 and the RMSEAs, TLIs and CFIs are almost identical, it was worthwhile proceeding to multi-group testing. Measurement invariance may be assessed with different levels of stringency, depending on which parameters are constrained to be equal. The three levels of variation for measurement models are: item factor loadings, factor correlations, and item uniquenesses. Byrne (2001) believes that invariance can be deemed acceptable at the factor loading level since undertaking tests of “equality constraints bearing on error variances and covariances is now considered to be excessively stringent” (p.202).

Factor loadings are considered to be the most crucial parameter to assess for invariance because of the necessity for measurement stability within latent variables (Byrne, 1998; Marsh, 1993a). Initially all of these three levels of variation were constrained for Model 5 (M5T1). That is, the factor loadings, factor correlations, and item uniquenesses were constrained to be equal across sex. In order to assess the model’s variation, two processes were employed. The first process entailed examining the goodness-of-fit indices to assess whether the model provided a good fit to the data. The second process entailed comparing the baseline model (M2aT1) with the invariant model (M5T1) using the chi square difference test.

### Table 9.9

<table>
<thead>
<tr>
<th>Model</th>
<th>(\chi^2)</th>
<th>df</th>
<th>(\chi^2/df)</th>
<th>TLI</th>
<th>CFI</th>
<th>RMSEA</th>
<th>Model Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M4aT1</td>
<td>408.45</td>
<td>220</td>
<td>1.86</td>
<td>.96</td>
<td>.96</td>
<td>.05</td>
<td>Hypothesised model T1 Males</td>
</tr>
<tr>
<td>M4bT1</td>
<td>5161.09</td>
<td>253</td>
<td>2.40</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>Null model T1 Males</td>
</tr>
<tr>
<td>M4cT1</td>
<td>339.97</td>
<td>220</td>
<td>1.55</td>
<td>.95</td>
<td>.96</td>
<td>.05</td>
<td>Hypothesised model T1 Females</td>
</tr>
<tr>
<td>M4dT1</td>
<td>3063.80</td>
<td>253</td>
<td>12.11</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>Null model T1 Females</td>
</tr>
</tbody>
</table>
The invariant model M5T1 yielded a chi-square of 538.08 (df = 220), a TLI of .95, a CFI of .96 and RMSEA of .05. These fit indices demonstrate that the invariant model provides a good fit to the data because all indices reached criterion values.

The next process in assessing a model’s invariance involves comparing a baseline model (M2aT1) with the invariant model (M5T1) using the chi square difference test. The baseline model for this comparison was M2aT1. Specifically, this model comprised the pooled male and female sample (focus sample n = 535). The baseline model (M2aT1) was specified to be unconstrained; that is, the factor loadings, factor correlations, and uniquenesses were freely estimated. A comparison between the unconstrained model (M2aT1) and the invariant model (M5T1) is presented in Table 9.10. If the difference between these two models is nonsignificant then it can be concluded that the constrained-equal (invariant–M5T1) model is the same as the unconstrained across sex model (M2aT1). A chi square difference test was then applied to determine whether the difference was significant. Chi square for this comparison was 30.41 with 276 degrees of freedom. This difference is nonsignificant, indicating M2aT1 and M5T1 display measurement invariance across sex groups.

Table 9.10
Comparative Fit Indicators for the Unconstrained and Invariant Models

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\chi^2$/df</th>
<th>TLI</th>
<th>CFI</th>
<th>RMSEA</th>
<th>Model Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M2aT1</td>
<td>538.08</td>
<td>220</td>
<td>2.45</td>
<td>.96</td>
<td>.96</td>
<td>.05</td>
<td>Unconstrained model</td>
</tr>
<tr>
<td>M5T1</td>
<td>838.49</td>
<td>496</td>
<td>1.70</td>
<td>.95</td>
<td>.96</td>
<td>.05</td>
<td>Invariant</td>
</tr>
</tbody>
</table>

9.7 Summary of Chapter

Three important findings emerged from the analyses in the first wave of data. Section 9.1 demonstrated that the combined GAGOS–ASDQII provided a marginal fit to the data but once the five poorly fitting items were removed, M2aT1 was a significantly better fit to the data. Section 9.2 presented cross-validation results which demonstrated that the refined model provided a good fit to both the focus sample and
the independent sample, thereby substantiating the fact that chance played no role in fitting the data to the model. Section 9.3 showed the GAGOS–ASDQII instrument yields data independently of the sex of the students. Consequently, inferences concerning differences in motivation and self-concept between males and females can be validly drawn.

Marsh et al. (1999) recommend researchers commence with simple CFA models in order to address potential measurement problems before proceeding to more complicated structural equation models. Notably, this chapter resolved measurement concerns by refining the initial hypothesised model: by removing the five poorly fitting items. This refined model is tested further in the following chapter to ensure measurement issues have been evaluated and rectified appropriately.
CHAPTER 10
CONFIRMATORY FACTOR ANALYSES TIME 2 AND TIME 3

1. Section 10.1 presents results derived from the first-order CFA for the focus sample at Time 2 (T2) and Time 3 (T3). The key objective explored in this section was:
Examining the multi-dimensionality of students’ goals and academic self-concept. Multi-dimensionality would be demonstrated if multiple goals could be represented by three distinct goals (mastery, performance and social) and if academic self-concept could be represented in two specific domains (English and mathematics).

2. The key objective of Section 10.2 was to examine the stability of the factor structure of the measurement model across T2 and T3. Stability would be demonstrated if factor correlations between the goals and between academic self-concepts replicated a similar pattern across T2 and T3. If this was the case, relations between goal orientations and domain-specific self-concepts would not change over time.

3. The key objective of Section 10.3 was to cross-validate the model to avoid the possibility of capitalising on chance variation within a given sample. Analyses replicate the first-order CFA with an independent sample at T2 and T3.

4. The purpose of Section 10.4 was to determine whether males and females uniformly interpret the items from the combined GAGOS–ASDQII across time waves T2 and T3. It presents a test for factor invariance across sex for these two waves.
10.1 Method

10.1.1 Focus sample across Time 2 and Time 3

The focus sample was selected from the schools that provided complete data across three waves (Schools 1, 2, 3, 4, and 6). Students who participated at Time 1 of the investigation were surveyed for a second (November, 2003) and third (November, 2004) time, with an interval of one year between each data collection point. The focus sample comprised 535 respondents, more than half ($n = 315, 59\%$) of whom were male, 220 being female ($41\%$). Table 9.1 from the previous chapter presents details of the composition for the focus sample.

10.1.2 Materials and procedures

The same survey from Time 1 was delivered to the respondents at both Time 2 and Time 3. The standardised explanation of the purpose of the survey that was provided at Time 1 was also given at T2 and T3 at each school. The term “motivated” was defined for all respondents, to ensure their understanding of the term. The survey was then read aloud to the students to (a) ensure that most participants completed the survey within the time allotted (b) overcome reading and language difficulties of some students (c) ensure consistency with the procedure from school to school and year to year and (d) assist students with learning difficulties. At each session there were at least two research assistants present to assist the respondents completing the surveys. School teachers were not involved in the administration of the survey. Surveys were collected from the respondents before leaving the room.

10.1.3 Overview of analyses across Time 2 and Time 3

CFAs using LISREL (Jöreskog & Sörbom, 1989a; 2003) and Reliability Analyses (Pedhazur & Pedhazur-Schmelkin, 1991) using SPSS were used to determine the psychometric properties of the combined GAGOS-ASDQII scales for the focus sample at T2 and T3. To begin, four nested models were tested in a structural approach to determining the properties of the combined scales at T2 and T3. These models were:

Model 2a (M2aT2): the hypothesised (5-factor) model with the revised set of 23-items at Time 2.
Model 2b (M2bT2): the null model with the revised set of 23-items at Time 2.
Model 2a (M2aT3): the hypothesised (5-factor) model with the revised set of 23-items at Time 3.
Model 2b (M2bT3): the null model with the revised set of 23-items at Time 3.

Once a valid and reliable measurement model is substantiated at T2 and T3, the next step would be to cross-validate the measurement model for the independent sample at both time waves. This analysis involved:

Model 3a (M3aT2): the hypothesised (5-factor) model with the revised set of 23-items at Time 2 for the independent sample.
Model 3b (M3bT2): the null model with the revised set of 23-items at Time 2 for the independent sample.
Model 3a (M3aT3): the hypothesised (5-factor) model with the revised set of 23-items at Time 3 for the independent sample.
Model 3b (M3bT3): the null model with the revised set of 23-items at Time 3 for the independent sample.

When the measurement models M3aT2 and M3aT3 demonstrated good fits to the independent sample it was integral to this study to examine whether the refined measurement model (M2aT1) was invariant across sex. This process entailed two steps. The first step was to examine the measurement model in two separate tests, firstly for the male sample and secondly for the female sample at T2 and then at T3. This step involved examining how consistent these two models were for males compared with females. These analyses were:

Model 4a (M4aT2): the hypothesised (5-factor) model with the revised set of 23-items at Time 2 for males.
Model 4b (M4bT2): the null model with the revised set of 23-items at Time 2 for males.
Model 4c (M4cT2): the hypothesised (5-factor) model with the revised set of 23-items at Time 2 for females.
Model 4d (M4dT2): the null model with the revised set of 23-items at Time 2 for females.
Model 4a (M4aT3): the hypothesised (5-factor) model with the revised set of 23-items at Time 3 for males.

Model 4b (M4bT3): the null model with the revised set of 23-items at Time 3 for males.

Model 4c (M4cT3): the hypothesised (5-factor) model with the revised set of 23-items at Time 3 for females.

Model 4d (M4dT3): the null model with the revised set of 23-items at Time 3 for females.

After establishing that the sample for males and females was consistent at both time waves, the final step was a true test of invariance. These analyses were:

Model 5: (M5T2): test of invariance for the hypothesised (5-factor) model with 23-items from Time 2 for males and females.

Model 5: (M5T3): test of invariance for the hypothesised (5-factor) model with 23-items from Time 3 for males and females.

10.2 Results

10.2.1 Confirmatory factor analyses for the refined instrument

The first CFA analysis for Time 2 and Time 3 is parallel to the first-order CFA conducted on the refined instrument at Time 1. The hypothesised model tested 23-items loaded on 5-factors at T2 (M2aT2) and T3 (M2aT3). All latent constructs comprised four or five items. Models M2aT2 and M2aT3 provided a good fit to the data. M2aT2 yields a chi square of 527.06 (df = 220), a TLI of .95, a CFI .96, and .05 RMSEA. M2aT3 yields a chi square of 585.67 (df = 220), a TLI of .96, a CFI .96, and .06 RMSEA. These results support the convergent and discriminant validity of the measures, and indicate support for the multidimensionality of both students’ goals and academic self-concepts at T2 and T3. Table 10.1 presents the factor loadings, Cronbach’s alpha for the scales and $R^2$ for Model M2a at T2 and T3.

The correlations between the variables for T2 and T3 are presented in Table 10.2. The positive correlations at T2 and T3 between (a) mastery and performance goals and (b) performance goals and social goals replicate the pattern of findings for the first wave of data for both the focus sample and the independent sample. Also
parallel to the focus sample at T1 was the positive correlations at T2 and T3 between mastery goals and English self-concept and weaker yet positive correlations between mastery goals and mathematics self-concept. Conversely, performance goals at T2 and T3 correlated more highly with mathematics self-concept than with English self-concept. Relations between social goals and English self-concept and mathematics self-concept change over time. It appears that social goals for the focus sample are negatively correlated with English self-concept at T2 and at T3 are negatively correlated with both English self-concept and mathematics self-concept.
Table 10.1

*Factor Loadings, Cronbach's Alpha, and $R^2$ for M2aT2 and M2aT3*

<table>
<thead>
<tr>
<th>Item</th>
<th>T2 α</th>
<th>M2aT2 Factor Loadings</th>
<th>M2aT2 $R^2$</th>
<th>M2aT3 Factor Loadings</th>
<th>M2aT3 $R^2$</th>
</tr>
</thead>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T2 α = .77</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T3 α = .79</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>MAS27</td>
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<td>MAS42</td>
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<td>.59</td>
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</tr>
<tr>
<td>MAS50</td>
<td>.62</td>
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<td>.39</td>
<td>.55</td>
<td>.52</td>
</tr>
<tr>
<td>T2 α = .75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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Table 10.2

*Correlations Among the 5-factors for M2aT2 and M2aT3*

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*Note. Coefficients are significant at *p < .05. ** p < .01. *** p < .001.*
10.3 Cross Validation Across Time 2 and Time 3

The refined model demonstrated a good fit to the data for the focus sample at both time waves. The following procedure was to determine whether an independent sample would also demonstrate a good fit to the data at T2 and T3. This procedure is a strong feature of this study as it provides a robust test for the validity and reliability of the measurement model.

10.3.1 Independent sample

Respondents from the independent sample at Time 1 were also surveyed approximately one year later (November, 2003) and then the following year (November, 2004). Respondents with complete data, except for achievement ranks, at Time 3 were traced back at Time 2 and Time 1. The matched cases for the independent sample comprised 466 secondary students. Table 9.1 from the previous chapter presents details of the composition for the independent sample across the three data collection points.

10.3.2 Confirmatory factor analyses for the independent sample at Time 2 and Time 3

Parallel to the CFA conducted on the refined instrument at Time 1 (M2aT1 and M3aT1), these analyses involved two identical CFAs with the independent sample across two distinct time waves, T2 (M3aT2) and T3 (M3aT3). At T2 a chi square of 496.39 (df = 220) was obtained, with a TLI of .96, CFI of .97, and RMSEA of .05. At T3 a chi square of 488.39 (df = 220) was obtained, with a TLI of .95, CFI of .96, and RMSEA of .05. The model fit at T3 was comparable with T2. The factor loadings and $R^2$ are presented in Table 10.3. These fit indices demonstrate that the measurement model at T2 and T3 for the independent sample indicates a good fit to the data and further substantiates the refined measurement model.

The correlations between the variables at T2 and T3 are presented in Table 10.4. Interesting to note is the reasonably consistent pattern of results across all three time waves. Although correlations between mathematics self-concept and mastery and performance goals varied, consistent relations were evident between (a) mastery goals and performance goals and (b) performance goals and social goals for both the
independent sample and focus sample. These consistent factor correlations indicated that relations between the goal orientation and domain-specific self-concept scales are reasonably stable overtime. Also consistent across time waves and the samples are the positive correlations among mastery goals and English self-concept.

Factor stability of goals and domain-specific self-concept was demonstrated because the items loaded on their factors consistently over the survey waves, indicating factor structure stability. These findings are consistent with results from two studies which both describe goal orientations as relatively stable (Attenweiler & Moore, 2006; Colquitt & Simmering, 1998).
### Table 10.3

*Factor Loadings, Cronbach’s Alpha, and $R^2$ for M3aT2 and M3aT3*

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Note. Coefficients are significant at *p < .05. ** p < .01. *** p < .001.
10.4 Factor Invariance Across Sex

Before testing for sex invariance in the structural model, it is necessary to ascertain that there is negligible invariance in the measurement model. Otherwise, variation may be attributed to the structural model when in fact the variation may be in the measurement model. Separate analyses for males (M4aT2 and M4aT3) and females (M4cT2 and M4cT3) indicate the models are comparable (see Table 10.5 for the fit statistics).

Table 10.5
_CFA for Males and Females_

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<td>n.a.</td>
<td>Null model T3 Females</td>
</tr>
</tbody>
</table>

Consequently, a true test of invariance was conducted. When the factor loadings, factor correlations, and uniquenesses were constrained to be equal across sex groups, the results indicated that M5aT2 and M5aT3 provided a good fit to the data. Table 10.6 presents the fit statistics for these models. A comparison between the invariant model at T2 and T3 with the unconstrained model (M2aT2 and M2aT3) using a chi
square difference test was then conducted. The chi square difference test between M5aT2 and the hypothesised model (M2aT2) revealed a chi square of 391.63 with 276 degrees of freedom. The chi square difference test between M5aT3 and M2aT3 revealed a chi square of 276.25 with 276 degrees of freedom. These results demonstrate that the invariant M5aT2 and M5aT3 were not significantly different from their respective unconstrained model. Importantly these findings demonstrate that males and females responded uniformly in the measurement model.

Table 10.6

Comparative Fit Indicators For the Unconstrained and Invariant Models

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<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\chi^2$/df</th>
<th>TLI</th>
<th>CFI</th>
<th>RMSEA</th>
<th>Model Description</th>
</tr>
</thead>
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<td>.95</td>
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<td>Unconstrained model</td>
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<tr>
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10.5 Summary of Chapter

This chapter has demonstrated that:

- The combined GAGOS–ASDQII reliably and validly measured students’ multiple mastery, performance and social goals, and English and mathematics self-concepts in the context of one instrument at T2 and T3 (Section 10.1).
- The multi-dimensional model provided a good representation of the data for both time waves (Section 10.1).
- The factor structure of goals and academic self-concept remained stable across T2 and T3, therefore providing support for the stability of the measurement model (Section 10.2)
• The model at T2 and T3 for an independent sample also provided a good fit to
the data. These results confirm that chance played no role in fitting the data to
the model (Section 10.3).

• Males and females respond equally to the GAGOS–ASDQII items (Section
10.4).

The next process, which is addressed in the following chapter, according to Marsh et
al.’s (1999) recommended procedures for analysing LSEM is to conduct more
complicated CFA models where all variables across all time waves are
simultaneously examined.
CHAPTER 11
CONFIRMATORY FACTOR ANALYSES OF THE COMBINED THREE WAVES

For research addressing longitudinal causal ordering, Marsh et al. (1999) recommend a necessary sequence of four distinct phases of analysis.

1. straightforward CFA models to address measurement issues.
2. pursuing more complicated CFA models that involve all variables across time waves.
3. a full-forward structural equation model and
4. developing alternative causal models with the purpose of providing a point of comparison, exploring general issues, and idiosyncrasies of the specific study.

Thus far, this research has addressed the first phase by testing a number of simple single wave a priori CFA models with the purpose of identifying measurement problems and resolving them accordingly. The conclusion is that the combined GAGOS–ASDQII instrument yields robust psychometric properties, hence demonstrating that students’ multi-dimensional goals and academic self-concepts are stable over time and invariant across sex.

This chapter addresses the second phase. Two complicated models are tested in this chapter:

I. a model that simultaneously tests five first-order variables (mastery goals, performance goals, social goals, English self-concept, and mathematics self-concept) across all three waves (Time 1 = 2002, Time 2 = 2003, and Time 3 = 2004). This model is referred to as the 5-variable 3-wave model (5V3W).
II. a model that simultaneously tests seven first-order variables (same five variables above in addition to English achievement and mathematics achievement) across all three waves. This model is referred to as the 7-variable 3-wave model (7V3W).
11.1 Correlated Uniquenesses With Longitudinal Data

A priori CFAs usually assume that errors of measurement associated with each observed variable (more frequently referred to as uniquenesses and hereafter referred to as such) are distinct from the errors of measurement associated with other observed variables. Due to this distinction, CFA models hypothesise that error uniquenesses associated with each measure are uncorrelated. In the case of longitudinal data, however, parallel items are administered on multiple occasions to the same sample; hence, the uniqueness associated with identically measured variables is likely to be correlated (more frequently referred to as correlated uniquenesses and hereafter referred to as such). If these correlated uniquenesses are not stipulated in the a priori model, then the estimated correlations between the parallel latent constructs will be positively biased and can result in a poorly fitting model and lead to improper solutions (Marsh et al., 2005). Consequently, Marsh and Hau (1996) proposed as a guideline for longitudinal data that: it is crucial to posit an a priori model that specifies correlated uniquenesses between parallel measures collected across different points in time. Importantly, this guideline applies to latent constructs inferred on the basis of multiple indicators such that one factor is inferred by at least three indicators (Marsh, Hau, Balla, & Grayson, 1998). Correlating uniquenesses does not apply, however, when only a single indicator is available for a latent construct. This exception to following the guidelines is relevant to subsequent analyses involving achievement ranks and is addressed in subsequent analyses.

11.2 Overview of Analyses

There is a requirement in longitudinal studies to consider correlated uniquenesses, that is, parallel measures collected on multiple occasions to avoid positively biased estimates of stability. It is essential to specify a priori models that contain correlated uniquenesses when a latent construct is inferred on the basis of multiple indicators (Marsh et al., 2005). Marsh et al. (1999) add that it is desirable to evaluate the size and nature of these effects by comparing both a model with and a model without uniquenesses, but they also highlight the inappropriateness of evaluating only models with no correlated uniquenesses. Subsequently, the first section of analyses includes
two a priori models comprising 5V3Ws for comparison and a test of invariance for
the best fitting 5V3W model. In this study both an a priori model with correlated
unique unities specified (Model 7) and an a priori model with no correlated
unique unities (Model 6) were proposed and compared with each other. The
importance of specifying correlated unique unities is demonstrated through this
comparison. (The LISREL syntax generated to test the model with correlated
unique unities (M7) is included in Appendix D).

In addition to testing two a priori models, the better fitting model of M6 and M7 will
be assessed to determine that the measurement model is applicable across sex. Past
analyses involved separate CFAs of the same a priori model, one for males and one
for females. These separate analyses provide the opportunity for preliminary
analysis because if the models are vastly different, it is unlikely that the measurement
model will be invariant. In the case that there are five variables across three waves, it
is impossible to conduct these separate analyses since the sample size (males \( n = 315 \)
and females \( n = 220 \)) is smaller than the number of parameters to be estimated.
Subsequently, only a true test of invariance will be conducted for these more
complicated CFA models.

A true test of measurement invariance involves comparing an unconstrained model
with a model whose parameters are constrained to be equal among factor loadings,
factor correlations, and unique unities. Initially the fit indices of the constrained-equal
model are examined to assess whether the data provide an adequate fit, and
then a chi square difference test is conducted between the unconstrained model and
the constrained-equal model. If the chi square difference test reveals a nonsignificant
difference between the two, then the conclusion drawn is that the model has
measurement invariance (that is, males and females respond uniformly to the
measurement model). (The LISREL syntax generated to test the 5V3W model is
included in Appendix E). Below is a summary of the models tested:

Section one’s analyses in this chapter include:

- Model 6 (M6): the hypothesised (5-factor 3-wave) model with no correlated
  unique unities
- Model 7 (M7): the hypothesised (5-factor 3-wave) model with correlated
  unique unities
Model 8 (M8): test of invariance across sex for the better fitting model between M6 and M7

Parallel analyses as those described above for the 5V3W model are followed for the model which includes achievement data (i.e., 7V3W model). Specifically, an a priori model is proposed to comprise seven variables. These seven variables include the same five variables as those referred to above, with the addition to English ranks and mathematics ranks. Before pursuing longitudinal structural equation models (LSEM), a prerequisite proposed by Guay et al. (2003) is to perform a large CFA where all variables from all time waves are simultaneously tested. The opportunity was taken to include English and mathematics ranks in Model 9. Essentially, this CFA is mathematically equivalent to the most general SEM model, referred to as a “full-forward” model. A full-forward model estimates all paths among all variables and is equivalent to the corresponding CFA where the chi square and degrees of freedom are the same, and the parameter estimates are either the same or reparameterizations of each other (Marsh et al., 1999). By performing the 7V3W CFA, it is possible to verify the appropriateness of a full-forward model and assess potential problems and possible solutions, since these are more readily pursued for CFA models than for SEM models.

Unlike the variables from M7, which all have multiple indicators, the achievement data are inferred by a single indicator for English ranks and a single indicator for mathematics ranks. Importantly, Marsh et al. (1999) affirm that their guideline for correlating uniquenesses is inapplicable to variables denoted by a single indicator. Marsh (1987) suggested that when only a single indicator is available it is necessary to analyse results based on a range of plausible values of reliability and correlated uniquenesses. This means that the latent correlation may be smaller or larger than the observed correlation and consequently, conclusions based on this approach must be tentative.

Parallel to the first section of analyses in this chapter, the second section also involves a true test of measurement invariance across sex. The a priori model comprising 7V3W will be constrained so that factor loadings, uniquenesses and error variances are constrained to be equal across sex. To assess the model, the fit indices
will be examined and then a chi square difference test will be completed between the constrained and unconstrained model. If the chi square difference test results in a nonsignificant difference between the two, then the measurement model is invariant across sex. (The LISREL syntax generated to test the 7V3W model is included in Appendix F and the syntax generated to test whether this model remained invariant across sex is included in Appendix G). The models tested were:

Model 9a (M9a): the hypothesised (seven factor) model which includes achievement ranks with correlated uniquenesses among variables with multiple indicators and no correlated uniquenesses among the achievement ranks.

Model 9b (M9b): M9a test of invariance across sex

11.3 Results

Following recommendations from Marsh and Hau (1996) the analyses for the first section commenced with an a priori model with correlated uniquenesses between parallel measures collected at T1, T2 and T3 for all five variables (Model 7). However, to demonstrate the significance of this consideration an a priori model with no correlated uniquenesses was also tested (Model 6). M6 represented an exceptionally poor fit to the data (TLI = .56) and provided an improper solution because the correlation matrix was specified to be “not positive definite”. A common criterion for improper solutions is when the output specifies that the correlation matrix was “not positive definite”. (Marsh et al., 1998). In Model 7, 69 correlated uniquenesses (relating uniquenesses with parallel T1, T2 and T3 measures) were included. Here the fit was substantially improved (TLI = .97). Hence, the a priori model (M7) that included the correlated uniquenesses fits the data better than the corresponding model that did not. Consistently with expectations, the correlated uniquenesses were predominantly positive, although not all were significantly positive and none was significantly negative. Comparative fit statistics of M6 and M7 are provided in Table 11.1. On the basis of the guidelines recommended by Marsh and Hau (1996), as well as from the results of the preliminary analyses, and in order to facilitate substantive interpretations of the results, subsequent models including three waves of data will focus on a priori models with correlated uniquenesses (Marsh et al., 2005).
Table 11.1

Comparative Fit Indices for the 5V3W Model

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<th>$\chi^2$/df</th>
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<th>CFI</th>
<th>RMSEA</th>
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<td>5V3W with correlated uniquenesses</td>
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<td>M8</td>
<td>6478.40</td>
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<td>.94</td>
<td>.94</td>
<td>.04</td>
<td>M7 that tests for invariance across sex</td>
</tr>
</tbody>
</table>

11.4 Invariance Across Sex

Model 7, the best fitting a priori model, was then used to test whether it remained invariant across sex. When the factor loadings, uniquenesses, and error variances were constrained to be equal across sex groups, the results indicated that M8 provided a good fit to the data. Table 11.1 presents the fit statistics for this model. A comparison between the invariant Model M8 with the unconstrained Model M7 using a chi square difference test was then conducted. The chi square difference test for M7d revealed a chi square of 2687.4 with 2415 degrees of freedom. These results demonstrate that the invariant M8 was not significantly different from its respective unconstrained model. Importantly, these findings demonstrate that males and females responded uniformly in the measurement model.

The second section of analyses commenced with an a priori model with correlated uniquenesses between parallel measures collected at T1, T2, and T3 for the five variables with multiple indicators while the achievement data with single indicators were not correlated across the three waves of data (Model 9a). Results demonstrate that the a priori model with 7V3W provided an excellent fit to the data, with all fit indices exceeding criterion values. Table 11.2 presents the fit statistics for Model 8. This model provides a good basis for pursuing SEM models, which are the substantive emphasis of this research.
The next analysis in the second section was a test of invariance across sex. When the factor loadings, uniquenesses and error variances were constrained to be equal across sex groups, the results indicated that M9b provided a good fit to the data. Table 11.2 presents the fit statistics for this model. A comparison between the invariant model M9b with the unconstrained model M9a using a chi square difference test was then conducted. The chi square difference test for M9b revealed a chi square of 3308.4 with 2855 degrees of freedom. These results demonstrate that the invariant M9b was not significantly different from its respective unconstrained model. It can be concluded that males and females responded equally to the measurement items at all three time waves for all seven variables, thus demonstrating that the measurement model was invariant across sex.

Table 11.2

<table>
<thead>
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<th>Model</th>
<th>$\chi^2$</th>
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<td>.03</td>
<td>M8a that tests for invariance across sex</td>
</tr>
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</table>

11.5 Correlations Among the Factors

Correlations among the seven factors across three waves are presented in Table 11.3. Most notable are the stability correlations which are the test-retest correlations for the seven latent constructs across three waves of data. As expected, variables collected on multiple occasions were highly and positively correlated with each other; for example, the correlation between performance goals at T1 and T2 is .62 and at T2 and T3 is .51. This pattern of results between parallel variables collected on multiple occasions was replicated for mastery goals, social goals, English self-concept, mathematics self-concept, English ranks, and mathematics ranks (boldfaced correlations).
As hypothesised in Chapter 6, English self-concept is more highly correlated with achievement ranks from the corresponding domain ($r$s vary from .16 to .36 across three waves) and this was also true for mathematics self-concept and mathematics achievement ($r$s vary from .13 to .36 across three waves). Consistently with predictions, correlations among the two achievement ranks ($T1 = .51 \ T2 = .54 \ T3 = .58$) were substantially larger than correlations among the two academic self-concept scales ($T1 = .19 \ T2 = .17 \ T3 = .20$).

A similar pattern of correlations that emerged in the earlier first-order CFAs, were evident in the results for Model 8. In particular, mastery and performance goals were positively correlated at all three time waves. Performance goals and social goals were positively correlated at all three time waves. Similarly to performance goals, social goals related more strongly with mathematics self-concept and mathematics ranks than with English self-concept and English ranks. Specifically, social goals related negatively with English self-concept at T2 and T3 and negatively to English ranks at all three time points. Social goals related positively with mathematics self-concept but related negatively with math ranks, and this pattern was replicated across all three time points. It appears that socially oriented individuals may be preoccupied with helping others and that this preoccupation with others negatively affects their achievement in both domains and self-concept in English. These results are discussed in more detail in Chapter 12.
Table 11.3

Correlations Among 7V3W a Priori Model

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Note. Decimals omitted. Coefficients are significant at *p < .05. **p < .01. ***p < .001.
11.6 Summary of Chapter

This chapter demonstrated that:

- The 5V3W model (M7) provided a good fit to the data when correlated uniquenesses were specified in the model.
- The 7V3W model (M9a) also provided a good fit to the data and the fit indices of this model were essentially comparable with the 5V3W model.
- M9a provided an exceptionally good fit, with indices exceeding recommended criterion values. Consequently, both the 5V3W (M7) and 7V3W (M9a) models supported the convergent and discriminant validity of the measures.
- Both the 5V3W (M8) and 7V3W (M9b) models proved to be invariant across sex.
- The factor structure for both the 5V3W and 7V3W model remained stable across all three waves, providing support for the stability of mastery and performance goals and English and mathematics self-concepts.
- The factor structure for social goals varied, providing evidence that social goals may be unstable across time.
- The above findings continue to demonstrate that students’ goals and academic self-concepts can be represented as multi-dimensional.

Based on Marsh et al.’s (1999) recommended guidelines for analysing longitudinal structural equation models (LSEM) the pivotal findings from the first two phases from their fourth guideline are discussed in the following chapter.
CHAPTER 12
DISCUSSION OF CONFIRMATORY FACTOR ANALYSES RESULTS

One of the challenges of examining student motivation is the various “ways of conceptualising it which help teachers to understand children’s progress and behaviour, thereby helping them to evaluate their classroom practice and teaching methods” (Galloway et al., 1998, p.42). In order to address the complex nature of student motivation, this study endeavours to unify two significant bodies of research in an attempt to provide a more comprehensive and meaningful model to explain student motivation. Stringent and advanced validation processes are employed to establish reliable and valid measures that concisely operationalise student motivation. Central to this study is the widely accepted and useful employment of a test-retest design (Rayko & Penev, 2005). Not only are models cross-validated with an independent sample, the models are also examined on multiple occasions, providing a rigorous means by which the models can be assessed.

Chapter 9 tested an a priori model of students’ goals and academic self-concept by determining the best fitting items and subsequently making some post hoc adjustments. This refined model was then tested for the remaining two waves of data with both the focus sample and independent sample. Next, the model for both samples was tested for invariance across sex. Chapter 11 presented more complicated CFAs, where the three waves of data were simultaneously examined in a large CFA. The initial 5V3W model was extended to include English ranks and mathematics ranks, thereby hypothesising an a priori model with seven variables across three time points. Key findings from the first-order CFAs are discussed below.
12.1 Hypothesised and Refined Model

Model 2 (M1At1) tested the hypothesis that the 28 initial items loaded on 5-factors. The fit for this model did not reach criterion values. As a result, five poorly fitting items (i.e., items with low factor loadings, high uniquenesses, and relatively high modification indices) were removed from Model 1 (M1At1). These items were A37MAS, A58PER, A62PER, A83PER, and A108SOC.

The resulting model (Model 2a) was tested with the same constraints as M1aT1, that is, the remaining items loading on their same “target” factors, with no cross-loadings allowed. M2aT1 showed a better fit to the data than M1aT1. M2aT1’s RMSEA is substantially less than M1aT1’s. The TLI for M2aT1 is above .95, and substantially higher than that for M1aT1. Thus, removing the five poorly fitting items from the original hypothesised model led to an improved overall model fit. In order to assess whether M2aT1 was a significantly improved overall fit to the data than M1aT1, a chi square difference test was computed. The difference proved significant, indicating that M2aT1 represents a significantly improved fit over M1aT1.

A strength of this study is the robust procedure of model cross validation. Byrne (1998) acknowledges the need for model respecification but criticises researchers for atheoretical fiddling with models to make them fit. She highlights an approach that addresses concerns with post hoc model fitting, and this method has been employed in this study. First, Byrne (1998) recommends testing the final model derived from post hoc analyses with an independent sample. This method of cross validation can highlight whether a solution based on a given sample capitalised on chance relationships (Kelloway, 1998). Since post hoc analyses may be driven by distinct characteristics from the particular sample from which the model was tested, it is necessary to test the respecifications on an independent sample. The final model, or as it is referred to in this study, the refined model (M2aT1) for the focus sample, was tested with the independent sample (M3aT1). Furthermore, the refined model was tested across an additional two waves for both the focus sample and the independent sample. Fit indices for the focus sample (M2aT1, M2aT2, & M2aT3) and independent sample (M3aT1, M3aT2, & M3aT3) across all three waves were essentially comparable, demonstrating the replicability of paths, hence validating the
refined hypothesised model. Test–retest design is a feature of this study and directly addresses Byrne’s (1998) concern with educational psychology research that rarely retests models.

The refined model for the focus group at all three time waves was also assessed for invariance across sex. Results show there is no significant amount of variation to the factor loadings, factor correlations, and item unique-nesses due to sex in the measurement model at all three time waves (M5T1, M5T2 and M5T3). This demonstrates that males and females interpret the items for the combined GAGOS-ASDQ II homogeneously.

The above findings support the convergent and discriminant validity as well as the reliability of the combined GAGOS-ASDQ II. This demonstrates that students’ goals can be conceptualized as comprising multiple mastery, performance, and social goals and that students’ academic self-concept can be conceptualized as comprising students’ English and mathematics self-concept. Results from the CFAs provide strong evidence that these motivational forces can be measured in the context of one instrument at Time 1, Time 2, and Time 3. Factor correlations across the CFA models in T1 through to T3 indicate that both the goal orientation and academic self-concept scales are stable.

Findings from both the first phase and second phase lend support to the theoretical argument that goals and self-concept should be viewed as multi- rather than unidimensional constructs. Results of this study are, thus, congruent with other theoretical (e.g., Urdan & Maehr, 1995), qualitative (e.g., Dowson & McInerney, 2001, 2003) and quantitative studies (e.g., Marsh et al., 2002; McInerney et al., 2003; McInerney et al., 1997), which also support the multidimensionality of students’ goals and academic self-concept. Furthermore, this clear conceptualisation of student’s multiple goals and self-concepts can facilitate teachers’ understanding of what contributes to student motivation. By clearly conceptualising motivation in terms of students’ goals and self-concept, an unambiguous explanation of student motivation is provided to teachers which can facilitate them to understand children’s progress and behaviour.
Pursuit of multiple goals has recently been proposed by a number of researchers (DeShon & Gillespie, 2005; Giota, 2002; Harackiewicz & Linnenbrink, 2005; Linnenbrink, 2005; Smith & Sinclair, 2003). Rather than adopting one goal exclusively, individuals may pursue more than one goal at a time which interact simultaneously and vary in salience depending on task structure, the school environment, and the broader social and educational context (McInerney et al., 1997; Meece et al., 2006; Lemos & Goncalves, 2004). Notable is the proposed inclusion of social goals, interacting alongside academic goals. This revised framework can enrich our understanding of motivation and achievement. In particular, the models in this study work well with the inclusion of social goals as a first-order construct. This, consistently with other studies (for example, Dowson & McInerney, 2003; Giota, 2002), suggests that social goals in addition to academic (mastery and performance) goals are important for students in educational settings. Hence, this study provides a measurement framework within which goal theory is clarified but importantly, is extended to include social factors. For these reasons, this study provides a measurement framework within which the interaction of multiple goal orientations and academic self-concept variables may justifiably be examined further.

12.2 Relations Among Goals and Domain-specific Self-Concept

Correlations between mastery goals and performance goals were positively related (T1 = .44, T2 = .43 and T3 = .50) at all three time waves. There are mixed findings in the literature regarding the relations between mastery and performance goals (Shih & Alexander, 2000). For instance, some researchers have found negligible positive correlations between the two goals (see for example Midgley et al., 1995; Roeser et al., 1996) while many others report positive correlations (Barker et al., 2006a; 2006b; Hagen, 1994; Nolen & Haladyna, 1990). The correlations found in this study contribute further to current literature on students’ goals as, not only were the correlations between the goals significantly positive, but they also demonstrated that the relationship between mastery goals and performance goals remained stable across three years. Elliot and Harackiewicz (1996) have argued that both mastery and performance goals pertain to self-regulatory strategies which contribute to positive outcomes, including attainment of competence or task mastery. This study concurs
with numerous achievement goal theory researchers, who postulate that mastery goals serve an adaptive motivational function and positively influence performance goals (Dweck, 1986; Urdan, 1997; Pajares et al., 2000). Urdan (1997) substantiates that mastery goals are affiliated with a range of adaptive outcomes and suggests positive correlations between mastery goals and performance goals, demonstrating that performance goals have adaptive qualities also.

The positive correlation between mastery goals and performance goals suggests that, rather than focusing on one goal to the exclusion of the other, respondents who adopted a mastery goal were also likely to adopt performance goals and that this relationship proved stable over three waves of data. Barron and Harackiewicz (2001) found consistently positive correlations between mastery goals and performance goals, but this was only one point in time. This study extends previous work to provide a longitudinal investigation on how goals relate. Harackiewicz et al. (1998) provided a review of a number of correlational studies on students’ goal pursuits. Instead of the traditional dichotomy in which one goal is pursued exclusively (which would be the case if these two goals were negatively correlated), they revealed correlational studies that consistently found that measures of students’ mastery goals and performance goals were uncorrelated or even positively correlated. Given the possibility that individuals can adopt multiple goals, it is critical to test the interaction of mastery and performance goals and their combined effect on important outcomes such as students’ academic self-concept and academic achievement.

How students coordinate the pursuing of multiple goals is beginning to be investigated (Lemos, 2004). Interesting to note is whether particular goal combinations facilitate or impede each other. Argyle et al. (1981) believes that the simultaneous pursuit of certain goals can positively relate such that the particular combination of multiple goals facilitate each other or that the certain goals could negatively relate such that they impede each other. When particular combinations of goals facilitate each other they are referred to as “goal independence” but when certain combinations impede or interfere with each other they are referred to as “goal interference” (Argyle et al., 1981). To date, most research supports goal instrumentality when mastery and performance goals are combined. Specifically, both goals work in a complementary manner, such that mastery goals predict interest
and performance goals predict academic performance; hence, this combination of goals produces optimal motivation and performance (Barron & Harackiewicz, 2000). The next strongest positive correlation across the three waves of data was between performance goals and social goals (T1 = .36, T2 = .39 and T3 = .30) followed by mastery goals and social goals (T1 = .22, T2 = .19 and T3 = .17). It appears that over three years students who adopt a social goal also pursue performance goals and mastery goals. According to research, social goals that focus on cooperation and assisting peers align well with mastery goals (Anderman & Anderman, 1999; Covington, 2000; Feshbach & Feshbach, 1987). This explanation appears to be relevant to the present study, as the social goals relate to the desire to work with and assist peers and therefore correlate positively with mastery goals.

Social goals that focus on maintaining a positive outward view relate particularly well with performance goals (Ryan et al., 1997). A focus on maintaining favourable judgements from others is important to both social goals and performance goals (Anderman & Anderman, 1999). A number of studies have included components of social goals when operationalising performance goals (see for example, Nicholls et al., 1988). This similarity between social goals and performance goals denotes the common underlying processes reported between academic goals and social goals (Hinkley et al., 2001). It appears that contending with others to preserve a positive public image is a common process pursued amid performance oriented individuals and social goal oriented individuals.

Although relations between mastery and performance goals have previously been examined by others, there is a need for research to explore multiple goal pursuits with the inclusion of social goals. In this study, social goals promote cooperation and facilitating peers with their work as well as focusing the individual’s attention on maintaining positive judgements from others. Vital questions relating to how academic goals relate with social goals and how the various combinations influence important educational outcomes such as students’ academic self-concept and academic achievement remain largely unanswered.
Of the limited research on the relations between students’ goals and self-perceived abilities, mastery goals and performance goals have been found to be uncorrelated with self-perceived abilities, or weakly correlated (Ames & Archer, 1988; Nicholls, 1989; Nicholls et al., 1985). Of the significant correlations found in the literature between mastery goals and self-perceived abilities, most are positive. Findings from this study surmise that students’ mastery goals positively relate to English and mathematics self-concepts. Inconsistent relations have been found between performance goals and self-perceived abilities. Results from this study maintain that performance goals, as operationalised in this study, positively relate to English and mathematics self-concepts. These findings are congruent with an understanding that performance goals are not always adverse, or at least not for all students, all of the time (Dowson & McInerney, 2003; Urdan, 1997). Importantly, these positive correlations between mastery and performance goals with English and mathematics self-concept could be evidence that goals and self-concept are mutually reinforcing.

Specifically, mastery goals were more positively correlated with English self-concept (T1 = .39, T2 = .25, T3 = .20) and not so strongly correlated with mathematics self-concept (T1 = .17, T2 = .21, T3 = .15). Congruent with these findings, performance goals were more positively related to mathematics self-concept (T1 = .24, T2 = .22, T3 = .30) than with English self-concept (T1 = .22, T2 = .07, T3 = .12). Mathematics as a subject usually focuses on evaluation and competition (Aunola et al., 2006) because there is an objectively correct or incorrect result, whereas there is an element of subjectivity in English. Classroom structures in these two distinct subject domains can harvest the pursuit of a particular goal. Mathematics classroom structures are more likely to encourage performance goals due to the focus on accuracy and the evaluative and competitive nature of the subject (Dowson, 1999). In contrast, classroom structures in English are more likely to encourage mastery goals due to the element of subjectivity and emphasis on opinions and feelings. However, given the apparently small differences found in the correlations, this contention need to be further investigated.

Social goals also replicated the pattern demonstrated by performance goals as both were more often highly correlated with mathematics self-concept, compared with English self-concept. Perhaps a common quality of both social goals and
performance goals is that each is externally referenced. Anderman and Anderman (1999) hypothesised that students’ social goals that relate to peer relationships may in fact link to performance goals. In this study, social goals are broadly related to individuals who are concerned with helping others and showing empathy and interest for their peers in academic situations. Similarly, performance goals are externally referenced, such that individuals are concerned with competing and doing well relative to others. It is feasible to hypothesise that since both performance goals and social goals are externally referenced, these students are more likely to judge their competence relative to others more regularly, and these continual external comparisons may be more salient in mathematics, due to the evaluative and competitive nature of the subject.

A notable difference between students in this study and high school students from previous research (for example Frances, Yeung, Putai, & Low, 1997; Tay et al., 1995) is the correlation between mathematics and English self-concept, which has frequently been found to be near zero (Marsh, 1986a) or even negative (Yeung & Lee, 1999). To account for the near-zero and negative correlations found between self-concepts in different domains, Marsh proposed the Internal/External frame of reference model (Marsh, 1986a; 1990a). Congruently with this research, this study hypothesised (refer to Hypothesis 5) a weak or near zero correlation between mathematics and English self-concepts. In contrast however, this study found correlations between mathematics and English self-concepts to be moderately and positively correlated across all three time waves for both the focus sample and independent sample.

Despite the majority of research studies reporting weak correlations between mathematics and English self-concepts, there have been some methodologically sound studies that report the same positive correlations between the two self-concepts revealed in this study. For instance, the findings of this study are consistent with Yeung et al., (2000) who also demonstrated moderate correlations between mathematics and English self-concepts. These findings indicate that students with a positive English self-concept are likely to hold a positive mathematics self-concept. Skaalvik and Rankin (1992) attest that positive correlations between mathematics and English self-concept are evidence that not all students make internal comparisons
where they perceive themselves to be more competent at one subject at the expense of another, because students could rate their mathematics and English ability as equally good or bad.

There were some ambiguities among the correlations, that need to be addressed. One of these inconsistencies was the relationship between performance goals and mathematics self-concept for the independent sample at T1. Specifically, performance goals at T2 and T3 were more highly correlated with English self-concept than mathematics self-concept, but this was not the case at T1. Another ambiguous finding was for social goals. Initially, social goals were positively correlated with all variables, but at T2 and T3 for both the focus sample and independent sample, they were negatively related to English and mathematics self-concept. These findings provide evidence that students’ social goals change over time. This can be expected, since research on high school students’ motivation shows change over time (Martin, 2005; Watt, 2004). It appears that social goals become negatively related to English and mathematics self-concepts over time. One interpretation of these findings could be that students with a high or low English and mathematics self-concepts have little concern for working cooperatively with others.

There exists an absence of consensus regarding whether goal orientations should be treated as a stable trait or whether goal orientations are a state that changes as a function of personal characteristics and situational cues (Button et al., 1996). Research remains indecisive about whether goals are fostered across a range of various learning contexts (a trait—Pervin 1994) or whether goals are a short term state induced by salient features of the context (a state—Fridhandler 1986; Nesselroade 1988). In their review of goals, DeShon and Gillespie (2005) reveal that there is substantial conceptual argument regarding the stability of goals across contexts, domains, and time. Unsurprisingly, researchers aligned with goals as a trait more commonly identified goals as being stable. In fact, 47% of the 89 studies examined by DeShon and Gillespie (2005) advocate the stability of goals. The pattern of correlations from this study across three waves suggest that goals are fairly stable over time, but they seem to change somewhat; so at most there is support for the trait hypothesis. In particular, mastery and performance goals showed a consistent pattern over the three time waves, while social goals only varied in pattern
for the first wave. These results partially support Hypothesis 3, which specifies goal orientations will remain stable over time, and appear to be consistent with Attenweiler and Moore’s (2006) and Colquitt and Simmering’s (1998) descriptions of goal orientations as relatively stable.

12.3 Inclusion of Achievement Data

The first-order modelling process for the sample as a whole demonstrated that the refined 23-item model was a good fit for the data at Time 1, Time 2 and Time 3 (M2a). Achievement data in terms of English and mathematics ranks were then added to the best 23-items from the GAGOS-ASDQII instrument to determine the model’s fit over the combined three waves. Specifically, this large CFA involved examining the simultaneous interaction of students’ goals, academic self-concept, and achievement across the combined three points in time. The 7V3W model presented an excellent fit to the data (M9a). This demonstrated that the achievement data, along with the combined GAGOS-ASDQII instrument, reliably and validly measured students’ multiple mastery, performance & social goals, English & mathematics self-concept, and English and mathematics achievement (ie. 7V3W) in the context of the one instrument for Time 1, Time 2 and Time 3, thereby providing support for stability.

In summary, the results suggest that the multidimensional model was a good representation of the data at all three waves. This integrative model of student motivation represents the data well and substantiates the definition of goals and self-concept proposed by the combined GAGOS-ASDQII instrument. The present study directly addresses Bong’s (1996) concern that social cognitive models are inept, due to vague construct definitions, as this study lucidly defines three approach goals (as well as domain-specific self-concepts) and rigorously tests the definition using single wave and multiple wave confirmatory factor analysis. This study has developed and tested a more unified model of students’ motivation by acknowledging the academic self-concept–goal theory linkage.
This useful integrative framework was tested for sex differences of kind using a test of sex invariance. This test of differences of kind determines whether the factor structure for a given instrument actually measures the same components for males as for females. If this difference of kind remains untested it is possible to overlook the possibility that males and females respond fundamentally differently to the facets of motivation measured in this study. Analyses of the 7V3W model demonstrated no qualitative differences between males and females, which demonstrates that the combined GAGOS-ASDQII instrument has the same underlying meaning for both males and females. The practical significance of these findings is that programs aimed at modifying and enhancing students’ goals and academic self-concept need not be qualitatively and fundamentally distinct for males and females, but similar approaches will work equally well for both sexes.

12.4 Relations Among Goals, Domain-specific Self-concept, and Academic Achievement

Inclusion of the achievement data in the model allowed for the examination of how students’ goals and academic self-concepts relate to achievement in English and mathematics. Mastery goals related positively at all three time waves with English achievement; however, this relationship was nonsignificant at T1. These results are consistent with research that shows the positive effects of mastery goals on academic achievement (Aunola et al., 2006). Since mastery goals are associated with deep levels of processing (Barker et al., 2002), it is more likely that these students will experience success due to their ability to self-regulate by selecting effective and appropriate learning strategies (Harackiewicz et al., 2002).

A different pattern of correlations between mastery goals and achievement emerged for the subject domain of mathematics. All of the correlations between mastery goals and mathematics were nonsignificant and at T1 and T3 the relationship was negative. These results are consistent with the remaining research on mastery goals and academic achievement, which reports the lack of a strong relationship between mastery goals and academic achievement (Meece et al., 2006).
Correlations between social goals and academic achievement in English and mathematics were more substantial than either mastery or performance goals. Social goals, across all three time points, related negatively to both English and mathematics achievement but interestingly, the negative correlation between social goals and English ranks was far greater than for mathematics ranks. Learning experiences in mathematics in Australian high schools tend to be structured, and emphasis is on individual accomplishment; that is, fewer opportunities are provided to work in groups in mathematics since emphasis is on solving problems for oneself so as to learn concepts (Archer, 2000; Martin, 2005). Students who espouse social goals in a mathematics classroom are, therefore, availed few opportunities to work cooperatively. This could explain why social goals were more negatively related to mathematics achievement than to English achievement.

The negative relationship between social goals and academic achievement is interesting, as few studies have directly explored relations between social goals and English and mathematics achievement. The negative correlation appears to demonstrate that the preoccupation with helping others is associated with poor academic achievement. Specifically, students who perform poorly are more likely to be socially oriented, whereas students who perform well academically are less likely to be preoccupied with helping friends. Hence, those who are more likely to pursue social goals perform more poorly than students who are less likely to pursue social goals.

Relations among achievement and academic self-concept yield some interesting findings that can be explained using Marsh’s (1986a; 1990a) Internal/External (I/E) frame of reference model. A component of Marsh’s I/E model assumes that individuals judge their own achievements in one subject with their achievements in other subjects. This process of internal comparison should result in negative relations in achievement in one subject (e.g., English) against self-concept in a different subject (e.g., mathematics domain; Moller et al., 2006). Although only one pattern of relations in the 7V3W model replicated the proposed negative correlation assumed by the I/E model, all remaining paths between both domains of achievement with the other (non-matching) self-concept were close to zero. Notably, mathematics achievement was less correlated with English self-concept than with mathematics.
self-concept, and English achievement was less correlated with mathematics self-concept than with English self-concept. Furthermore, and as predicted by the I/E model, correlations between matching domains of achievement and self-concept were statistically significant (Moller et al., 2006).

One finding that was inconsistent with the literature was the near-zero correlations found between achievement in English and achievement in mathematics. Past research reports positive correlations between mathematics and English achievement because students who perform well in one subject domain are likely to perform well in other subject domains (Marsh and Craven, 2006). This finding appears to be an anomaly and requires further investigation.

The stability correlations, which are the test-retest correlations among the seven variables, were substantially larger than any other correlations in the a priori model. These findings are consistent with expectations, since variables collected on multiple occasions correlate highly with the corresponding measure at a different time point. Also consistently with expectations, English self-concept was more highly correlated with English ranks, and this pattern was replicated for mathematics self-concept and mathematics ranks. Shavelson et al.’s (1976) model specifies that academic achievement is correlated more positively with academic self-concept than with non-academic or general self-concept, and that English and mathematics achievement indicators are correlated more highly with self-concepts in parallel domains than with other self-concept facets.

Correlations discussed in this chapter provide important implications for understanding the nature of students’ goals, domain-specific self-concepts and academic achievement in English and mathematics. Although the 7V3W model, which specifies correlations among all seven variables across three waves, has important implications for how these variables relate across time, it is not particularly useful in disentangling the causal ordering of these constructs. Chapter 14 pursues the ambitious task of disentangling the causal ordering of goals and self-concept and their effect on academic achievement.
12.5 Summary of Chapter

The main findings highlight that the combined GAGOS-ASDQII reliably and validly measured students’ multiple mastery, performance, and social goals, as well as students’ English self-concept and mathematics self-concept, and English and mathematics achievement in the context of one instrument for T1, T2, and T3, therefore providing support for stability. In general, this model was an excellent representation of the data at all three time waves.

The results discussed above address Bong’s (1996) concern that social cognitive models are inept, due to vague construct definitions. A rigorous procedure has been applied to the construct validation processes for this study in an attempt to further define students’ multiple goal pursuits in achievement-related situations. The results from earlier chapters consistently illustrate that students’ goals can be conceptualised as comprising multiple mastery goals, performance goals and social goals. Findings substantiate that students pursuing mastery goals are also likely to pursue performance goals and students pursuing performance goals are also likely to pursue social goals. Importantly, the inclusion of social goals within the framework demonstrates that students also pursue a goal that is directly related to individuals or groups associated with an academic task. Social goals prove to be important to students in achievement-related situations and influence student achievement behaviour. Whether this behaviour is adaptive or maladaptive remains unclear, as the results from the first-order CFAs suggest that social goals relate positively to mathematics self-concept but are more often negatively related to English self-concept and consistently negatively correlated to both English ranks and mathematics ranks. Although they are not as extensively examined as academic goals, it appears that social goals are another important class of goals that influence student achievement behaviour and require further examination.

A key goal of this study is to unify competing motivational constructs to provide a more comprehensive and meaningful model of student motivation. Although not as complete as the proposed comprehensive model, this study does unite two distinct fields, specifically, goal theory and self-concept. Combining the GAGOS-ASDQ II allowed for relations to be explored among students’ goals and academic self-
concept in the domains of English and mathematics. Correlations among these two independent motivational dimensions and academic achievement indicate that they are not mutually exclusive but are in fact interconnected. By unifying these two fields of motivation, it is possible to seek valuable insight into how students’ goals and academic self-concepts both relate to influence student achievement.
13.1 Hierarchical Structure of Goals and Domain-specific Self-concepts

As discussed in the review of the literature, the three variables measuring goals are conceptually akin, as are the two variables measuring domain-specific self-concepts. For instance, the three goal orientations (mastery, performance, and social goals) all represent purposes for achievement. However, the reasons for achieving differ for each of the goals. The two domain-specific self-concepts (English and mathematics self-concept) represent self-perceptions of ability, but differ according to the subject domain. Due to the conceptual comparability between the first-order variables for the three goals and comparability between the domain-specific self-concepts at the first-order level, it was considered that analyses may be rendered more parsimonious if performed on the basis of conceptual comparability.

Furthermore, whenever first-order factors are correlated, it is logical to test models positing one or more higher-order factors (Marsh et al., 2002). Exploring correlations between the multiple first-order factors provides the opportunity to demonstrate a hierarchical representation of goals and academic self-concept. Consequently, this chapter tests whether students’ goals and domain specific self-concepts can be conceptualised as two singular latent constructs labelled “Purposes for achievement” and “Academic self-concept” respectively, represented within a hierarchical factorial structure that consists of three first-order goals (mastery, performance, and social goals) and two first-order domain-specific self-concepts (English and mathematics self-concept).
13.2 Method

13.2.1 Focus sample
The focus sample for the higher-order analysis was identical to the focus sample from the first-order CFA analyses. Respondents were the same 535 students that were surveyed across three waves of data. More than half of the respondents \((n = 315, 59\%)\) were male, 220 were female \((41\%)\). The mean age of respondents at T1 was 13.0 \((SD = 1.03)\), T2 was 14.27 years \((SD = 0.96)\) and at T3 was 15.09 years \((SD = 0.89)\).

13.2.2 Procedures
There was a number of purposes for conducting the higher-order analyses. These were:
1. evaluating an a priori hierarchical CFA model positing one HO factor (academic self-concept) that was consistent with the design of the ASDQII instrument and the Shavelson et al (1976) model on which these instruments were based;
2. evaluating an a priori hierarchical CFA model positing one HO factor (Purposes for achievement) that was hypothesised to relate to the underlying premise of the items in the GAGOS instrument with particular attention to the inclusion of a social goal to the academic goals framework;
3. evaluating whether the a priori HO model remains stable across three waves of data;
4. comparing this a priori model with the corresponding first-order CFA model across all three waves;
5. evaluating whether the HO model remains invariant across sex for all three waves;
6. evaluating the fit of the a priori HO model when all three data waves are combined in the one analysis, in order to assess the simultaneous interplay among the variables;
7. evaluating whether the large HO model remains invariant across sex; and finally
8. comparing this large a priori HO model with the corresponding large first-order CFA model \((M9a)\) when all three waves were simultaneously combined.
Investigating higher-order models involves examining the size of correlations among the first-order factors. If correlations among the first-order factors are small, then the hierarchy will be unavoidably weak. If this is the case, most of the reliable variance in the first-order factors cannot be explained in terms of a higher-order factor. Conversely, if the correlations are strong among the first-order factors, then a higher-order factor is plausible, at least empirically.

The size of first-order correlations is directly related to the size of the second-order factor loadings but is not directly related to the overall fit of the model. For instance, a model with uniformly weak correlations may still fit the data well. Essentially, evaluating higher-order models involves examining the overall model fit and making judgements as to whether the model counterbalances the loss of fit from constraining additional paths with the increase in the degrees of freedom.

A higher-order model is a model that has one or more latent constructs whose indicators are themselves latent constructs. In higher-order models, correlations between first-order factors are constrained to be zero and relations among the first-order factors are explained in terms of higher-order factors. Thus, the higher-order structure in this study is the component of the model that connects the second-order latent variables (e.g., Purposes for achievement and academic self-concept) with the five first-order latent variables (mastery goal, performance goal, social goal, English self-concept, and mathematics self-concept). This hypothesised hierarchical model is proposed in Figure 13.1.
Higher-order models are usually more parsimonious than first-order models since the number of higher-order factor loadings is typically smaller than the number of correlations among first-order factors. Higher-order models are usually nested under first-order models, and chi square difference values (and fit indices congruent with
chi square) will favour the first-order model. When the fit of a higher-order model approaches that of the first-order model (or exceeds it) in terms of fit indices that adjust for lack of parsimony, then the higher-order model is arguably a better fit on the basis of greater parsimony. However, this argument may be invalidated if the theoretical integrity of both the first-order and higher-order structures is not critically evaluated.

### 13.3 Representing Students’ Goals and Academic Self-concept as Multidimensional and Hierarchical

#### 13.3.1 Goal Orientations

Three first-order factors comprise the achievement goals in this study: mastery goals, performance goals and social goals. As conceptualised in this study, these three goals are appetitive, or approach forms of motivation (Elliot & Church, 1997) since they relate to purposes for achievement. Although the purposes for achievement are different for these specific goals (mastery-oriented individuals engage to seek competence, performance-oriented individuals engage to demonstrate ability relative to others, and social-oriented individuals engage to collaborate with peers), there is a universal disposition among the three specific goals, however, such that they are posited to direct, select and energise behaviour (McClelland, Koestner, & Weinberger, 1989). Correlations among the three distinct goals presented in Chapter 11 (Table 11.3, for instance) also support the hypothesis that there may be a common quality underlying these constructs. For example, strong to moderate correlations are apparent between mastery goals and performance goals, between social goals and performance goals, and between mastery goals and social goals. Consequently, a higher-order factor labelled Purposes for achievement is posited to represent the higher-order structure of the three distinct yet related goals.

#### 13.3.2 Domain-specific Self-concepts

Historically, researchers conceptualised self-concept as unidimensional and hence, instruments designed on this model provided limited insight into self-concept. Not until relatively recently have researchers developed instruments designed to measure the specific facets of academic self-concept. Marsh devised the ASDQ instrument...
based on Shavelson’s model and firmly believes “theory and instrument construction are inexorably intertwined, and that each will suffer if the two are separated” (Marsh, 1990d, p.19). Inadequacies from previous self-concept research methodology and theory can be addressed with a more reliable instrument that accounts for the multidimensional and hierarchical structure of self-concept and provides the opportunity to test hypotheses using a sound theoretical model as the basis.

Typically the hierarchy of academic self-concept has been weak, especially for high school students’ self-concept in specific school subjects (El-Hassan, 2004; Marsh & Yeung, 1998a). It appears that the school subjects studied by high school students are so distinct that attempting to capture the various self-concepts in each of these areas has proven problematic. That is, a higher-order factor of academic self-concept has proved more complicated than anticipated. One of the few studies that found convincing evidence for a hierarchy in high school students’ academic self-concept was that of Yeung et al. (2000). They reported moderate correlations (.26) between mathematics and English self-concept which demonstrates that students’ self-concepts in these two domains are related, even though the subjects themselves are distinct.

It is speculated that since both English and mathematics subjects are prioritised highly (a) in Australian high schools, (b) as prerequisites to apply for university entrance, and (c) valued in the workforce, that this commercial focus may explain why, what would appear to be two distinct subjects, may actually be related. Furthermore, similarities between the subjects also extend to the significant number of lessons scheduled in a week relative to other school subjects, and both these subjects are usually programmed to be taught at the beginning of the day. Based on these speculations, previous research, and correlations between mathematics and English self-concepts reported in earlier chapters, it is hypothesised that a higher-order factor of Academic self-concept represents two distinct yet related self-concepts: mathematics self-concept and English self-concept.
13.4 Overview of Analyses for the Second-order CFA Model

Nine second-order models were tested to determine the multi-dimensional and hierarchical structure of goals and self-concepts, and to assess the stability of the solutions over the three waves of data collection. The multiple goals construct was related to the higher-order factor Purposes for achievement, while English and mathematics self-concept were related to the higher-order factor Academic self-concept. (The LISREL syntax generated to test the T1 higher-order model is included in Appendix H and the syntax generated to test whether this model remained invariant across sex is included in Appendix I). The models tested were:

- **Model 10aT1 (M10aT1):** the hypothesised second-order model with 23-items for the focus sample at Time 1.
- **Model 10bT1 (M10bbT1):** the second-order null model with 23-items for the focus sample at Time 1.
- **Model 10cT1 (M10cT1):** test of invariance across sex for the hypothesised second-order model with 23-items for the focus sample at Time 1.
- **Model 10aT2 (M10aT2):** the second-order hypothesised model at Time 2 for the focus sample.
- **Model 10bT2 (M10bT2):** the second-order null model at Time 2 for the focus sample.
- **Model 10cT2 (M10cT2):** test of invariance across sex for the hypothesised second-order model at Time 2 for the focus sample.
- **Model 10aT3 (M10aT3):** the second-order hypothesised model at Time 3 for the focus sample.
- **Model 10bT3 (M10bT3):** the second-order null model at Time 3 for the focus sample.
- **Model 10cT3 (M10cT3):** test of invariance across sex for the hypothesised second-order model at Time 3 for the focus sample.
The a priori model hypothesises that the three first-order academic and social goals could be represented by one second-order factor referred to as Purposes for achievement and that the two first-order English and mathematics self-concepts could be represented by one second-order factor referred to as Academic self-concept. This hypothesis is represented diagrammatically in the above Figure, Figure 13.1.

13.5 Results

Table 13.1 shows the hypothesised second-order model results at Time 1, Time 2, and Time 3, all of which represent a good fit to the data. That is, students’ multiple mastery, performance and social goals can be represented by a higher-order factor Purposes for achievement, and students’ English and mathematics self-concepts can be represented by a higher-order factor Academic self-concept. All indices for the models reached acceptable criterion values.
Table 13.1

Model Fit Statistics for the Higher-order Models Across All Time Waves

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\chi^2$/df</th>
<th>TLI</th>
<th>CFI</th>
<th>RMSEA</th>
<th>Model Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M10aT1</td>
<td>567.33</td>
<td>224</td>
<td>2.5</td>
<td>.95</td>
<td>.96</td>
<td>.05</td>
<td>Hypothesised second-order model T1</td>
</tr>
<tr>
<td>M10bT1</td>
<td>8093.45</td>
<td>253</td>
<td>32.0</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>Null second-order model T1</td>
</tr>
<tr>
<td>M10cT1</td>
<td>863.36</td>
<td>495</td>
<td>1.7</td>
<td>.95</td>
<td>.95</td>
<td>.05</td>
<td>Invariance across sex T1</td>
</tr>
<tr>
<td>M10aT2</td>
<td>471.38</td>
<td>224</td>
<td>2.1</td>
<td>.96</td>
<td>.96</td>
<td>.05</td>
<td>Hypothesised second-order model T2</td>
</tr>
<tr>
<td>M10bT2</td>
<td>7065.55</td>
<td>253</td>
<td>27.9</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>Null second-order model T2</td>
</tr>
<tr>
<td>M10cT2</td>
<td>954.38</td>
<td>495</td>
<td>1.9</td>
<td>.94</td>
<td>.95</td>
<td>.05</td>
<td>Invariance across sex T2</td>
</tr>
<tr>
<td>M10aT3</td>
<td>60.37</td>
<td>224</td>
<td>2.7</td>
<td>.96</td>
<td>.96</td>
<td>.06</td>
<td>Hypothesised second-order model T3</td>
</tr>
<tr>
<td>M10bT3</td>
<td>9401.08</td>
<td>253</td>
<td>37.2</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>Null second-order model T3</td>
</tr>
<tr>
<td>M10cT3</td>
<td>872.91</td>
<td>495</td>
<td>1.8</td>
<td>.95</td>
<td>.95</td>
<td>.05</td>
<td>Invariance across sex T3</td>
</tr>
</tbody>
</table>

In addition to examining the overall model fit, it is also important to assess the structural regression coefficients and correlations among factors in the higher-order model. Structural regression coefficients and correlations for the hypothesised second-order model at T1, T2 and T3 are presented in Table 13.2. Significant and substantial structural regression coefficient paths are evident for mastery, performance and social goals to the higher-order factor (Purposes for achievement). Results for the structural regression coefficients demonstrate that the higher-order factor Purposes for achievement is most influenced by performance goals (T1 = .69; T2 = .83; T3 = .84) then mastery goals (T1 = .68; T2 = .54; T3 = .49), and least influenced by social goals (T1 = .39; T2 = .43; T3 = .29).
Structural regression coefficient paths from the Completely Standardised Solution in LISREL were similar for English self-concept and mathematics self-concept at Time 1, Time 2 and Time 3 to the higher-order factor (Academic self-concept), but these coefficients tend to be smaller in comparison to each of the structural regression coefficients for goals. This indicates that the hierarchy for academic self-concept is weaker than the proposed hierarchy for students’ goals. Overall it appears that the first-order factors load substantially on their respective second-order factors. These results, the overall model fit, as well as the relatively small increase of the chi square and degrees of freedom ratio all indicate that the second-order model provides a good approximation of the data. The results demonstrate that the higher-order model remains stable across all three waves.
Table 13.2

Structural Regression Coefficients and Correlations Based on a Two Factor Higher-order CFA

<table>
<thead>
<tr>
<th>Goals T1</th>
<th>Self T1</th>
<th>Goals T2</th>
<th>Self T2</th>
<th>Goals T3</th>
<th>Self T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastery T1</td>
<td>.68***</td>
<td>Performance T1</td>
<td>.69***</td>
<td>Social T1</td>
<td>.39***</td>
</tr>
<tr>
<td>English self-concept T1</td>
<td>.49***</td>
<td>Mathematics self-concept T1</td>
<td>.38***</td>
<td>Mastery T2</td>
<td>.54***</td>
</tr>
<tr>
<td>Performance T2</td>
<td>.83***</td>
<td>Social T2</td>
<td>.43***</td>
<td>English self-concept T2</td>
<td>.30***</td>
</tr>
<tr>
<td>Mathematics self-concept T2</td>
<td>.56***</td>
<td>Mastery T3</td>
<td>.49***</td>
<td>Performance T3</td>
<td>.94***</td>
</tr>
<tr>
<td>Social T3</td>
<td>.29***</td>
<td>English self-concept T3</td>
<td>.31***</td>
<td>Mathematics self-concept T3</td>
<td>.66***</td>
</tr>
</tbody>
</table>

Correlations

<table>
<thead>
<tr>
<th>Goals T1</th>
<th>Self T1</th>
<th>Goals T2</th>
<th>Self T2</th>
<th>Goals T3</th>
<th>Self T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goals T1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Self T1</td>
<td>.80***</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Goals T2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Self T2</td>
<td>.49***</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Goals T3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Self T3</td>
<td>.41***</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Coefficients > .* are significant at $p < .05$* $p < .01$** $p < .001$***

The chi square difference tests between the second-order model and the corresponding first-order model are presented in Table 13.3. Specifically, the chi square test was conducted between the second-order model and the refined first-order model at all three time points (e.g., Time 1 second-order M10aT1 versus Time 1 first-order M2aT1). Results from all three chi square difference tests revealed significant differences between the two models. As predicted, the chi square difference values favoured the first-order model. However, the fit indices for higher-order were in some cases identical to or at least comparable with the first-order. In the case that higher-order models approached that of the first-order model, then the
higher-order model is usually considered a better fit on the basis of greater parsimony. In sum, the first-order model provides a better representation of the data and there is only weak support for the higher-order model.

Table 13.3

*Chi Square Difference Tests*

<table>
<thead>
<tr>
<th>Difference test between second-order model and first-order model</th>
<th>Models</th>
<th>Chi square difference</th>
<th>Degrees of freedom</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M10at1</td>
<td>29.3</td>
<td>4***</td>
</tr>
<tr>
<td></td>
<td>M2at1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M10at2</td>
<td>131.5</td>
<td>4***</td>
</tr>
<tr>
<td></td>
<td>M2at2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M10at3</td>
<td>14.7</td>
<td>4**</td>
</tr>
<tr>
<td></td>
<td>M2at3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Difference test between invariant and unconstrained model</th>
<th>Models</th>
<th>Chi square difference</th>
<th>Degrees of freedom</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M10Ct1</td>
<td>296.03</td>
<td>271</td>
</tr>
<tr>
<td></td>
<td>M10At1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M10Ct2</td>
<td>438</td>
<td>271</td>
</tr>
<tr>
<td></td>
<td>M10At2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M10Ct3</td>
<td>272.54</td>
<td>271</td>
</tr>
<tr>
<td></td>
<td>M10At3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**13.6 Invariance Across Sex**

A substantive issue for this study is the extent to which the structure of students’ goals and academic self-concept is the same for males and females. Having established that the second-order model provides an equivalent fit to the data, it was important to assess whether this model would remain invariant across sex. A true test of invariance was conducted. To test this, the structural regression coefficients, factor loadings, and uniquenesses were simultaneously constrained to be equal across sex groups. To determine whether the second-order model was invariant across sex the overall fit statistics were examined and then a chi square difference test between the invariant model and unconstrained model was conducted.
The TLI penalises model complexity, so the introduction of invariance constraints provides for a more parsimonious model and should result in an improved (larger) TLI. Parallel to the TLI, the chi square and degrees of freedom ratio also imposes a penalty for model complexity, so it is feasible for this index to improve (decrease in size) when invariance constraints are specified, but the significant issue in relation to improvement in the chi square/degrees of freedom ratio is whether the chi-square value increases relatively little in comparison with the increased degrees of freedom. Consequently, if the introduction of equality constraints results in an improved TLI and relative increases to the chi square/degrees of freedom ratio, then it can be concluded that there is strong support for the equality constraints. However, constrained models usually fit the data worse than unconstrained models so it is important to determine how much worse the constrained invariant model fits, relative to the hypothesised model.

In this study there was a relative improvement at all three time waves for the chi square/degrees of freedom ratio and there was a modest reduction of the TLI at T2 and T3. A comparison between the invariant model at all three time points with the corresponding unconstrained model (M10aT1, M10aT2 and M10aT3) using a chi square difference test was then conducted. Results for these chi square tests are reported in Table 13.3. The chi-square difference statistic demonstrates that the invariant model at all three time points is not significantly different from the unconstrained model, which attests to the model being invariant across sex.

13.7 Discussion

13.7.1 Hierarchical structure of goals

Literature reviewed in Chapter 2 demonstrates that mastery goals, performance goals and social goals are adaptive and positively oriented goals because they all express purposes for achievement rather than addressing why individuals choose not to achieve. Examining how these three approach goals relate with each other in a hierarchical structure contributes to a deeper and fuller understanding of the various purposes for achievement and this can help inform theory. Gorsuch (1983) believes that analysing data across different levels provides different perspectives on the constructs under investigation. An exclusive focus on goals at the base (first-order)
jeopardises the investigation of possible interaction for the full scope (i.e., first- and second-order) (McInerney et al., 2003). For this reason, studies that limit their examination of individual goals and their effect on achievement may provide fragmented and superficial assumptions.

Although purposes for achievement vary for each of these specific goals—for instance, mastery oriented individuals achieve to seek competence, performance oriented individuals achieve to demonstrate ability relative to others, and social oriented individuals achieve to collaborate with peers—there is a universal disposition among the three specific approach goals such that they are posited to direct, select and energise behaviour (McClelland et al., 1989). Correlations between the three distinct goals presented in Chapter 11 (see for example Table 11.3) support the hypothesis that there is a common quality underlying these constructs. Besides demonstrating a common quality underlying the constructs, these correlations also indicate that individuals pursue multiple goals. Lemos and Goncalves (2004) believe that a higher-order factor structure may help explain how students coordinate multiple goals. Consequently, a higher-order factor labelled Purposes for achievement is posited to represent the three distinct yet related goals.

Examining the hierarchy of approach goals provides the opportunity to validate the theoretical structure of Goal Theory and in particular, approach forms of goals. As a result of testing the hierarchy of approach goals, this study contributes to the theory by providing a lucid and differentiated definition of three approach goals. Furthermore, this study contributes to Goal Theory by demonstrating that all three goals represent Purposes for achievement. The higher-order factor “Purposes for achievement” reflects purposefulness with respect to achievement such that the first-order factors identify the three distinct but related purposes.

This study conceptualised students’ Purposes for achievement as a singular latent construct, within a hierarchical factorial structure that consists of three first-order factors—mastery goals, performance goals and social goals. Support for the hierarchy of goals is evident from the model fit, given that all models (10aT1, 10aT2, and 10aT3) reached criterion values. Among the three goals, strong correlations to their higher-order factor provide further evidence of the strong hierarchy.
Importantly, the hierarchy remained invariant across sex, demonstrating that the model provides an equally good fit for males and females. Demonstrating the equivalence of males and females is a particularly important finding, since it adds weight to future studies that explore mean sex differences.

A number of practical implications arise as a result of these findings and warrant further investigation. For instance, the hierarchy of approach goals demonstrates that all three goals relate positively with each other. It provides further evidence for social goals to be included alongside academic goals when examining the various purposes for achievement. This study would encourage future research to investigate the effects of social goals on academic goals, since they have been shown to be an important goal pursuit for adolescent students.

### 13.7.2 Hierarchical Structure of self-concept

In addition to proposing a hierarchical structure of approach goals, this study also conceptualised students’ academic self-concept as a singular latent construct, within a hierarchical factorial structure that comprised two first-order factors—English self-concept and mathematics self-concept. This structure was supported for both males and females through a test of sex invariance. Results attest that the ASDQII reliably and validly measures students’ specific facets of academic self-concept, and these can be represented hierarchically. These results are consistent with the design of the ASDQII instrument, which was based on the Shavelson et al. (1976) model.

Typically the hierarchy of self-concept has been shown to be weak. Weakness of this hierarchy can be indexed by the size of the correlations between the first-order factors. Previous research has found near zero and negative correlations between domain-specific self-concepts, particularly for adolescents. This is partially a result of subjects studied in high schools being so varied and distinct, that encapsulating different self-concepts across the different domains is intricate and more complex than anticipated. To account for relatively uncorrelated results between domain-specific self-concepts Marsh proposed the Internal/External frame of reference model (Marsh, 1986a; 1990a). According to the I/E model, academic mathematics and English self-concepts are formed as a result of two comparison processes or frames
of reference (Hau et al., 2000). These external and internal frames of reference are
detailed in the review of the literature in Chapter 2.

In contrast with research reporting relatively uncorrelated results between
mathematics and English self-concepts this study found, along with El-Hassan
(2004), support for a hierarchical structure for adolescence which posits academic
self-concept to be represented by English and mathematics self-concepts. Correlations between mathematics and English self-concepts were found to be
moderate and positively correlated across all three time waves. These findings are
consistent with Yeung et al. (2000), who also demonstrated moderate correlations
between mathematics and English self-concept. These results indicate that students
with a positive English self-concept are likely to hold a positive mathematics self-
concept and conversely, students who hold a positive mathematics self-concept are
likely to hold a positive English self-concept. Skaalvik and Rankin (1992) attest that
positive correlations between mathematics and English self-concept are evidence that
not all students make internal comparisons where they perceive themselves to be
more competent at one subject at the expense of another, but in fact students could
rate their mathematics and English ability as equally good or bad.

Self-concept can be both multidimensional and hierarchical, and these two features
are not necessarily mutually exclusive (Lau et al., 1999). One of the theoretical
contributions of this study is evidence of a self-concept hierarchy, whereby a higher-
order construct is capable of explaining the covariance of its subordinate first-order
self-concept measures (in this case, English self-concept and mathematics self-
concept). The strength of this hierarchy can be indexed by the size of the
correlations between the first-order factors. The modest and highly significant
correlations between English and mathematics self-concepts at the first-order showed
that although the self-concept domains were distinct enough to be perceived as
multidimensional, their relationship was close enough to form a higher-order
construct that represented the two domains.
A number of practical implications are raised as a result of these findings and warrant further investigation. For instance, a multidimensional structure of self-concept assumes that self-concept enhancement and intervention should be more effective if it targets specific domains. However, evidence of an academic self-concept hierarchy in this study, which encapsulates both Mathematics and English self-concept, suggests that enrichment and development of self-concept could also be effective if it is targeted at a more general level (academic self-concept). In terms of classroom practices, these findings support self-concept enhancement programs that encourage increased self-perceptions through more general approaches. Some examples of approaches that teachers could adopt for the purpose of increasing students’ academic self-concept include reducing social comparisons and competitive learning environments, encouraging self-regulation and positive self-talk, encouraging students to reflect on feedback as corrective rather than criticism, and providing learning experiences in which students are likely to achieve their goals (Snowman & Biehler, 2006; Zimmerman, 1998, 2004).

Confirmatory factor analyses of the first-order factors supported the possibility of a hierarchical structure. Correlations between the two second-order factors (Purposes for achievement and Academic Self-concept) related strongly at Time 1 \((r = .80)\) and moderate to weakly at Time 2 \((r = .49)\), and Time 3 \((r = .41)\). This pattern of results shows that adolescent students’ approach goals and academic self-concept are related and that this relationship is positively oriented. These findings substantiate the theoretical argument in the review of the literature (Chapter 5) that approach goals and domain-specific self-concepts are related in achievement situations. It appears that increases in academic self-concept contribute to increases in approach goals and increases in approach goals contribute to increases in academic self-concept. Although these correlations are informative and heuristic, they do not show how these two constructs are causally related. The following chapter extends on reporting correlations between the two constructs and investigates how goals and domain-specific self-concepts are causally related over time.
13.8 Summary of Chapter

A number of key findings have been disclosed and discussed in this Chapter 13.

- support for an a priori hierarchical CFA model positing one HO factor (academic self-concept) that is consistent with the design of the ASDQII instrument and the Shavelson et al. (1976) model, on which this instrument was based;
- support for an a priori hierarchical CFA model positing one HO factor (Purposes for achievement) that is hypothesised to relate to the underlying premise of the items in the GAGOS instrument, which includes social goals to the academic goals framework;
- evidence that the a priori HO model remains stable across three waves of data;
- some indication that the higher-order model represented the data better than the corresponding first-order model;
- clear evidence that the HO model remains invariant across sex for all three waves; and
- confirmation that approach goals and academic self-concept are related, that this relationship is positive and remained stable across three years.
Analyses from Chapters 9, 10, and 11 provided opportunities to evaluate measurement issues for the confirmatory factor analysis models and make necessary modifications before pursuing the full-forward SEM model (like that in Figure 7.3 in Chapter 7). Earlier chapters also focused on how goals, self-concept, and academic achievement were related. Specifically, correlations reported in Table 11.3 (Chapter 11) between goals and domain-specific self-concept, tended to be positive. Although correlations are informative and heuristic, they do not reveal the underlying mechanisms that cause the positive correlations. This chapter pursues the more complicated and central aim of the study concerning the causal ordering of goals and academic self-concept and their combined effect on academic achievement. Since correlations reported in the earlier CFA chapters were based on single waves of data, they provide no clear basis for concluding that either goals influence subsequent academic self-concept or that academic self-concept influences subsequent goal adoption or that perhaps the two constructs are mutually reinforcing. This chapter intends to disentangle the causal ordering of these constructs utilising structural equation modelling and applying Marsh et al.’s (1999) recommended guidelines for analysing longitudinal causal ordering.

In Chapter 14, the central aim is to proceed with a full-forward model and then test alternative models to evaluate various aspects of the solution and find the model that affords the best explanation of the data. The full-forward model will be used as a starting point for analysing causal relations and to assess the reciprocal effects model. The full-forward model will also be utilised as a point of comparison for the two subsequent competing models: (a) goal orientations cause academic self-concepts, which in turn affect subsequent academic achievement and; (b) academic
self-concepts cause goal orientations, which in turn affect subsequent academic achievement.

14.1 Method

14.1.1 Sample
A total of 9 high schools were initially involved in this study. However, over the three years of data collection four schools were unable to provide complete data across the time span of this study; consequently, five schools (School 1, School 2, School 3, School 4, and School 6) were utilised for the Longitudinal Structural Equation Modelling (LSEM) analyses. This focus sample was used in earlier chapters to test the CFAs at T1, T2, and T3 and for the more complicated CFAs (5V3W and 7V3W CFAs). Table 14.1 presents composition details of the focus sample.

Table 14.1
Sample Composition

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>195 (36%)</td>
<td>179 (34%)</td>
<td>161 (30%)</td>
</tr>
<tr>
<td>T2</td>
<td>179 (34%)</td>
<td>195 (36%)</td>
<td>179 (34%)</td>
</tr>
<tr>
<td>T3</td>
<td>161 (30%)</td>
<td>161 (30%)</td>
<td>179 (34%)</td>
</tr>
</tbody>
</table>

Focus Sample

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 7</td>
<td>195 (36%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 8</td>
<td>179 (34%)</td>
<td>195 (36%)</td>
<td></td>
</tr>
<tr>
<td>Year 9</td>
<td>161 (30%)</td>
<td>179 (34%)</td>
<td>195 (36%)</td>
</tr>
<tr>
<td>Year 10</td>
<td>161 (30%)</td>
<td>161 (30%)</td>
<td>179 (34%)</td>
</tr>
<tr>
<td>Year 11</td>
<td></td>
<td></td>
<td>161 (30%)</td>
</tr>
<tr>
<td>Number</td>
<td>535</td>
<td>535</td>
<td>535</td>
</tr>
<tr>
<td>Ratio male/female</td>
<td>59/41</td>
<td>59/41</td>
<td>59/41</td>
</tr>
<tr>
<td>Age–mean</td>
<td>13.0</td>
<td>14.3</td>
<td>15.1</td>
</tr>
<tr>
<td>Age–std dev</td>
<td>1.0</td>
<td>1.0</td>
<td>0.9</td>
</tr>
</tbody>
</table>
Achievement data provided included school ranks for English and school ranks for mathematics. Students were assigned ranks based on performance in class tests and exams. Ranks ranged from 1 through 5, with 5 representing top performers and 1 representing the poorest performers. Too few schools provided achievement scores in English and mathematics to permit analyses using multiple measures of academic achievement.

14.1.2 Procedures

Marsh et al. (1999) recommend ten guidelines for examining causal relations between self-concept and academic achievement. These ten guidelines and affiliated phases for examining self-concept and academic achievement were discussed in the review of the literature. Although this study includes academic and social goals in its examination of relations between self-concept and academic achievement, the fourth guideline detailing procedures for analyses of longitudinal causal ordering remains applicable. In particular, their fourth guideline recommends four distinct phases by which to proceed when conducting longitudinal causal ordering analyses.

A part of Chapter 7’s brief orientation and overview of analyses for this study was a synopsis of this fourth guideline, the four distinct phases and links to affiliated Chapters. For instance, Chapters 9 and 10 correspond with Phase 1 of this guideline, with analyses of straightforward CFAs. Chapter 11 corresponds with Phase 2, with analyses of more complicated CFAs. This Chapter continues with the remaining two phases, Phases 3 and 4. Each of Marsh et al.’s (1999) four phases affiliated with Guideline 4 are briefly recalled below, with particular attention to the last two phases as they directly apply to analyses to be conducted in this chapter.

Initially, straightforward CFA models should be conducted to address measurement issues (refer to Chapters 9 and 10). Secondly, more complicated CFAs should be pursued that comprise all variables across all waves, so as to examine simultaneous interactions among the variables and to again, address any measurement issues before moving on to structural models (refer to Chapter 11). This is because potential problems and their solutions are typically more easily resolved for CFA models than SEM models (Marsh et al., 1999). The third phase involves a full-forward SEM where all paths in the model are estimated. Consistent with Marsh et al.’s (1999)
guidelines, this chapter commences with a full-forward SEM in which correlations among factors within the same wave, as well as paths from all constructs in each wave to all constructs in subsequent waves are freely estimated. The final phase entails testing alternative causal models by constraining certain paths in the full-forward model. Alternative models are nested within the full-forward model, because paths in the nested model are constrained such that they are a subset of the model with additional parameters (full-forward model). Consequently, nested models can be used as a point of comparison with the purpose of determining, using available evidence, which model explains the data best. Nested models usually fit the data more poorly than additional parameter models (i.e., full-forward model) because they place supplementary (error laden) restrictions on the data.

This chapter presents analyses in two sections which correspond to the last two phases of Marsh et al.’s (1999) fourth guideline. The first section of analyses corresponds with Phase 3 and involves examining the full-forward model. The second section corresponds with Phase 4 and involves examining two competing models that are nested under the full-forward model. An overview of these sections is reviewed below.

14.2 Overview of Analyses

Data were analysed using LISREL 8.54 (Jöreskog & Sörbom, 1989a; 2003). Models were estimated using Maximum Likelihood estimation (MLE). The benefits associated with MLE are described in Chapter 7. In order to test the potential causal ordering of goals and self-concept with respect to achievement, the final two phases of Marsh et al.’s (1999) guidelines were applied. Specifically, Phase 3 entails testing a full-forward model. The full-forward model proposes that goal orientations (mastery, performance and social goals) and self-concepts (English and mathematics self-concept) are reciprocally related to affect academic achievement (English and mathematics achievement). Phase 4 entails testing two nested models under the full-forward model. The nested models propose two causal orderings. The first causal ordering hypothesises that goals at Time 1 affect self-concepts at Time 2, which influence academic achievement at Time 3. The second causal ordering hypothesises self-concepts at Time 1 (T1), affect goals at Time 2 (T2), which influence academic achievement at Time 3.
achievement at Time 3 (T3). These competing models were examined across English and mathematics domains. (The LISREL syntax generated to test the full-forward model is included in Appendix I and the syntax generated for the two competing models is included in Appendix J).

In sum, Phase 3 tests the full-forward model while Phase 4 tests the two nested models:

**Phase 3**
- Model 11 (M11): the full-forward model with all parameters estimated.

**Phase 4**
- Model 12 (M12): the constrained full-forward model with paths from goals T1, self-concept T2 and ranks T3
- Model 13 (M13): the constrained full-forward model with paths from self-concept T1, goals T2 and ranks T3

### 14.2.1 Analyses for phase 3: Full-forward model

Phase 3 is designed to test hypotheses bearing on the issue of causal predominance between goal orientations (mastery, performance, and social goals), and domain-specific self-concepts (English and mathematics), and their combined effect on domain-specific academic achievement (English and mathematics ranks). It is a longitudinal model involving the measurement of these constructs at three points in time (November, 2002, November 2003, and November 2004), with each data collection point taking place one academic year apart. The central relationships in the hypothesised model are presented in Figure 14.1.
Specifically the full-forward model specifies correlations among observed variables within parallel waves, in addition to all paths from all latent variables (e.g., mastery goals, English self-concept) in each wave to all latent variables in subsequent waves. The central aim is to investigate the causal ordering of goals and domain-specific self-concept and their combined effect on academic achievement. It was necessary to control for prior levels of achievement and effects of prior levels of achievement on all variables, therefore all paths from English and mathematics achievement were specified to be freely estimated. A schematic portrayal of the hypothesised full-forward model is shown in Figure 14.2.

Figure 14.1 Basic structure of the hypothesised full-forward model showing reciprocal effects. MAS = Mastery goal, PER = Performance goal, SOC = Social goal, ESC = English self-concept, MSC = Mathematics self-concept, EACH = English achievement, MACH = Mathematics achievement, T1 = Time 1, T2 = Time 2, T3 = Time 3.
Figure 14.2 shows that each latent construct is measured by the same number of observed variables at each of the three time points. Consistent with Marsh and Byrne’s first guideline, each latent construct is inferred by at least four items, except for the two latent constructs for academic achievement (English achievement and mathematics achievement) which are inferred by one each. Furthermore, to avoid method-halo effects, multiple observed variables which were collected on multiple occasions are specified in the model to be correlated. To facilitate reading of Figure 14.2 these paths are not schematically represented, but were included in the model’s specifications. Specifying method-halo effects demonstrates application of Marsh and Byrne’s guideline number two.

The three columns in Figure 14.2 represent the three waves of data collected. Instead of the recommended two data collection points, this study includes three, with the desirable data span of one academic year between each collection point. Therefore this study exceeds the requirements of Marsh and Byrne’s third guideline which recommends at least two collection points. The seven rows in Figure 13 represent the number of latent constructs. Marsh and Byrne’s sixth guideline for examining relations between self-concept and academic achievement recommends extending existing research by including more than one academic domain. This study comprises both English and mathematics self-concept and English and mathematics achievement.

Following analyses of the full-forward model are analyses of two competing causal ordering models. These competing models fulfil Marsh and Byrne’s fourth phase of guideline four. Model restrictions for these two competing models are described in the following section.
Figure 14.2  Schematic portrayal of the full-forward model. Note. MAS = Mastery goal, PER = Performance goal, SOC = Social goal, ESC = English self-concept, MSC = Mathematics self-concept, EACH = English achievement, MACH = Mathematics achievement, T1 = Time 1, T2 = Time 2, T3 = Time 3.
14.2.2 Analyses for phase 4: Competing models

After testing the full-forward model, two competing causal orderings are analysed. To obtain these competing models, specific paths or parameters from the full-forward model are constrained to be equal to 0. Since parameters in the full-forward model are being constrained to obtain the competing models, these competing models are said to be nested models, because they are a subset of the model with additional parameters (full-forward model).

Nested models have a greater number of degrees of freedom compared with the model with additional parameters. Furthermore, nested models impose additional restrictions on model parameters, which results in higher chi square values than the model with additional parameters. Differences between chi squares of a nested model and full-forward model, compared to differences in degrees of freedom, can be used as a test of significance. The chi square difference test demonstrates whether restrictions imposed on one or more parameters resulted in a significant decrement in model fit (Raykov & Marcoulides, 2000). This chi square difference test will be conducted between the full-forward model and the two competing models.

The first competing longitudinal causal model to be tested in Phase 4 hypothesises that mastery, performance and social goals affect English and mathematics self-concepts, which in turn influence subsequent academic achievement in mathematics and English. The central relationships in this hypothesised longitudinal causal model are presented in Figure 14.3.
Constraints are placed on the self-concept latent constructs as this model examines causal predominance of goals and their subsequent effect on English and mathematics self-concept. Specifically, paths from English and mathematics self-concept at Time 1 (T1) to mastery, performance and social goals at Time 2 (T2) are constrained (see Figure 14.4). Likewise paths from English and mathematics self-concept T2 to mastery, performance and social goals T3 are constrained (see Figure 14.4). A total of 12 paths in the beta matrix are constrained to be equal to 0. Freely estimated in this model are paths for mastery, performance, and social goals, as well as English and mathematics achievement at all three time waves. The achievement latent constructs in this model are freely estimated with the purpose of controlling for prior levels of achievement and the effects of this on all variables in the model. Specifically, paths for these five latent constructs for each time wave, to all latent variables in subsequent waves are freely estimated. A modified schematic portrayal of the hypothesised competing model is shown in Figure 14.4.
Modifications to the schematic portrayal attempt to facilitate interpretation of the model. This model has been modified as it only depicts paths for: (a) one goal orientation construct, (b) one self-concept construct, and (c) one academic achievement construct. This is because the patterns of paths are replicated for each of these three constructs with their counterpart constructs. Moreover, identical patterns of paths represented by mastery goals in Figure 14.4 apply to performance goals and social goals; however, these paths have not been visually represented in the model. Patterns of paths represented by English self-concept apply to mathematics self-concept and patterns of paths represented by English achievement apply to mathematics achievement. Modifications to the schematic portrayal allow for method-halo effects to be visually represented. Unlike Figure 14.2, this schematic representation depicts correlations between observed variables collected on multiple occasions to address method-halo effects.
Figure 14.4 Nested model with goal orientations causally predominant. Note. MAS = Mastery goal, PER = Performance goal, SOC = Social goal, ESC = English self-concept, MSC = Mathematics self-concept, EACH = English achievement, MACH = Mathematics achievement, T1 = Time 1, T2 = Time 2, T3 = Time 3.
The second competing longitudinal causal model to be tested in Phase 4 hypothesises that English and mathematics self-concepts affect mastery, performance and social goals, which in turn influence subsequent academic achievement in mathematics and English. The central relationships in the hypothesised longitudinal causal model are presented in Figure 14.5.

Figure 14.5 Basic structure of the second hypothesised nested model with self-concept causally predominant. MAS = Mastery goal, PER = Performance goal, SOC = Social goal, ESC = English self-concept, MSC = Mathematics self-concept, EACH = English achievement, MACH = Mathematics achievement, T1 = Time 1, T2 = Time 2, T3 = Time 3.

Constraints are placed on the goal orientation latent constructs as this model examines causal predominance of self-concepts and their subsequent effect on mastery, performance and social goals. Specifically, paths from mastery, performance, and social goals at Time 1 to English and mathematics self-concept at T2 are constrained. Likewise, paths from mastery, performance, and social goals at T2 to English and mathematics self-concept at T3 are constrained. Identical to the first nested model, the achievement latent constructs in this model are freely estimated, with the purpose of controlling prior levels of achievement and the effects of this on all variables in the model.
Parallel to the first competing model, a total of 12 paths in the beta matrix were constrained to be equal to 0. This resulted in the equivalent number of degrees of freedom for each nested model, since both models will have applied an identical number of restrictions to parameter estimates. Freely estimated in this model are paths for English and mathematics self-concept, as well as English and mathematics achievement (see Figure 14.6). Specifically, paths for these four latent constructs at each wave to all latent variables in subsequent waves are freely estimated. A modified schematic portrayal of the hypothesised competing model is shown in Figure 14.6.

Modifications to the schematic portrayal attempt to facilitate interpretation of the model. This model has been modified as it only depicts paths for: (a) one goal orientation construct, (b) one self-concept construct, and (c) one academic achievement construct. This is because the patterns of paths are replicated for each of these three constructs with their counterpart constructs. Moreover, identical patterns of paths represented by mastery goals in Figure 14.6 apply to performance goals and social goals, although these paths have not been visually represented in the model. Patterns of paths represented by English self-concept apply to mathematics self-concept and patterns of paths represented by English achievement apply to mathematics achievement. Similarly to Figure 14.4, this schematic representation depicts correlations between observed variables collected on multiple occasions, to address method-halo effects.
Figure 14.6 Nested model with domain-specific self-concepts causally predominant.

Note. MAS = Mastery goal, PER = Performance goal, SOC = Social goal, ESC = English self-concept, MSC = Mathematics self-concept, EACH = English achievement, MACH = Mathematics achievement, T1 = Time 1, T2 = Time 2, T3 = Time 3.
14.3 Results

14.3.1 Full-forward Model

Phase 3 involved testing the full-forward model (Model 11). Model 11 (M11) assumes that the latent constructs are reciprocally related and therefore the model’s specifications comprised correlations among observed variables within parallel waves, in addition to all paths from all latent variables in each wave, to all latent variables in subsequent waves. This complex model converged to a proper solution. M11 was well defined in that factor loadings were substantial and the fit statistics were very good. Table 14.2 presents the overall goodness-of-fit indices. Table 14.3 presents the factor loadings, Table 14.4 presents factor correlations, and Table 14.5 presents the path coefficients and total effects. Figure 14.7 depicts only the significant path coefficients.

Table 14.2

Model Fit Statistics

<table>
<thead>
<tr>
<th>Model</th>
<th>( \chi^2 )</th>
<th>df</th>
<th>( \chi^2/df )</th>
<th>TLI</th>
<th>CFI</th>
<th>RMSEA</th>
<th>Model Description</th>
</tr>
</thead>
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<tr>
<td>M11</td>
<td>3573.48</td>
<td>2427</td>
<td>1.5</td>
<td>.97</td>
<td>.97</td>
<td>.03</td>
<td>Full-forward model</td>
</tr>
<tr>
<td>M12</td>
<td>3603.90</td>
<td>2445</td>
<td>1.5</td>
<td>.97</td>
<td>.97</td>
<td>.03</td>
<td>Goals T1, Self T2 and Ranks T3</td>
</tr>
<tr>
<td>M13</td>
<td>3601.82</td>
<td>2445</td>
<td>1.5</td>
<td>.97</td>
<td>.97</td>
<td>.03</td>
<td>Self T1, Goals T2 and Ranks T3</td>
</tr>
</tbody>
</table>
### Table 14.3

**Factor Loadings for the Full-Forward Model**

|       | M    | P    | S    | ES   | MS   | EA   | MA   | Time 2 | M    | P    | S    | ES   | MS   | EA   | MA   | Time 3 | M    | P    | S    | ES   | MS   | EA   | MA   |
|-------|------|------|------|------|------|------|------|--------|------|------|------|------|------|------|------|--------|------|------|------|------|------|------|------|--------|------|------|------|------|------|------|------|
| FL    |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
| MAS   | 27   | 52***|      |      |      |      |      |        | 53***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
|      | 32   | 49***|      |      |      |      |      |        | 53***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
|      | 42   | 53***|      |      |      |      |      |        | 58***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
|      | 50   | 46***|      |      |      |      |      |        | 48***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
| PER   | 72   | 72***|      |      |      |      |      |        | 70***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
|      | 78   | 62***|      |      |      |      |      |        | 71***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
|      | 90   | 74***|      |      |      |      |      |        | 64***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
|      | 95   | 81***|      |      |      |      |      |        | 73***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
|      | 98   | 61***|      |      |      |      |      |        | 64***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
| SOC   | 35   | 68***|      |      |      |      |      |        | 59***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
|      | 55   | 87***|      |      |      |      |      |        | 56***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
|      | 67   | 75***|      |      |      |      |      |        | 57***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
|      | 101  | 40***|      |      |      |      |      |        | 88***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
| ESC   | 1    | 76***|      |      |      |      |      |        | 83***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
|      | 2    | 74***|      |      |      |      |      |        | 76***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
|      | 3    | 60***|      |      |      |      |      |        | 69***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
|      | 4    | 71***|      |      |      |      |      |        | 79***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
|      | 5    | .72***|      |      |      |      |      |        | .73***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
| MSC   | 1    | 91***|      |      |      |      |      |        | 92***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
|      | 2    | 93***|      |      |      |      |      |        | 94***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
|      | 3    | 89***|      |      |      |      |      |        | 86***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
|      | 4    | 87***|      |      |      |      |      |        | 89***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
|      | 5    | 87***|      |      |      |      |      |        | 88***|      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
| EACH  |      | 1.00 |      |      |      |      |      |        | 1.00 |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |
| MACH  |      | 1.00 |      |      |      |      |      |        | 1.00 |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |        |      |      |      |      |      |      |      |

*Note.* Decimals omitted. Coefficients are significant at *p < .05. ** p < .01. *** p < .001. FL = Factor loading, MAS = Mastery goal items, PER = Performance goal items, SOC = Social goal items, ESC = English self-concept items, MSC = Mathematics self-concept items, EACH = English achievement, MACH = Mathematics achievement.
Table 14.4

*Factor Correlations for the Full-forward Model*

<table>
<thead>
<tr>
<th>FC</th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th>Time 2</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Time 3</th>
<th></th>
<th></th>
<th></th>
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Note. Decimals omitted. Coefficients are significant at *p < .05. ** p < .01. *** p < .001. FC = Factor correlations, MAS = Mastery goal items, PER = Performance goal items, SOC = Social goal items, ESC = English self-concept items, MSC = Mathematics self-concept items, EACH = English achievement, MACH = Mathematics achievement, EA = English achievement, MA = Mathematics achievement, T1 = Time 1, T2 = Time 2, T3 = Time 3.
Table 14.5: Path Coefficients and Total Effects for the Full-forward Model

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Note. Decimals omitted. Coefficients are significant at *p<.05. ** p<.01. *** p<.001. PC = Path Coefficients, MAS = Mastery goal items, PER = Performance goal items, SOC = Social goal items, ESC = English self-concept items, MSC = Mathematics self-concept items, EACH = English achievement, MACH = Mathematics achievement, T1 = Time 1, T2 = Time 2, T3 = Time 3.
Figure 14.7 Significant path coefficients for the full-forward model. Note. MAS = Mastery goal, PER = Performance goal, SOC = Social goal, ESC = English self-concept, MSC = Mathematics self-concept, EACH = English achievement, MACH = Mathematics achievement, T1 = Time 1, T2 = Time 2, T3 = Time 3.
Subsumed in the full-forward model were the two competing or nested models. Therefore, the full-forward model is particularly useful for examining relationships between the variables, since all possible paths are represented in M11. (Appendix L presents a complete table of direct, indirect, and total effects for M11). Path coefficients and total effects were particularly important (see Figure 14.12; Marsh, Prada, Craven, & Finger, 2004). In causal ordering models path coefficients are the direct effects which relate earlier variables with subsequent variables (e.g., T1 scores to T2 and T3 scores; see Figure 14.2). Total effects are the sum of direct and indirect (mediated) effects. Since there are no variables between T1 and T2 or between T2 and T3, in the causal ordering there are no mediated effects. Therefore total and direct effects are the same. However, for the effects of T1 variables on T3 variables, there are both direct and mediated effects (e.g., the direct effect of T1 variables on T3 variables and the effects of T1 variables mediated by T2 variables). Consequently, total effects and direct effects typically differ, since a proportion of the effects of T1 variables on T3 variables are likely to be mediated by T2 variables. Reporting of results will therefore focus primarily on total effects and path coefficients.

The largest effect for each T2 and T3 outcome was the parallel variable from the preceding wave. For instance, Table 14.5 showed the total effects for mastery goals at T1 to T2, T2 to T3, and T1 to T3 were highly significant and positive (.28, .36, and .28 respectively). However, the crucial effects in relation to the a priori reciprocal effects model which was hypothesised in Chapter 6 are the effects of goal orientations on domain-specific self-concepts and the effects from domain-specific self-concepts on subsequent goal orientations. Importantly the total effects of T1 goals on T2 English self-concept are positive, although not for social goals, and this effect was significant for mastery goals. T1 goals negatively affect T2 mathematics self-concept, although not for social goals, and this effect was significant for performance goals. A different pattern of effect from T1 goals to T2 English self-concept appeared for T2 goals and T3 English self-concept but these effects were close to 0. Instead of being positive, performance and social goals negatively affect T3 English self-concept. T2 goals positively affect T3 mathematics self-concept except for mastery goals, which negatively affect T3 mathematics self-concept.
The total effects of T1 English self-concept on T2 goals were mixed. There was a nonsignificant effect on both social and performance goals but a significant positive effect on mastery goals (.15). The total effect for T1 mastery goals on T2 English self-concept was significantly positive (.24). This pattern of results indicates that there is a pattern of reciprocal effects in which mastery goals and English self-concept are both positive causes and effects of each other (i.e., prior pursuit of mastery goals can cause changes to English self-concept and English self-concept can lead students to adopt mastery goals). This reciprocal effect, however, is only evident between T1 and T2. The same variables at T2 and T3 are nonsignificant and near 0. An unexpected result was the significant negative effects of both T1 English and mathematics achievement on T2 mastery goals (-.22, -.16). The inconsistent and nonsignificant effects between mathematics self-concept and goals indicate no clear cut causal ordering.

As expected, T1 mathematics achievement had a significant positive effect on T2 mathematics self-concept (.26) and this pattern of effect was repeated between T2 mathematics achievement and T3 mathematics self-concept (.15). This pattern of effect also emerged for T1 English achievement and T2 English self-concept; however, this effect was nonsignificant. The effect between T1 English self-concept and T3 English achievement was positive and significant but these variables at T2 and T3 were nonsignificant.

T1 performance goals significantly affect a number of T2 variables. In particular, performance goals have a significant negative effect on mathematics self-concept (-.20) and a substantially negative effect on English achievement (-.51). The effect on mathematics achievement however was significantly positive (.39). T2 performance goals have no significant effect on these variables at T3. However, the relationship changes such that performance goals no longer negatively affect mathematics self-concept. Additionally, the negative effect of T2 performance goals on English achievement (-.51) becomes positive at T3 (.11) while the opposite is the case for T2 performance goals and T3 mathematics achievement (T1 and T2 =.39, T2 and T3 = -.15).
Only two significant crosslagged effects emerged, for social goals. The first is between T1 mastery goals and T2 social goals (-.15). Results show a negative effect between these two variables. The second significant effect occurs between T1 social goals and T3 performance goals (-.14). In particular, T1 social goals have a significant negative effect on T3 performance goals. Other interesting effects emerge between T1 and T3 variables. T1 English achievement has a significant negative effect on T3 mathematics self-concept (-.22) but a significant positive effect on mathematics achievement T3 (.33).

The full-forward model provided a good representation of the data according to the goodness-of-fit indices but the inconsistent and large number of nonsignificant crosslagged effects provided only tentative judgements at best concerning the causal ordering of these variables. Examination of the total effects provided little evidence to support a reciprocal effects model. The full-forward model was useful for exploring how each of the variables related across three waves of data and will be used as a baseline comparison for the competing models of causation.

14.3.2 Competing Models Results

Since few significant effects between goals and domain-specific self-concepts were reported in the full-forward model, disentangling the causal predominance was challenging. Analysing results from the nested models in relation to the two a priori hypotheses presented in Chapter 6 will provide further insight into the possible causal orderings.

Phase 4 tested the two competing models which are nested under the full-forward model. Overall results of these two models and the full-forward model are presented in Table 14.2. In order to compare the full-forward model with the two competing nested models, it is necessary to conduct a chi square difference test. If the chi square difference test reveals a significant difference between the full-forward model and a nested model, then the conclusion drawn is that the full-forward model provides a significantly better fit to the data. It is common for the model with additional parameters (full-forward model) to fit the data better than nested models. This was the case for the full-forward model with the first nested Model (Model 12), which hypothesised the causal flow of goals T1, domain-specific self-concept T2,
and achievement T3. Table 14.6 presents the results of the chi square difference tests. Interestingly, the second nested Model (Model 13) with the causal ordering of domain-specific self-concept T1, goals T2, and achievement T3 provided a nonsignificant difference chi square test and therefore the full-forward model does not necessarily explain the data best. This nested model with domain-specific self-concept T1, goals T2, and achievement T3 was assessed for the relative strength of relationships to make judgements about causality.

Table 14.6

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Most of the patterns of relationships apparent in M11 were replicated in M13. This is because the full-forward model represents all possible paths and M13 is nested under the full-forward model. The patterns of effect for M13 are included in the Appendix since the pattern of effects was almost identical to M11’s. (Appendix M presents a table of the direct, indirect, and total effects for M13 model). Notably, the strength of relationships in M13 is comparable with M11. Given that: (a) the form of effects and strength of these effects are near equivalent between M11 and M13, (b) the chi square difference test reveals that M11 does not explain the data any better than M13, and (c) M13 is more parsimonious than M11, it is proposed that M13 provides the best explanation for the causal ordering of domain-specific self-concept, goals, and academic achievement. Model 13, which specifies domain-specific self-concept as causally predominant over goals and academic achievement, provides the best explanation of the data.
14.4 Discussion

This chapter applied Phases 3 and 4 from Marsh et al.’s (1999) fourth guideline. Pivotal to this study is the examination of the causal ordering of goal orientations, domain-specific self-concepts, and their effect on academic achievement. Examining causal ordering of these variables helps to elucidate the nature of student motivation. Results led to the judgement whereby self-concept is causally predominant over students’ goal orientations and academic achievement. Given that this model facilitates the interpretation of the results pertaining to the present investigation, a discussion of interpreting the results and the implications of this model is presented below.

Disentangling the causal relations between goals and self-concept in the full-forward model proved problematic because of the large number of nonsignificant effects, and because the pattern of these effects were inconsistent across data waves as well as between variables. Furthermore, relatively high levels of stability for each of these factors (discussed in Chapter 12 in relations to the 7V3W model) and the large number of paths to be estimated, resulted in changes in relations between the constructs being insubstantial. There were however, subsequent analyses of two competing nested models which provided further insight and the opportunity to explicate the causal ordering of goals and self-concept and their effect on academic achievement.

All paths in the full-forward model were freely estimated but to obtain the nested models a number of paths were fixed in the full-forward model. An identical number of restrictions were imposed on the two nested models. Distinguishing between M12 and M13 were the differential time waves and latent constructs for which these 12 paths were removed. These imposed restrictions resulted in equivalent increases to the degrees of freedom for M12 and M13. The restrictions also resulted in increases to the chi square values. However, the positioning of the restricted paths differentially affected increases in the chi squares, which influenced subsequent results of the chi square difference test between M11 and the nested models (M12 and M13).
Results from the chi square difference test revealed a significant difference between M11 and M12. This indicates that M12 provides a significantly worse representation of the data than M11, although interesting to note is that this difference was only marginally significant. More interesting was the fact that the same chi square difference test between M11 and M13 provided no significant difference. This indicates that M11 does not explain the data any better than M13 and that it may therefore be considered an equivalent representation of the data. This latter result was surprising, given that nested models typically fit data more poorly than additional parameter models because they place supplementary restrictions on the data. Furthermore, since M13 is more parsimonious than M11 and the model parameters were comparable with M11, it is proposed that M13 could be a better representation of the causal ordering of goal orientations, domain-specific self-concepts, and academic achievement. Thus it is plausible to suggest that domain-specific self-concepts may be causally predominant over goals and academic achievement.

Results emanating from this chapter suggest that how competent an individual perceives themself to be in a subject domain (English or mathematics) governs their purpose for achievement in subsequent academic situations and that these purposes or goals adopted by individuals affect subsequent academic achievement. Self-perceptions of ability that focus on “Can I do this?” lead to differential preferences for purposes for achievement such that individuals question themselves according to “what are the reasons for achieving in this achievement situation?” The reasons identified lead to goal adoption, which can influence academic achievement. Thus the purpose of engaging in academic related situations depends on an individual’s sense of self, and achievement results depend on goal adoption.

The substantive significance of the causal findings in this study is that both self-perceptions and perceptions of tasks are key variables in achievement-related situations. Both self-concept and goal orientations are fundamental psychological drivers of performance and achievement arising from associated tasks. If future research only considers goals or self-concept constructs when examining achievement-related behaviours and achievement itself, then either key perceptions concerning the task, or key perceptions concerning self will be absent from the
respective analyses, to the extent that if this is the case, then a holistic account of both fundamental constructs in achievement-related tasks will be missing.

Consistent with Skaalvik et al. (1994) who found perceptions of self predicted students’ goal orientations, this study demonstrated that domain-specific self-concepts affect subsequent goal pursuits. Consensus in contemporary motivation research is that poor self-perceptions have dire consequences for motivation such that these detrimental beliefs influence task engagement, effort expenditure, and persistence in the face of difficulty (Skaalvik, 1997a). This study provides further empirical evidence that self-perceptions of ability do indeed affect future purposes for achievement and contends that the relative salience of self-concept and goal orientations affects future academic achievement. In sum, self-perceptions of ability trigger the initiation of goals which affect subsequent achievement.

Results from this study showing self-concept as causally predominant provide significant evidence of the importance of self-perceptions in facilitating goal adoption. Academic self-concept has motivational properties such that changes to either English or mathematics self-concept lead to changes in subsequent goal adoption. It appears that domain-specific self-concepts and goal orientations fuel each other over time to affect subsequent achievement. A number of research studies report the effects of classroom structures on influencing goal pursuits (Ames, 1990). This study maintains that a classroom structure that fosters and builds positive senses of self will result in students adopting approach goals and that these goals will affect subsequent achievement. In sum, this study highlights the fundamental importance of self-perceptions in facilitating student goal adoption, and that this process influences academic achievement.

Consistent with Marsh and Craven’s (2006) prototype procedure for assessing causal ordering, this study found that paths of each T1 variable on the parallel T2 and T3 variable were substantially positive. Only 4 of 21 test-retest paths were nonsignificant (T1 to T2 mathematics achievement and performance goals, T1 to T3 English achievement and mathematics self-concept). Significant positive effects between both T1 English self-concept and T1 mathematics self-concept with T2 mastery goals is further evidence of self-concept causing goal orientations. The
nature of one’s academic self-concept is a crucial determinant of purposes for achieving in academic situations.

Of the studies examining perceptions of self and goal orientations, most have used correlational methods to explore relations. Notwithstanding the significance of this research, studies of this nature generally base their findings on a single wave of data. Hence the findings, although informative and heuristic, provide minimal insight into the underlying mechanisms that determine the positive or negative correlations. To address this void, this research tested structural equation models utilising longitudinal data to extrapolate the causal relations of self-perceptions and goal orientations. Despite the frequency with which these models have been used in previous research, particularly for examining the causal ordering of self-concept and achievement (e.g., Marsh & Craven, 2006; Marsh et al., 2005), the researcher is aware of no study that has employed this approach with goal orientations which include social goals and domain-specific self-concepts, in addition to academic achievement.

Although a sparse number of studies demonstrate that perceptions of self predict students’ goal orientations, fewer studies have been able to predict the direction of this relationship (Skaalvik et al., 1994). M13 provides a significant contribution to the extant literature examining student motivation. It offers a theoretical basis for explaining more fully the complex nature of students’ motivation and achievement. It challenges previous research that exclusively examines self-concept and achievement or exclusively examines goals and achievement by demonstrating that both self-concept and goals relate across time to influence subsequent academic achievement and therefore both constructs should be included in respective analyses of achievement. Furthermore, it has the potential to inform and underpin a deeper understanding of the causal relations between academic self-concept, goal orientations, and academic achievement. Depth and breadth is achieved in this study by including social goals with academic goals and examining domain-specific self-concepts as well as domain-specific achievement. Additionally, this study employs recent methodological advances to longitudinal structural equation modelling that exceed a number of previous causal ordering studies. Consequently, the model with
T1 self-concept, T2 goals, and T3 achievement (M13) offers a basis from which to broaden and inform theory, research, and practice.

14.5 Summary of Chapter

This thesis set out to answer the provocative question concerning the causal ordering of goal orientations and domain-specific self-concepts and their effect on academic achievement. Earlier chapters investigated the integrative model of student motivation and examined relations between students’ goals and domain-specific self-concepts as well as their effect on academic achievement in English and mathematics. Correlations reported in earlier chapters reveal strong links between goals and self-concept but do not reveal which construct causes the other, or whether goals and self-concept are mutually reinforcing. This chapter specifically explored the underlying mechanisms between these motivational constructs utilising longitudinal structural equation modeling. A tentative answer to the provocative causal ordering question based on this research attests that the model with self-concept causally predominant provides the best representation of the data.

The results contribute to a deeper understanding of the nature of student motivation and its effect on academic achievement. Students’ self-perceptions in various subject domains influence goal adoption and these goals affect subsequent academic achievement. The complex nature of motivational goals will be more adequately understood when the impact of self-concept is considered as an antecedent to goal adoption. These findings have important implications for future theory, research, and practice and are addressed in the following chapter.

The intent of the following chapter is to discuss pivotal findings emanating from the present investigation such that the model with self-concept causally predominant can serve to explain complex relations, and offer a theoretical basis for providing insights into the nature of student motivation and its effect on academic achievement.
CHAPTER 15
GENERAL DISCUSSION

15.1 Purpose

The purpose of this chapter is to briefly review key findings stemming from hypotheses posed in Chapter 6. Results for the provocative research question posed in Chapter 6 are also briefly reviewed. These pivotal findings from both the hypotheses and the research question are then discussed and implications for future research and educational practice are examined.

15.2 Review of Findings

To facilitate the review of the key findings, printed below in italics are the seven hypotheses and the central research question from Chapter 6, and a brief orientation to the results of each. Following the review of key findings for each of the hypotheses and the research question is a general discussion which addresses implications for research and educational practice.

*Hypothesis 1a: despite being combined in the one measurement instrument, the General Achievement Goal Orientation Scale (GAGOS) and the Academic Self Description Questionnaire II (ASDQII), will maintain scale independence.*

The General Achievement Goal Orientation Scale and Academic Self-Description Questionnaire II instruments were combined to form an integrative measurement instrument. Consistently with Hypothesis 1a, this integrative measurement instrument provided a good fit to the data across all three data waves for the focus and independent samples. Despite combining the two related yet independent instruments, the GAGOS and ASDQII maintained scale independence. Rigorous procedures were employed when testing this measurement model. For instance,
testing involved multiple waves of data and multiple samples. Comparable fit statistics across these analyses provide strong support for the proposed integrative measurement model of student motivation.

Hypothesis 1b: students’ multiple approach goals, as operationalised in the GAGOS, are represented by mastery goals, performance approach goals, and social goals thereby demonstrating their multidimensionality and;
Hypothesis 1c: academic self-concept can be represented by two distinct subject domains, English and mathematics, thereby demonstrating the multidimensional nature of students’ academic self-concept.

Confirmatory factor analysis revealed robust support for Hypotheses 1b and 1c. CFAs reported in Chapters 9, 10, and 11 identified three distinct goal orientations and two domain-specific academic self-concepts, thereby demonstrating the multidimensionality of both goals and academic self-concept. Distinct domain-specific academic self-concepts in this study comprised English self-concept and mathematics self-concept. Distinct goal orientations in this study comprised mastery goals, performance goals and social goals. These findings expand upon current conceptualisations of goal pursuits, since social goals are included within the goal theory framework. It appears that in addition to the approach forms of mastery and performance goals, social goals also facilitate individuals to organise and direct behaviour in achievement-related situations (Covington, 2000; Urdan & Maehr, 1995).

Hypothesis 2: (a) students pursuing performance approach goals will also pursue mastery goals, (b) students pursuing mastery goals will also pursue social goals, and (c) students pursuing performance goals will pursue social goals.

Relations hypothesised in 2a, 2b, and 2c were evident from positive correlations between each of the goals. Rather than focusing on one goal to the exclusion of the other, which would be the case if negative correlations occurred, adolescent students in this study adopted multiple goals. The strongest correlation was between mastery and performance goals and the next strongest was between performance goals and social goals. Since social goals have rarely been included in the goal theory framework, little is known of the effects this goal pursuit has on academic goals.
The strong relation between performance goals and social goals denotes similar underlying processes.

**Hypothesis 3:** In testing the stability of high school students’ goals and academic self-concept, two hypotheses are considered: (a) students’ goals remain stable across the three waves of data and (b) students’ English self-concept and maths self-concept remain stable across the three waves of data.

Consistent with Hypothesis 3, students’ goals and academic self-concept remained stable across the three waves of data. Only a handful of studies have examined stability of students’ goals and even fewer have investigated the stability of social goals (DeShon & Gallespie, 2005). Notably, domain-specific self-concepts, mastery, and performance goals demonstrated a consistent pattern, whereas social goals varied for the first wave but remained stable for the following two waves. It appears that as children develop and age their motivation becomes more stable.

**Hypothesis 4:** students’ goals are hierarchically structured such that the higher-order factor represents purposes for engagement and the first order represents the three varying purposes for engagement.

Higher-order confirmatory factor analysis in Chapter 13 found support for Hypothesis 4. Specifically, the proposed higher-order factor labelled Purposes for Approach Goals subsumed three distinct goal orientations. Each of these goal orientations espouse different reasons for engaging in academic tasks. A universal disposition among these three positively orientated goals is their ability to direct, select and energise behaviour.

**Hypothesis 5:** correlations between English and mathematics self-concept will be weak and may even be negatively correlated and therefore it is further hypothesised that there will be minimal evidence for a hierarchy of academic self-concept that encapsulates both English self-concept and maths self-concept.

Contrary to Hypothesis 5, higher-order confirmatory factor analysis found support for a hierarchical structure of academic self-concept. Examining correlations between English and mathematics self-concept provides an index of the strength of the hierarchy. In this study, correlations between English and mathematics self-concept were moderate and positive (ranging from .17 to .20), demonstrating a
weaker hierarchy relative to the hierarchy proposed for students’ goals. Although the self-concept domains were distinct, providing evidence of their multidimensionality, their relationship was close enough to form a higher-order construct labelled academic self-concept which represents self-concept in the domains of English and mathematics, but this hierarchy was weak.

**Hypothesis 6:** In testing for invariance of students’ goals and academic self-concept across sex, two hypotheses are considered: (a) that the number of underlying factors is equivalent and (b) that the pattern of factor loadings is equivalent.

Hypothesis 6 was supported for the first-order and higher-order confirmatory factor analysis models. These findings demonstrate that the instrument designed to measure students’ goals and academic self-concept measures the same components of motivation with equal validity for males and females. Males and females respond fundamentally the same to the facets of motivation examined in this study.

**Hypothesis 7:** (a) English self-concept will correlate positively with English achievement and negatively correlate with maths achievement; conversely, (b) Maths self-concept will correlate positively with maths achievement and negatively with English achievement.

Partial support for Hypothesis 7 was evident in the 7V3W model. Paths between English and maths achievement with non-corresponding domains of self-concept were close to zero, with only one path depicting the hypothesised negative pattern (T3 maths self-concept T3 English rank). Interestingly, paths between domains of achievement with corresponding domains of self-concept were positive and statistically significant. These results attest to the domain-specificity of self-concept.

**Research question:** What is the causal ordering of students’ goals, domain-specific self-concepts and academic achievement in English and mathematics?

Three models were hypothesised to explain relations between goals, domain-specific self-concept, and academic achievement. The model providing the best representation of the data was the model specifying self-concept as causally predominant. These results suggest that self-perceptions of ability in a subject domain influence subsequent goal adoption and that these various goals affect subsequent academic achievement.
15.3 Discussion of Key Findings

The intent of this section is to discuss pivotal findings emanating from the present investigation. Specifically, results overviewed in the above section are related and applied to theory and practice. Findings from this research study can serve to explain the complex relations between goal orientations and academic self-concept and offer a theoretical basis for providing insights into the nature of student motivation and its effect on academic achievement.

Students’ goal orientations and domain-specific self-concepts have been meaningfully linked, to provide a more thorough and integrative model of student motivation that attempts to explain student learning and achievement. Pintrich (1994) highlighted the need for studies to move beyond separate analyses of processes involved in learning and develop more comprehensive models that examine relations between cognitive, motivational, and affective components of learning. This research endeavours to fill this void by presenting an integrated model that incorporates motivational components (goal theory) and descriptive components (self-concept) and relates these to cognitive dimensions (academic achievement). Specifically, this model has been used to look at relations between motivational and affective processes and how they relate to influence academic achievement. Significantly, this model is examined across time to address the complex nature of student motivation and its effect on academic achievement.

Exclusive to this integrative model is the inclusion of social goals within the goal theory framework. Despite recent developments of a multiple goal perspective, reviewed in Chapter 2, this demonstrates that an additional goal relates with both mastery and performance goals. Comparable with academic goals, social goals organise and direct cognitions, effect and behaviour. However, unlike academic goals, these goals are directly referenced to individuals or groups associated with a task, in addition to being referenced to the task themselves (Bouffard et al., 1998; Pintrich et al., 1993). Schools are commonly considered to be a social place, particularly for adolescents. However, researchers and teachers need to reconsider the importance of peer relationships in motivating students to engage in academic achievement-related situations.
Mastery goals and social goals were positively related, demonstrating that social goals must have adaptive qualities in common with mastery goals. Perhaps the focus on understanding and improving is a common process for both goals, but mastery oriented individuals use this understanding for the purpose of attaining competence, whereas social oriented individuals use their understanding to assist their peers in completing tasks. Social goals and performance goals related very strongly, providing evidence that perhaps peer relationships and external references are some of the common qualities underlying both goal pursuits. Conceivably, preoccupation with others is a common process for performance and social goals. Anderman and Anderman (1999) contend that social goals focusing on cooperation more readily associate with mastery goals, whereas social goals focusing on external judgements associate best with performance goals. In this study, the latter appears to be the best explanation, because the stronger correlation was between social goals and performance goals.

Inclusion of social goals can enrich our understanding of student motivation and achievement. The longitudinal nature of this study allowed for the stability of these goals to be investigated. Factor correlations indicated that mastery and performance goals remained stable across the three years, although social goals were unstable for the first year and increased in stability for the last two years. Consistently with Mangos and Steele-Johnson (2001), goals become increasingly stable as children age and develop. This certainly appears to be the case for social goals.

This study has demonstrated that social goals are an important goal pursuit for adolescent students. Furthermore, they have common underlying processes with mastery and performance goals. Classroom goal structures that support social goals could provide opportunities for peers to work cooperatively to complete tasks. Students could be encouraged to understand material in order to assist their peers who are less capable, or those experiencing difficulties. Future research should include social goals in the examination of goal theory as for adolescents, they prove to be a particularly salient purpose for engagement in academic tasks.
To date, research supports no conclusive findings on the effects of social goals on important educational outcomes (Dowson, 1999; Dowson & McInerney, 2003). To contribute to our understanding of social goals, this study examined relations between social goals and important educational outcomes comprising academic self-concept and academic achievement in two subject domains. The effects of social goals on self-concept and achievement were interesting. Social goals had minimal influence on English self-concept but had a significant positive influence on mathematics self-concept. Social goals in this study related to individuals concerned with working with others and assisting their peers to complete work. Parallel with previous research on social goals, it appears that students who pursue social goals reference themselves to others (Ryan et al., 1997). A focus on maintaining favourable judgements from others seems to be important to students pursuing social goals in this study. It is feasible to hypothesise that since social oriented individuals externally reference themselves, they continually judge their competence relative to others and that these continual external comparisons may be more salient in mathematics, due to the evaluative and competitive nature of the subject.

Despite the goal correlating positively with academic goals and academic self-concept, social goals related negatively with academic achievement. The negative correlation between social goals and English and mathematics achievement could indicate that socially oriented individuals are preoccupied with working with their peers and that this preoccupation is costly for their own academic achievement. It may also indicate that students who perform well academically are less likely to pursue social goals.

All three goals conceptualised in this study are forms of approach goals. Typically, approach goals lead to positive outcomes, whereas avoidance forms lead to negative outcomes (Elliot et al., 2006). The three approach goals are posited to have differential predictive utility, given that each goal varies in content focus. For instance, research studies show that mastery goals are better predictors of interest because the goal’s content focus is on seeking competence and task mastery, whereas performance goals are better predictors of academic achievement because the goal’s content focus is on performance relative to others and social comparison (Harackiewicz et al., 2000). Only a small amount of research has been conducted on
the predictive qualities of social goals and the content focus for social goals. Subsequently, this study directly sought to address this void.

The instrument used to measure the integrative model of student motivation demonstrated sound construct validity. In particular, the integrative measurement model worked well with the inclusion of social goals. As operationalised in this study, the content focus for social goals concerned working cooperatively, and this cooperation occurred when individuals worked in groups, worked with others, or worked with friends. Emphasis was on helping others achieve academically.

The differential content focus for mastery, performance, and social goals demonstrates their distinctiveness and multidimensionality. As discussed above and as predicted in Hypothesis 2, students in this study pursued multiple goals. For instance, mastery oriented individuals pursued performance goals as well as social goals. Lemos and Goncalves (2004) contend that positing a higher-order factor may assist in accounting for how students coordinate their multiple goals. Perhaps the adaptive nature common to the three goals in this study provides some explanation for how students coordinate multiple goals. Mastery, performance, and social goals represent regulation associated with positive outcomes and are thus approach orientations. It is possible that the underlying processes for these approach orientations are complementary and that this complementary pattern of processes is responsible for facilitating the coordination of multiple goals. All three goals encapsulate purposes for engaging which energise behaviour, but the direction of this energised behaviour varies as a function of the distinct goal content. In this study, the energy or purpose for engagement represents the higher-order factor referred to as purposes for approach goals, whereas the direction or distinct goal content represents the first-order factors.

Positing the hierarchical model of approach goals provides the opportunity to validate the theoretical structure of Goal Theory. The specific component of the theory being validated is the ability to discriminate and lucidly define forms of approach goals. Early research on achievement motivation focused on two motives, the need for achievement (approach) and the fear of failure (avoidance). This approach-avoidance dichotomy has been applied to performance goals, mastery goals
and very recently to social goals (Elliot, 2006; Elliot & Fryer, in press; Elliot et al., 2006; Gable, in press). The proposed hierarchy clearly identified a higher-order factor that represented approach goals and differentiated between the content of the three goals.

The hierarchical structure of goals was integrated with a hierarchical structure of academic self-concept. Initially, the integrative model of student motivation revealed much stronger correlations between English self-concept and mathematics self-concept in the first-order CFA than hypothesised (refer to Hypothesis 5). Positive correlations between English and mathematics self-concept appear contrary to Marsh’s (1989a; 1990a) proposed internal/external (I/E) frames of reference model. This positive correlation provides evidence that not all students perceive themselves to be better at one subject compared with another. For example a student may perceive themselves as having equal ability in both English and mathematics. In this study, adolescents are just as likely to hold positive maths self-concepts as they are to hold positive English self-concepts. This explanation for positive correlations between maths and English self-concept was offered by Skaalvik and Rankin (1992).

The hierarchical structure of domain-specific self-concepts in this study has not typically been tested, primarily due to the difficulty of encapsulating the distinct self-concepts across vast domains. Although a small number of studies have concurred with this hierarchical structure (see for example El-Hassan, 2004; Yeung et al., 2000), it is important to recognise that students can have equivalently high or low self-concepts in various school subjects. For instance, an English teacher can not assume that a student in their class displaying a high self-concept in their subject necessarily evaluates themselves more poorly in another subject.

Further practical implications of this hierarchical structure concern the forms of intervention utilised to enhance self-concepts. This hierarchical model indicates that programs primarily targeting improvements to self-concept in specific subject domains are likely to be no more effective than those interventions that aim to enhance and improve self-concept utilising more general approaches which would apply to any subject domain. Reducing social comparisons, encouraging positive
self-talk, receiving feedback as corrective rather than as a criticism and setting learning tasks with achievable goals, are just a few general approaches that aim to enhance self-concept, and which could be utilised across subject domains.

Further empirical support for the proposed integrative model of student motivation is evident in that the two higher-order factors “Purposes for approach goals” and “Academic self-concept” were highly correlated, and this pattern was replicated across all three waves (T1 = .80, T2 = .49, T3 = .41). This finding is important because it confirms that approach goals and academic self-concept are inextricably linked. Thus, for example, individuals with high academic self-concepts adopt approach forms of goal orientations.

Correlations between approach goals, academic self-concept, and academic achievement were examined across single waves of data as well as examined simultaneously across three years (7V3W model of student motivation). Correlations across three waves reveal some of the long-term effects of goal adoption, which can be useful to inform learning and teaching practices (Schunk, 2000). Bong (1996) recommends studies to involve longitudinal data to examine the changing relations of student motivation. This study confirms the benefits of pursuing a mastery goal. Strong evidence supports the long-term positive effects of mastery goals on both English and mathematics self-concept, English achievement and to a smaller extent mathematics achievement.

The long-term effects for performance and social goals are not as clear cut. Performance and social goals were reasonably similar in their long-term pattern of effects on self-concept and achievement. Both were more often positively related to mathematics self-concept and negatively related to achievement in both English and mathematics. These findings contribute further to research that supports mastery goals and would lead to the recommendation that they be fostered over the long-term, due to the associated benefits to self-concept and academic achievement. Despite the salience of performance and social goals during adolescence, these goals seem to have both positive and negative long-term effects for students in this study.
Aside from the significant correlations reported above, which are informative and heuristic, a vital question remains unanswered concerning the underlying mechanisms responsible for the results. Consequently, an important contribution this study makes is the application of structural equation models utilising longitudinal data to disentangle the causal relations of goal orientations, domain-specific self-concept, and academic achievement. This study pursues a more challenging question which goes beyond considering the nature of relations between the constructs and attempts to extricate the causal ordering of goals and academic self-concept and whether they influence achievement across time.

Fundamental to exploring the provocative question on causal ordering was application of Marsh et al.’s (1999) guidelines for testing causal ordering models. Also deemed pivotal to this quest was the adoption of Marsh and Craven’s (2006) prototype for assessing causal models. Although application of Marsh and Craven’s (2006) prototype was problematic due to the smaller number of significant cross-paths between the constructs, the model providing the best representation of the data was the model with self-concept causally predominant. This judgement was based on the fact that the full-forward model provided an equivalent explanation of the data such that the chi square test resulted in no significant difference between the full-forward model and the self-concept predominant model, and the pattern and strength of paths between the two models were highly comparable. Finally, since the self-concept predominant model is more parsimonious than the full-forward model, it is deemed to be the best explanation for the causal pattern of relations between goal orientations, domain-specific self-concept, and academic achievement.

Interpretation of this model assumes that prior self-concept significantly affects the learning goals students adopt when engaging in subsequent academic tasks. Furthermore, these adopted goals affect subsequent academic achievement. Whether an individual has a high or low self-concept in English or mathematics will affect the type of goals pursued in subsequent tasks and depending on the goals adopted, subsequent academic achievement will be influenced. For an achievement-related situation in English or mathematics, according to the proposed causal model in this study, students will initially ask themselves how competent they think they are in English or mathematics and subsequently ask themselves what is the purpose for
achieving at the task. The questions “Can I do this and for what reason am I doing this” combine to influence future academic achievement.

The significance of these finding is grounded in the fact that self-perceptions play a vital role in predicting the goals students choose to adopt to engage in academic tasks. Self-perceptions of ability in English and mathematics facilitate future goal adoption. These results support experimental research studies which show the effect of classroom contexts and structures that influence goal pursuit (Ames, 1990). Taken together, the results from correlations across three waves simultaneously (7W3V) and longitudinal structural equation model (self-concept predominant), it appears that it might be best for teachers to enhance students’ self-concepts in both English and mathematics so as to influence their subsequent pursuit of mastery goals, especially since mastery goals positively influence subsequent academic achievement in both English and mathematics.

Substantively, the causal findings in this study contend that both self-perceptions and perceptions of tasks are key variables in achievement-related situations. Self-concept and goal orientations are fundamental psychological drivers of performance attainment. Since domain-specific self-concepts and goal orientations have been proven in this study to be interconnected and to combine to affect achievement, it is important to consider both constructs (self-concept and goals) when examining academic achievement. If one construct is examined to the exclusion of the other, then a holistic account of these two fundamental constructs causally combine to affect achievement will be absent and an insufficient explanation of academic achievement will be provided.

This study highlights the fundamental importance self-perceptions play in facilitating student goal adoption, and that this process influences subsequent academic achievement. Results from this investigation provide important contributions to the study of student motivation. Gaps in the research of student motivation have been directly addressed. These gaps include examining goals and their long-term effects on important educational outcomes. Goals were investigated across a three year time span and were integrated with domain-specific self-concept, which is an important outcome in its own right, and also associated with academic achievement in English
and mathematics. Furthermore, this study extended beyond showing that goals and self-concept are related but demonstrated how they relate in a causal manner to affect subsequent academic achievement.

15.4 Limitations of the Study

The tentative conclusions drawn above based on findings from this research must be viewed in relation to potential limitations of the present study. Notably, this study focused exclusively on approach forms of goals and should consider the implications of not including avoidance forms of goals when forming judgements relating to the multidimensionality and hierarchical structure of goals, as well as judgements on the causal ordering of goals. Additionally, implications arise concerning subject domain-specificity. For the construct of self-concept and for investigating academic achievement, two subject domains, English and mathematics, were examined. Measures used to examine approach goals were global; however, contemporary research suggests motivation varies as a function of the subject domain (Bong, 2001; Marsh et al., 2002) and therefore the results may vary due to the global level at which approach goal orientations were measured.

In order to assess causality, Marsh and Craven (2006) recommend examining the cross-paths between constructs. If these paths are substantial and positive then there is strong evidence of causal flow between the constructs. Only tentative findings of the causal links between goals and domain-specific self-concept were possible, due to the limited number of significant positive cross-paths between the constructs.

A potential weakness of this study is that two key theoretical constructs were examined using self-report measures. Consequently, shared method variance may exist between self-concept dimensions and achievement goals. Academic achievement in this study was measured by school ranks in English and mathematics. School based measures have been shown to relate more strongly with academic self-concept and were argued in the review of the literature to relate more strongly to achievement goals (Marsh, 1987). Instead of using ranks in English and mathematics as indicators of domain-specific achievement, this study could have been further improved if schools were able to provide achievement test scores in addition to achievement
ranks, with the purpose of constructing multiple indicators to measure domain-specific achievement (Marsh et al., 1999).

Notwithstanding the size and diversity of the sample for this study, the number of paths to be estimated in the model could have increased in significance with an even larger sample size. Future research may consider larger sample sizes when estimating models with substantial number of paths. In this study the benefit of a larger sample size may result in stronger evidence for the causal flow.

15.5 Directions for Future Research

This research study and its results illuminate a number of directions in which future research could embark. In endeavouring to unravel the causal ordering of goal orientations, domain-specific self-concept, and academic achievement, it would be important to determine whether a similar pattern that surfaced from this study applies to other groups of individuals, thus demonstrating the preferred model’s generalisability. Moreover, future research could test whether the causal model for high school students pertains to younger and older students; whether the model applies equally to Western and non-Western, as well as cross cultural settings; whether results could vary as a function of school, to be tested using multilevel structural equation modelling; whether students’ individual characteristics may moderate the model; and whether the model can be generalised across additional subject domains.

Although correlations can be useful and informative, this study advanced to longitudinal structural equation models to examine the underlying mechanisms of the constructs under investigation and how they are causally related. Future research examining the relations between goals, self-concept, and academic achievement should also consider alternative methodologies that avoid oversimplifying results and simultaneously address the context in which these relations occur. Questions concerning the conditions under which self-concepts can be enhanced to facilitate healthy goal adoption, necessitate varied research methodologies such as experimental designs, qualitative research into the constructs, and utilising
sophisticated structural equation modelling such as testing multiple indicator and multiple causes models (MIMIC).

Developmental differences may also be a factor that could further explain causal relations between goal orientations, domain-specific self-concepts, and academic achievement. Given a larger sample size, it would be possible to conduct multicohort-multioccasion analyses. It would also be valuable to use age as a moderating variable, as suggested by Marsh and Craven (2006), to determine the effects of age on the causal flow. Other variables that may influence causal flow should also be tested. Examining the causal flow across multiple subject domains for each of the constructs could be a valuable contribution to explaining causality.

15.6 Implications for Practitioners

The pivotal finding emanating from this study is that students’ academic self-concepts determine the differential purposes students espouse in future academic learning situations and that these goals affect subsequent academic achievement. Practitioners need to be aware of the motivational properties associated with academic self-concept. Although previous research has highlighted self-concept as an important issue in a child’s development which can predict future interest and achievement (Helmke & Van Aken, 1995), few would be aware of the effect that self-concept has on students’ achievement goal adoption. Practitioners should therefore be alerted to the suggestion that instructional practices for enhancing self-concept should also be accompanied by appropriate motivational interventions and emphasis on appropriate classroom goal structures.

Practitioners would be well aware of students engaging in academic tasks for the sake of gaining in competence, or for the sake of demonstrating their ability relative to others. What might not be so obvious, however, is that students also achieve in academic tasks for social purposes. These social purposes may relate to working at academic tasks so as to assist a peer or to work with friends. Goal theory has been consumed almost exclusively with the investigation of mastery and performance goals and has tended to overlook the significance of other important goals students espouse for learning, and how these alternative goals may interact with mastery and
performance goals. This study puts forward a case for social goals, which have emerged as salient goals pursued by adolescent students, related positively to mastery and performance goals.

Although social goals emerged as an important goal adopted by adolescents, the effects of this goal on academic self-concept were positive, but negative for achievement. Consequently, practitioners should be aware that social goals are beneficial for enhancing self-concept but that those students who are socially oriented may have poorer achievement results. Recommendations stemming from this research are that mastery goals, consistently with most research studies, are most beneficial in terms of heightening self-concept and academic achievement (Meece et al., 2006; Skaalvik, 1997b). Consistent with other research studies were the negative effects of both performance goals and social goals on academic achievement, but both goals were more often positively associated with academic self-concept (Dowson, 1999; Skaalvik, 1997b). Thus, findings of performance goals are congruent with studies that report performance goals are not always detrimental (Ames, 1992).

The school and classroom environment are vital factors that can influence both the formation of academic self-concept and goal adoption (Meece, et al., 2006; Plucker & Stocking, 2001). A final recommendation would be for practitioners to consider how their classroom context can address student wellbeing through enhancing students’ academic self-concept and fostering classroom goal structures that encourage the pursuit of mastery goals. Achievement levels of students will be improved if practitioners address self-perceptions of ability and emphasise adaptive goal orientations. Mastery patterns of behaviour are driven by a strong sense of self (Seifert, 2004). Therefore, practitioners need to keep in mind the benefits of self-concept interventions, and programs can be expanded to include their significance for affecting future goal adoption.
15.7 Summary of Chapter

Chapter 15 has highlighted the key findings concerning relations between goals, domain-specific self-concepts, and academic achievement and addressed the likely causal ordering of these variables. It also considered conceptualisations of goals and domain-specific self-concepts as multidimensional and hierarchically structured. Limitations of the study and directions for future research were addressed. Implications of the key findings for theory and practitioners were acknowledged. The following chapter outlines the pivotal findings of this study.
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Statement of Authentication

The work presented in this thesis is, to the best of my knowledge and belief, original except as acknowledged in the text. I hereby declare that I have not submitted this material, either in whole or part, for a degree at this or any other institution.
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We shall not cease exploration
And the end of all our exploring
Will be to arrive where we started
And know the place for the first time.

T.S. Eliot (1888-1965)
ABSTRACT

Specifying causal relations between students’ goals and academic self-concept: An integrated structural model of student motivation

Relationships between students’ goals and their academic achievement have been widely explored in the literature. Similarly, relationships between students’ academic self-concepts and their achievement have also been widely investigated. However, inter-relationships between students’ goals and academic self-concepts, and how these two sets of variables interact to influence academic achievement, remain largely unexplored. Consequently, the present study seeks to provide an integrative framework which proposes that, when combined, achievement goals (academic and social goals) and domain-specific academic self-concepts (English and Mathematics) provide a more comprehensive explanation of student achievement than either set of variables taken alone.

The central aim of this thesis was to investigate relationships between students’ goals and self-concepts and to demonstrate how these two sets of motivational variables interact to influence academic achievement. Answers were, thus, sought for vexed questions concerning the causal ordering of students’ goal orientations, academic self-concepts and academic achievement by hypothesising three competing models of causality: (a) goal orientations affect academic self-concepts, which in turn affect subsequent academic achievement, (b) academic self-concepts affect goal orientations, which in turn affect subsequent academic achievement and, (c) goal orientations, academic self-concepts, and academic achievement affect each other such that they are reciprocally related over time.

The study involved a 3-year panel design which examined the causal orderings described above utilising longitudinal structural equation modelling. Data were derived from 535 Australian high school students in Years 7, 8, and 9 in the first year of the study, Years 8, 9, and 10 in the second year, and Years 9, 10, and 11 in the final year of the study.
Key findings from the study include: (a) that students’ goal orientations and academic self-concepts can be validly conceptualised as interrelated components of an overall model of student motivation that is multidimensional and hierarchically structured, and (b) there is evidence for the causal predominance of self-concepts over goal orientations with respect to subsequent academic achievement. Findings from this research hold important implications for our theoretical understanding of factors affecting student motivation, and also for educational practice and research relating to students’ goals and academic self-concepts. These implications, in turn, provide new perspectives for promoting optimal motivation and academic achievement amongst secondary school students.
CHAPTER 1
INTRODUCTION

1.1 Disentangling the Causal Ordering of Students’ Goal Orientations,
Academic Self-concepts, and Academic Achievement

This study addresses the complex nature of student motivation. It presents an integrated model of student motivation by combining two related but independent constructs, goal theory and academic self-concept, with the purpose of providing a more comprehensive explanation for academic achievement. A small number of studies have investigated relations between goals and academic self-concept. Of these studies, most have examined relations utilising correlations with a single wave of data. Although these correlations are informative and heuristic, such that they provide important information concerning the nature of the relationship, they neglect to explain the underlying mechanisms responsible for the pattern of relations. To extend previous research and to address this apparent void, this study (a) demonstrates not only how students’ goal orientations and academic self-concepts are related but also how these constructs relate over a period of three years, (b) examines whether they combine to affect subsequent academic achievement, and (c) most significantly, focuses on unravelling the underlying mechanisms that are responsible for the pattern of relations by disentangling the causal flow of these two constructs.

This study sets out to demonstrate that in learning situations, perceptions of ability (academic self-concept) and perceptions of the purpose of a task (goal orientations) combine to influence achievement behaviour. It is argued that when combined, goal orientations and academic self-concepts can provide a more thorough and comprehensive explanation of student achievement than either set of constructs taken alone. This integrative model proposes that in learning situations, students question
themselves about how capable they are and question the reasons why they should achieve (or not) at learning tasks. Thus, academic self-concept and goal orientations are related such that they interact to affect achievement-related behaviours. Centrally, this study extends beyond examining ways in which goals and self-concept are related but aims to identify which of these two key psychological drivers is causally predominant in affecting subsequent academic achievement.

In tackling the vexed question of causal ordering, three alternative models of causation are hypothesised, each of which is tested in an attempt to find the model that best explains relations between goal orientations, domain-specific self-concepts, and academic achievement. These three competing models of causality comprise: (1) prior goal orientations affect domain-specific self-concepts, which in turn affect subsequent academic achievement, (2) prior domain-specific self-concepts affect goal orientations, which in turn affect subsequent academic achievement, and (3) goal orientations, domain-specific self-concepts and academic achievement are mutually reinforcing such that they are reciprocally related.

Recommended procedures for analysing longitudinal causal models have recently been proposed by Marsh, Byrne, and Yeung (1999) and are applied to this study. Based on these guidelines, analyses in this study progress with straightforward confirmatory factor analysis (CFA) and progress to testing more complicated CFA models to resolve measurement errors. Following the CFAs, a full-forward longitudinal structural equation model (reciprocal effects model) and two alternative causal models (goals causally predominant model and self-concept causally predominant model) are tested to determine which of these models provides the best representation of the data.

In the course of unifying the literature on student motivation the foreseen contributions of this study to theory and practice are multifold:

- it provides an integrative measurement model of student motivation which comprises goal orientations and academic self-concept;
- in contrast to the majority of goal theory research, which typically examines mastery and performance goals, this study includes an additional salient goal pursued by adolescents, social goals, in the goal theory framework;
• consistently with the trend of research that “emphasises a positive psychology” (Marsh & Craven, 2006, p.133) this study exclusively focuses on approach forms of goal orientations, not avoidance goals. This is primarily a result of the fact that the instrument utilised in this study was designed prior to the recent spate of literature on avoidance goals but also a result of wanting to focus on adaptive goals and their relation to academic self-concept and achievement;

• the study enriches our understanding of goal structures and the coordination of multiple approach goals;

• the study highlights issues with contemporary conceptualisations of the hierarchical structure of academic self-concept;

• the complex nature of the relations between goal orientations (mastery, performance, and social approach goals) and English and mathematics self-concepts are revealed, as well as their relations to academic achievement;

• relationships between the constructs and their relationship to academic achievement, which to date have typically been examined utilising (chiefly single wave) correlational or experimental methods, are assessed using longitudinal data;

• a significant contribution of this study is the examining of the causal flow between goal orientations and academic self-concept and their effects on academic achievement; and

• findings emerging from the study present a number of substantive and methodological implications for researchers and educational practitioners.

The following four chapters (Chapter 2 through to Chapter 5) presents a review of the literature as it applies to this study. Specifically, Chapter 2 considers the multidimensionality of goals and academic self-concept and presents the proposed integrative model of student motivation. Whereas Chapter 2 considers the multidimensionality of goals and academic self-concept, Chapter 3 considers the potential for these constructs to be hierarchically structured.
In order to explain causal relations between goals, self-concepts, and academic achievement, it is essential to examine how these variables relate with each other before making predictions on possible causal orderings. Chapter 4 reviews research that demonstrates how goals and academic self-concept independently relate to academic achievement. Following this, Chapter 5 reviews the literature examining the direct relationship between goals and academic self-concept. This research is then used to formulate competing models of causality between goals, domain-specific self-concepts, and academic achievement. A rationale for these competing models of causation is detailed in Chapter 5.

Chapter 6 presents the hypotheses and research question. Chapter 7 provides an orientation to the methodology and Chapter 8 discusses methodological considerations. Chapters 9 through 12 present the first-order confirmatory factor analyses, the results, and a discussion of the findings. Chapter 13 presents the higher-order analyses, the results, and a discussion of the findings. Chapter 14 presents the longitudinal structural equation analyses, the results, and a discussion of the findings. Chapter 15 provides a general discussion of all key findings from analyses conducted in the thesis and Chapter 16 presents the conclusion.
CHAPTER 2
MULTIDIMENSIONAL NATURE OF GOAL ORIENTATIONS AND ACADEMIC SELF-CONCEPT

2.1 Integrated Models of Student Motivation

In 1994 Paul Pintrich invited researchers to contemplate current research and literature on motivation, to attempt to link it meaningfully together, and to develop more thorough integrated theoretical models. He highlighted that prior research on the processes involved in learning in a school context had focused predominantly on cognitive, motivational, and affective components independently of each other, and very few studies had attempted to examine interactions and interrelations among these components. He highlighted the consequential need for integrated models that incorporate a number of components in order to provide a more comprehensive explanation for student learning and achievement. This research fills some of this void by going beyond the separate analyses of variables. It proposes an integrated model which not only incorporates both motivational (goal theory) and affective components (self-concept), but also relates a cognitive dimension (student academic achievement). The proposed model demonstrates how these variables interrelate but, more importantly, how they relate over a period of time. The purpose of the integrated model of student motivation is to explain how goals and academic self-concept may be causally related and how they may combine to affect academic achievement in high school age students.

This research is structured along two dimensions that may be related to academic achievement: (a) achievement goal theory and (b) academic self-concept. A rationale for combining these two constructs into an integrative model of student motivation is initially explained. Following this justification, Chapter 2 continues by
reviewing goal theory and academic self-concept and proposes that both constructs are multidimensional. The following chapter (Chapter 3) addresses recent advances in conceptualising goals and academic self-concept and examines whether the structure of goals and academic self-concept can be represented as hierarchical.

Chapters 4 and 5 of the review focus on relations between goals, domain-specific self-concepts and academic achievement. Specifically, Chapter 4 investigates the nature of relations between (a) goals and academic achievement and (b) academic self-concept and academic achievement. The final literature review chapter, Chapter 5, examines how (c) goals and academic self-concept are related. Based on research reported in Chapters 4 and 4, on relations between goals, academic self-concept and academic achievement, three potential explanations for how they are causally related are explored. Chapter 5 postulates three alternative causal models, derived from the earlier conceptual review of relations between the factors, each of which will be empirically tested in this study.

2.1.1 Unifying goals and academic self-concept

To date, few studies have endeavoured to unify the numerous competing motivational constructs. There have been repeated calls for a comprehensive model to more fully explain the dynamic interactions among motivational variables (Valle, Cabanach, Núñez, González-Pienda, Rodríguez & Piñeiro, 2003). This study, although not as complete in scope as the proposed comprehensive model, attempts to display greater depth and breadth by combining two related but independent motivational dimensions, specifically: goal theory and academic self-concept. Curiously, there appears to be a degree of division between many researchers investigating motivation from a goal theory perspective and those investigating academic self-concept (although see Skaalvik, 1997a; Skaalvik, Valas, & Sletta, 1994; Skaalvik & Valas, 1999 as exceptions). Researchers of goal theory repeatedly avoid the explicit discussion of academic self-concept, instead referring more frequently to perceptions of ability, which implicitly rather than explicitly denotes a self-concept linkage. Self-concept researchers acknowledge the impact of motivation but habitually avoid goal theory frameworks as an explanation. The present study endeavours to unify goal theory and self-concept as they are
interconnected and when combined can provide valuable insight into student achievement.

The self-concept–goal orientation linkage is explicitly recognised in questions such as whether a person will attempt a particular task, how much effort is expended, and how much persistence will be demonstrated in the face of difficulty. Both students’ goals and academic self-concept are influential in students’ academic performance and achievement. Therefore, it is reasonable to suggest that a combination of the two, especially when operationalised as a multidimensional construct, may provide a fuller explanation for students’ achievement than either taken alone, especially when over-simplified structures for these constructs have been investigated. A basic requirement for combining these two constructs will be to design and validate instruments that capture the multidimensional and possibly hierarchical structure of both academic self-concept and goals, and to determine whether these instruments are invariant across sex groups. Also, a theoretical rationale for why a combination of constructs from two largely distinct literatures should be explored is also required. The required rationale follows.

Given any achievement-related situation, there are at least two fundamental variables, the task (e.g., a sporting activity, a mathematics test or poetry writing) and the person doing the task (the self). These variables are fundamental in the sense that a task cannot be achievement-related unless there is a person (a self) to construe the task as achievement-related, and a person cannot construe a task as achievement-related unless there is a task to complete in the first place. Goal theory essentially suggests that self-perceptions of the purpose and structure of the task are influential in academic performance and achievement (Harackiewicz, Barron, Tauer, Carter, & Elliot, 2000; Kaplan & Maehr, 1999; Skaalvik, 1997b). Conversely, self-concept theory suggests that self-perceptions of relative ability are influential in academic performance and achievement (Anderman, Anderman, & Griesinger, 1999; Marsh & Craven, 1997). Thus, if task and self are the key variables in achievement-related tasks, then goal theory and the self-concept construct suggest that perceptions of task and self are fundamental psychological drivers of performance and achievement arising from engagement in those tasks. Thus, if only goal theory or only the self-concept construct are used to examine achievement-related behaviours, or indeed
achievement itself, then either key perceptions concerning tasks, or key perceptions concerning self may be missing from the respective analyses. To the extent that this is the case, a holistic account of both foundational variables in achievement-related behaviours will therefore be missing.

In addition to the above, perceptions of the purposes of a task and perceptions of the ability of self may be interconnected in a learning situation, such that perceptions of task purpose affect perceptions of self ability. For example, there is considerable evidence (e.g., Harackiewicz, Barron, & Elliot, 1998) that if one perceives a task to be competitive in nature this may negatively impact upon self-perceptions of relative ability. On the other hand, non-competitive tasks may enhance self-perceptions of relative ability. Conversely, poor perceptions of ability (low self-concept) may lead to disengagement in achievement-related tasks, and high self-concept may lead to enhanced engagement in tasks (see Zusho & Pintrich, 2001). Thus, perceptions of the purposes of a task and the abilities of the self are not only fundamental to achievement-related behaviours, but are also interactive in determining engagement (or not) in achievement-related behaviours. This latter reason provides further justification for investigating the simultaneous effects of perceptions of task and self on academic achievement.

The above discussion postulates that the nature of the task impacts upon perceptions of self, and that these causally related influences affect achievement outcomes. An alternative (perhaps complementary) perspective is that perceptions concerning “Why am I doing this?” (goal orientation), and perceptions concerning “Can I do this?” (self-concept), may interact reciprocally to influence both academic engagement and academic achievement. For example, one individual may perceive that the purpose of a task is to demonstrate competitive superiority (i.e., “I am doing this to win”), but be unsure that they have the ability to “win”. Another student may perceive the same task as competitive, but be sure of their ability to win. Yet another student may perceive the purpose of the task to be competence (mastery) related, yet evaluate themselves to be incompetent, and so on. The point is that the relative salience of the “mix” of task and self evaluations is crucial in determining, firstly, engagement in a task, and then achievement outcomes from the task. Thus, it may be (as discussed in the paragraph above) that perceptions of task affect evaluations of
self, which in turn affect academic engagement and achievement. Alternatively, (again from this discussion) perceptions of task and self may interact to influence engagement and achievement. Whatever the case, a prerequisite for investigating both these alternatives is an instrument capable of simultaneously measuring both goals and self-concept equally well for males and females.

Theory and measurement are interrelated; thus, an important consideration is how research has conceptualised goal theory and academic self-concept. The following section commences with conceptualisations of student motivation and focuses specifically on the developments of goal theory. Following this, conceptualisations of academic self-concept are examined.

2.2 Theories of Student Motivation

If motivation were a straightforward concept it would be uninteresting. The challenge is to find ways of conceptualising it which help teachers to understand children’s progress and behaviour, thereby helping them to evaluate their classroom practice and teaching methods (Galloway, Rogers, Armstrong, & Leo, 1998, p.42).

Conceptualisations of motivation have transformed dramatically over the last half of the 20th century. Initially, biological perspectives were used to explain individual motivation, followed by a shift to the assertion of a behavioural-mechanistic perspective. The current approach to explaining individual motivation is a cognitive-mediational/constructivist perspective (Dornyei, 2000). “The conception of the individual as a purposeful, goal-directed actor who must coordinate multiple goals and desires across multiple contexts within both short- and long-range time frames currently is predominant.” (Eccles, Wigfield, & Schiefele, 1998, p.1074.)
Arising from cognitive approaches of the late 1960’s were social-cognitive perspectives. Examples of social cognitive theories include goal theory (Ames, 1984), self-efficacy theory (Bandura, 1986a), attribution theory (Weiner, 1986), and expectancy-value theory (Eccles, Adler, Futterman, Goff, Kacala, Meece, & Midgely, 1983).

Although an abundance of models explore academic motivation, there is no solitary model that fully explains motivated behaviour. Bong (1996) believes that competing theoretical orientations, which differ between investigators, are primarily responsible for indeterminate findings. For instance, cognitive models of academic motivation are predominantly concerned with “understanding learners’ covert thought processes, often overlooking the impact of social and contextual variables” (Bong, 1996, p.150). Alternatively, models of self-perception (self-concept, self-efficacy), which explain different motivational patterns for given tasks (Skaalvik, 1997a), rarely consider related social and contextual variables. Another set of models arising from cognitive theory belongs to the social-cognitive approach, often conceptualised as goal theory. Unlike those previously described, goal theory pulls together different aspects of achievement research (Weiner, 1990) because these models formulate and test specific hypotheses on the nature and direction of influential social and contextual factors (See for example Ames, 1992; Ames & Archer, 1988). This study acknowledges both the usefulness and value of a goal theory framework because it encompasses social and contextual factors which influence students’ achievement behaviour.

Bong (1996) warns, however, that social-cognitive models are often inept, due to vague construct definitions, as researchers have created their own terms perhaps before thoroughly examining existing terms. For example, conceptualisations of adaptive and maladaptive patterns of academic motivation have been coined in terms such as: intrinsic versus extrinsic orientations (Lepper & Greene, 1978), task involvement versus ego involvement (Nicholls, 1984a), and mastery goals versus performance goals (Ames, 1992). In addition, d’Ydewalle (1987) acknowledges that many of these constructs lack discriminant validity. This study provides a measurement framework within which goal theory is clarified but importantly, is extended to include social factors.
Goal theory, also known as *achievement goal* theory (Cury, Biddle, Sarrazin, & Famose, 1997), is currently the dominant approach to the analysis of achievement motivation (Anderman & Wolters, 2006; DeShon & Gillespie, 2005; Meece, Anderman, & Anderman, 2006). Weiner (1990) acknowledged the current dominance of cognitive approaches to motivation and regarded goal theory “as a major new direction, one pulling together different aspects of achievement research” (p. 620). A principal objective of contemporary achievement motivation has been the explanation and prediction of human behaviour in educational contexts (e.g., Ames, 1984; Dweck, 1991; Elliot & Harackiewicz, 1996; Kurita & Zarbatany, 1991; Nicholls, 1984a, 1984b). Central to this cognitive perspective is the initiation and regulation of behaviours referred to as “goal theory” (Weiner, 1990).

### 2.3 Achievement Motivation

Goal theory focuses on the goals or purposes perceived for learning, rather than on the actual level of motivation (e.g., students’ ongoing interest or deep task involvement; Middleton & Midgley, 1997; Seifert, 2004). Essentially, students are concerned with reasons for doing the task. Students’ individual answers to the question “Why am I doing the task?” (Pintrich & De Groot, 1990; Pintrich & Schrauben, 1992) orient students’ intensity and direction of behaviour toward the academic task. These goals provide a framework within which individuals interpret, experience, and react according to the achievement situation, and result in different patterns of affect, behaviour, and cognition (Bouffard, Vezeau, & Bordeleau, 1998; Dweck & Leggett, 1988; Elliot & Dweck, 1988; Weiner, 1986).

Within an achievement context, the predominant interest is the demonstration of competence. This may be achieved in two significant ways which are associated with two distinct motivational goals. Various conceptualisations of these two tendencies exist within the literature but most research maintains that students who engage in a task in order to master a skill or activity in an attempt to seek competence are claimed to have *mastery* goal orientation, whilst students who engage in a task to attain favourable judgements of competence are claimed to have *performance* goal orientation (Ames & Archer, 1988; Rose & Thornburg, 1984).
2.3.1 Mastery goals

Mastery goal oriented individuals assert self-referenced criteria for success (Seifert, 2004). Learning is valued for its own sake because the emphasis is on learning a skill, understanding and improving individual performance (Butler, 1999; Graham & Golan, 1991; Solomon, 1996). Some researchers have termed analogous goal dimensions as intrinsic goals (Lepper & Greene, 1978; Harter, 1981; Green & Foster, 1986; Vallerand & Bissonnette, 1992), task-involved goals (Nicholls, 1984b), learning goals (Dweck & Leggett, 1988; Elliot & Dweck, 1988) and process goals (Ertmer & Newby, 1996).

Strong support exists for a mastery goal perspective, also referred to as the normative perspective (Pintrich, 2000a): that is, the adaptive qualities of a mastery goal are beneficial across cognitive, socio-emotional, and achievement outcomes (Kaplan & Middleton, 2002; Midgley, Kaplan, & Middleton, 2001). Congruent with previous literature, this goal perspective is associated with adaptive motivational behaviours, some of which include persevering with difficult tasks (Elliot & Dweck, 1988; Nadler, 1998; Rudisill, 1990; Ryan & Pintrich, 1998), preference for challenging tasks (Nicholls, 1984b; Sarrazin, Famose & Cury, 1995; Seifert, 2004) and exerting effort, interest and value (Duda, Smart, & Tappe, 1989; Linnenbrink, 2005; Robins & Pal, 2002). Due to the internally referenced criteria for success, a sense of accomplishment is acquired on the basis of improved performance or successful completion or mastery of a task. This goal tendency adopts the perspective that competence or ability can be increased through effort; that is, intelligence is malleable (Seifert, 1997).

2.3.2 Performance goals

Alternatively, performance goal oriented individuals determine success as a means of demonstrating superior ability relative to others and/or against external standards such as marks and grades (Ames, 1992; Cury et al., 1997; Nicholls & Utesch, 1998). Central to a performance goal orientation is the establishment of ability (Dweck, 1986), self-worth (Butler, 1999) and seeking favourable judgments from others (Meece, 1994). Parallel terminologies for this tendency are extrinsic goals (Lepper & Greene, 1978), ego-involved goals (Nicholls, 1984b), ego-social goals (Meece,
Performance oriented individuals attribute success to ability (Solomon, 1996). This criterion for success depends on the performance of peers, so improved performance or mastery of a task is not in itself sufficient to evoke feelings of competence. One must surpass or outperform others to feel a sense of achievement and, consequently, may not always view success as a possibility. From this perspective, ability is likely to be characterised as a fixed attribute. Little or no effort will be invested in a task if an individual perceives they lack the ability to succeed, that is, to “beat” others.

Striving to attain mastery, or to demonstrate superior ability reflect two distinct motivational orientations for schoolwork (Ames & Archer, 1988; Nicholls, Cheung, Lauer, & Patashnick, 1989). Nicholls (1984b) argues, however, that the degree to which either goal will be salient depends on situational cues. Studies (see review by Jagacinski, 1992) concur that attributes of effort and preference for challenge were more profound in mastery goal experimental conditions where an activity provided an opportunity to learn and develop competence, than in performance conditions, where the focus is on measuring ability relative to others. According to Nicholls (1984b), performance goal oriented individuals maintain a differentiated conception of ability, where individual difference in ability limits the efficacy of effort. Moreover, feelings of success derived from gaining favourable judgements from others may be modified by concerns to uphold self-worth by masking low ability and avoiding further failure among people who perform poorly. In contrast, mastery goal oriented individuals maintain a less differentiated conception of ability as developing through effortful learning. That is, even less competent individuals will persevere and feel successful if they can satisfy strivings to learn and improve (Butler, 1999).
2.3.3 Approach and avoidance goals

Traditionally, mastery and performance goal orientations have received the most attention in studies concerning achievement motivation. However, recent research (for example, Barker, Dowson, & McInerney, 2004; Barker, McInerney, & Dowson, 2003; Elliot & Sheldon, 1998; Middleton & Midgley, 1997), offers an alternative framework by partitioning the performance goal into two independent, but related orientations. These are the performance approach and performance avoidance orientations. This recent dichotomy provides the opportunity to assess the distinct difference between the goal to demonstrate ability (directed towards the attainment of favourable judgements of competence) and the goal to avoid demonstrating lack of ability (focused on avoiding unfavourable judgements of competence). Interestingly, the approach of partitioning the performance goal into performance approach and performance avoidance was incorporated into the earliest achievement motivation conceptualisation (see, for example, Atkinson, 1957; Lewin, Dembo, Festinger, & Sears, 1944; McClelland 1951; McClelland, Atkinson, Clark, & Lowell, 1953; Murray, 1938).

Early theorists proposed that individuals’ achievement pursuits may be oriented toward the attainment of success or the avoidance of failure (Rawsthorne & Elliot, 1999). These achievement goal theorists pursued the lead of Lewin, McClelland, and Atkinson in conceptualising an approach and avoidance motivation (Atkinson, 1974; Lewin, 1944; McClelland et al., 1953). However, it later received little theoretical and empirical attention and was eventually overlooked (Elliot & Harackiewicz, 1996). As reported by Middleton and Midgley (1997), for example, performance approach and avoidance goals were overlooked by Nicholls and his colleagues (e.g., Nicholls, Patashnick, Cheung, Thorkildsen, & Lauer, 1989). Their early work assessed an avoidance goal with a two-item scale. The two scales were combined and labelled “ego-orientation”. Studies following this research disregarded the items assessing avoidance goals from the ego-orientation measure.

Dweck (1986) abandoned the concept of performance approach and performance avoidance since the constructs were statistically indistinguishable. Nicholls et al. (1989) attested that performance approach and avoidance were “two forms of approach motivation” (p.181). Conversely, Midgley et al. (2001) concluded that
both performance approach and performance avoidance goals were maladaptive and that performance approach goals, like performance avoidance goals, lead to deleterious outcomes. These studies questioned the usefulness of distinguishing between approach and avoidance goals (Harackiewicz, Barron, Pintrich, Elliot, & Thrash, 2002; Pintrich 2000b). In a review of the literature, Urdan (1997) questioned the usefulness of the dichotomy by highlighting the limitations of a performance avoidance orientation.

More recently the trend in achievement motivation research has been to reintroduce the dichotomy of performance goals (Elliot, 2006; Elliot & Moller, 2003; Sideridis, 2004; in press). This recent reconsideration led by Elliot and colleagues (Elliot, 1994, 1997; Elliot & Church, 1997; Elliot & Harackiewicz, 1996) strives to differentiate performance goals in terms of approach and avoidance (Pintrich, 2000b). Conceptualisations of achievement goals have continually evolved, particularly for approach and avoidance goals. These evolving conceptualisations of goals have caught the attention of Urdan and Mestas (2006) and have led them to raise questions concerning the number of inconsistent and elusive definitions of goals reported in research programs.

A number of contemporary studies continue to have difficulties distinguishing between performance approach and performance avoidance goals. From a measurement perspective, performance avoidance goals prove to be problematic because they are highly correlated with performance approach goals (Middleton & Midgley, 1997). For instance, researchers employing the Patterns of Adaptive Learning Survey to examine performance approach and performance avoidance have frequently reported high correlations between the two scales, with \( r \) approaching or exceeding .70 (Urdan & Mestas, 2006). From a theoretical perspective, results on performance goals continue to be in conflict, such that some studies attest that performance goals facilitate adaptive achievement behaviour (Elliot & McGregor, 1999; Sideridis, 2005), whereas a substantial number of studies reveal performance goals have negative consequences, while other studies posit that performance goals have no discernible effect (Elliot, 1999).
Debate concerning the utility of dichotomising performance goals is no longer hotly contested, as most researchers agree there are fundamental differences between performance approach and performance avoidance goals (Elliot, Shell, Henry, & Maier, 2005). A consensual and lucid definition of each goal and its pattern of associations, however, remains elusive. Elliot and Moller (2003) concede that the measurement of performance approach goals and performance avoidance goals has been problematic. In particular, these researchers have had difficulties tracing specific item components for each construct.

There is no firm consensus for how performance goals should be operationally defined. Measurement of performance-based goals has encompassed aspects of social goals. These measurements combine elements of a performance goal with elements of a social goal such that instruments have been designed to measure: performing for teachers, and working with friends as the objective for engagement (see Nicholls et al., 1985), or performing for grades (Ames & Archer, 1988), and partiality for challenge (Pintrich & Garcia, 1991). Albeit that these operational definitions of performance goals relate to demonstrating competence, they do not, however, align with the current argument that performance goals are represented by two distinct components: (a) social comparisons and (b) concerns with appearance (Elliot, 1999; Urdan, 2000; Urdan & Mestas, 2006). Other instruments have vaguely defined performance goals such that they comprise positive and negative valenced items and assess a hybrid performance approach/avoidance goal (Elliot & Moller, 2003).

In an attempt to clarify performance goals, Urdan and Mestas (2006) conducted interviews which questioned high school seniors about their responses to survey items. Unexpected interpretations by the participants occurred for the performance avoidance items. A large number of participants had difficulties distinguishing between wanting to do better than others (performance approach) and wanting to avoid performing worse than others (performance avoidance). A significant implication of these findings is the question whether students genuinely interpret any survey item that relates to performance avoidance goals consistently with researchers’ intentions. Given high correlations between performance approach and performance avoidance scales in other studies, it appears that the distinction between
wanting to demonstrate superior ability and wanting to avoid demonstrating lack of ability remains vague and indistinct.

More recently, theorists (see for example Cury, Elliot, Fonseca, & Moller, 2006; Pintrich, 2000c; Elliot, 1999; Elliot & McGregor, 2001) have conceived a fourth dimension of goal orientation. The trichotomous (mastery, performance approach and performance avoidance goals) framework has been further modified to include a mastery avoidance goal. Typically, mastery goals focus on approach forms since individuals strive to master tasks. In contrast, mastery avoidance goals can be maladaptive as they represent individuals who strive to evade falling short of task mastery (DeShon & Gillespie, 2005). Mastery avoidance goals are a relatively new dimension and their predictive pattern has yet to be clearly established (Cury et al., 2006). Elliot acknowledges that only a select few will pursue a mastery avoidance goal, as they require specific conditions. For instance, a mastery avoidance goal may be adopted by an expert who values not losing their skill set. To date, there is minimal empirical support for dichotomising mastery goals into approach and avoidance forms, whereas a performance goal dichotomy has been supported.

2.3.4 Social goals

Despite the recent focus, almost exclusively on mastery and performance goals in research, students may also adopt other goals which possibly affect their academic performance (Blumenfeld, 1992). Another important class of goals represented in theoretical literature is that of students’ social goals (Blumenfeld, 1992; McInerney, Hinkley, Dowson, & Van Etten, 1998; Urdan & Maehr, 1995; Wentzel, 1994). Unlike academic goals, social goals are directly referenced to individuals or groups associated with the academic task, in addition to being referenced to the tasks themselves (Dowson, 1999).

In the past, social goals have been overlooked and ignored by studies examining motivation (Blumenfeld, 1992). Most of the research on social goals has been conducted with adults and younger children, not adolescents (Jarvinen & Nicholls, 1996). This is astonishing, given that adolescence denotes a time of significant social change (Snowman & Biehler, 2006). For many, adolescence is a turbulent time, typically characterised as a period of “storm and stress” (see for example Arnett,
1999). Some evidence of this turmoil is displayed through disturbingly low levels of school motivation, increasingly negative attitudes toward school and decreasing perceptions of self (Anderman & Maehr, 1994; Marsh, 1989). Some evidence suggests that social goals could be significant motivators for students, especially for those going through adolescence (Dowson & McInerney, 2003; McInerney, Dowson, & Yeung, 2005; McInerney et al., 1998). For this reason, social goals are considered to be relevant goals pursued by high school students, and so are examined alongside academic goals in this study. The multiple goals perspective is expanded to include both academic and social goals.

In addition to the predominant two-goal structure of achievement motivation, which emphasises students’ interest in demonstrating competence, social goals acknowledge other reasons for engaging in, or failing to engage in, academic tasks. The extensive range of goals associated with the investigation of social aspects in achievement motivation has proven to be problematic (Patrick, Hicks, & Ryan, 1997; Urdan & Maehr, 1995). Therefore the present study limits the focus to social academic goals; that is, goals associated with students’ beliefs about the social reasons for attempting to achieve in academic situations. Hence, social goals in this study are defined as the perceived social purposes for attempting or not attempting to achieve in academic tasks or situations (Urdan & Maehr, 1995). This definition of social goals varies from other research studies since it is specific to social reasons for achieving academically, whereas other researchers more broadly define social goals as “what students are trying to accomplish in the classroom” (Wentzel, 1996, p. 393). In order to clarify, social goals in this study focus on social reasons for why students try to achieve academically.

Also deemed problematic for research on social goals is the large number of studies investigating social goals that simply reiterate research findings from previous studies and then postulate hypotheses without theoretical underpinnings. The present research proposes a multiple goal coordination model as the theoretical framework underpinning the function of social goals. This theoretical framework predicts that social goals have underlying common processes with academic goals such that they share a common foundation. For instance, social goals (e.g., social affiliation, social concern) that focus on cooperation relate strongly to mastery goals.
(Anderman & Anderman, 1999; Hinkley, McInerney, & Marsh, 2001). Thus, social goals in this study are proposed to relate strongly with academic goals.

The common process between academic goals and social goals is often reported between performance approach goals and social goals (e.g., social approval, social status) that focus on favourable judgements from significant others. Often, performance goals have incorporated content that directly relates to the operationalising of a social goal (see for example Nicholls, Patashnick, & Nolen, 1988). Ryan, Hicks, and Midgley (1997) note the similarities of social goals and performance goals, as both concern the importance of maintaining a positive public image in front of others. Furthermore, they found that academic goals that focused on self-presentation correlated highly with social comparison. Ryan et al. (1997) concluded that goals that reflect relative ability and social status could represent a singular motive toward social comparison.

Since this study is primarily concerned with adaptive goals, the social goals in this study focus on encouraging cooperation through assisting peers and friends to complete academic tasks. Affectively, these social goals engender feelings of belonging and solidarity, although occasionally these goals can result in negative feelings of isolation or rejection, if desires to facilitate remain unfulfilled. Social affiliation and social concern goals are associated with a variety of adaptive approaches to learning (Dowson, 1999). For instance, Dowson (1999) reported that social affiliation and social concern goals resulted in increased student effort. Effort expenditure facilitates these students’ understanding of academic tasks so as to transfer this understanding to peers.

Although not extensively researched, students’ social goals have been represented in theoretical literature. For instance, social constructs have been included in conjunction with (or even within) research measures that operationalise students’ academic goals. Specifically, Maehr (1984) prescribes social solidarity goals in addition to performance, mastery, and extrinsic reward goals. Correspondingly, Pintrich and colleagues (Pintrich, Marx, & Boyle, 1993) prescribe social goals in addition to performance, mastery, and epistemic goals. Dodge, Asher, and Parkhurst’s (1989) formulation includes multiple (and on occasions, conflicting)
social goals which students adopt with respect to schooling. Urdan and Maehr (1985) stipulate a list of social goals students may adopt that comprise social approval, social compliance, social solidarity and social welfare goals. Although not entirely congruent with the definition of goals used in this research, Ford (1992) maintains a detailed description of eight social goals that differentially affect motivation, cognition, and affect. Finally, Wentzel (1991a, 1989) has researched students’ multiple social and academic goals and their interactive effect on students’ academic achievement. While Ford and Wentzel have both referenced social goals, their definition is not entirely congruent with this study’s definition.

When social goals are evident in the literature, it is essential to differentiate between the definitions of social goals. In this study, social goals remain analogous with achievement goal definitions as intentions and purposes that drive cognitions, affect, and behaviour (e.g., Bouffard et al., 1998; Dweck, 1992; Pintrich et al., 1993). Notable, however, is the refinement of this definition since social goals are operationalised in this study as social purposes expressed in academic achievement situations (Dowson & McInerney, 2004; Urdan & Maehr, 1995). This definition of social goals differs from other definitions which define social reasons for desiring to achieve in social situations (eg., Eder, 1985; Lochman, Wayland, & White, 1993; Pietrucha & Erdley, 1996; Wentzel, 1991b, 1989).

Few theorists have examined social goals in the context of goal theory (see Farmer, Vispoel & Maehr, 1991; Schneider, Ackerman, Kanfer, 1996 as exceptions). This study highlights the need to address social goals within the framework of goal theory. Parallel to academic goals, social goals assist individuals to organise and direct behaviour so as to empower them to achieve in academic situations (Covington, 2000). How social goals operate in the dynamic context of a classroom and how they influence academic achievement remains largely unexplored. This is surprising, given that individuals of all ages value social purposes for engaging in academic tasks (Allen, 1986; Ford, 1992). For example, students acknowledge that they are motivated at school when there are opportunities to work with their friends, or when they help their peers to complete tasks (Dowson & McInerney, 2004). Furthermore, social dimensions become increasingly salient for early adolescence (Berndt, 1982; Brown, 1990).
A large proportion of the extant literature on adolescent development focuses on the negative effects of peer groups (Arnett, 1999). Nevertheless, effects of peers can also be a positive influence, as is frequently the case with the limited research findings on social goals (Dowson & McInerney, 2003). It is argued that social goals become increasingly important as a goal pursuit during adolescence. Adolescents spend more time with their peers, and these relationships impact on how an individual thinks, feels and behaves (Hartup & Sancilio, 1986; Rubin & Krasnor, 1985). Furthermore, the quality of interactions among peers plays a central role in academic achievement and school behaviour (Fredricks, Blumenfeld, & Paris, 2004; McInerney et al., 2005; Wentzel, Barry, & Caldwell, 2004). Clear and well-documented evidence highlights students’ preferences for working with peers, which has been shown to heighten motivation and to support and extend learning (Eccles et al., 1998; Zusho & Pintrich, 2001).

Investigation of “how students’ social goals could complement, compensate, or conflict with mastery and performance motivation goals” is recommended by Pintrich et al. (1993, p.181) and Dowson and McInerney (2001). The successful pursuit of multiple goals may directly assist the learning processes whereby the goals may complement one another to heighten student incentives to achieve (Atkinson, 1974; Reuman, Atkinson, & Gallop, 1986, Wentzel, 1989). Conversely, goals may conflict if the adoption of social goals takes priority over the pursuit of mastery goals (Wentzel, 1991a). Alternatively, social goals may compensate for academic goals if the adoption induces insufficient motivational incentive to engage in tasks (Wentzel, 1991a).

Classroom goal structures may also influence how social goals interact with academic goals. Lemos and Goncalves (2004) suggest that students are often discouraged from engaging in interpersonal relationships within classroom learning experiences. The opportunities for independent work seem to be reduced in high schools due to the perceived need for teachers to maintain “control” of student behaviour so as to avoid adverse behaviour management issues. It is no surprise that Lemos and Goncalves (2004) found that social goals often conflict with classroom goal structures, so students prefer to pursue academic goals since they align more closely with class structures. Classroom goal structures that promote the perusal of
academic goals over social goals seem particularly relevant in Western cultural settings, whereas social goals are more often congruent in non-Western cultural settings where social dimensions are more salient (Maehr & McInerney, 2004).

The above discussion has focused solely on social goals that emphasise social purposes for achievement. This conceptualisation of social goals appears to relate closely to an approach motive, since it is positively oriented toward achievement rather than avoidance of achievement. Recently, Gable and colleagues (Gable, in press; Gable & Strachman, in press) proposed an approach and avoidance dichotomy of social motives. Approach social motives energise adaptive relational behaviour and have been linked to social affiliation; contrastingly, avoidance social motives relate to aversive relational behaviour and have been linked to fear of rejection (Elliot, Gable, & Mapes, 2006). Consistent with approach and avoidance predictions for mastery and performance goals, it is hypothesised that approach social motives will lead to positive outcomes, while avoidance social motives will lead to negative outcomes. Since this dichotomy of social motives is a very recent development, researchers are only beginning to empirically test the proposed distinction.

2.3.5 Three positively oriented goals

Central to the purpose of the present study is an exploration of three positively oriented goals (mastery, performance, and social approach goals). These goals are “positively oriented” in the sense that they express students’ purposes for achieving, rather than their purposes for avoiding achievement (such as is the case with work-avoidance or performance-avoidance goals). Importantly, the approach goals in this study are associated with adaptive motivational patterns (Elliot & McGregor, 1999; Sideridis, 2005).

“Mastery goals and performance approach goals both represent regulation according to positive potential outcomes and are thus considered approach orientations” (Rawsthorne & Elliot, 1999, p.329). Urdan (1997) references the vast number of studies that confirm the adaptive nature of mastery goals. He substantiates that since mastery goals and performance goals are positively correlated, performance goals must have adaptive qualities in common with mastery goals. Elliot and Moller (2003) set out to determine whether performance approach goals were adaptive.
Evidence from 41 studies, all of which addressed the dichotomy of approach and avoidance, concluded that performance approach goals were positively associated with a large number of positive processes and outcomes. These studies supported the adaptive pattern for performance approach goals. Approach social goals have also been shown to have adaptive motivational patterns since they induce positive relational behaviour in the classroom (Gable, in press).

There is a number of reasons for the exclusive emphasis on approach goals in this study. First, although there is substantial empirical support for dichotomising performance approach and performance avoidance goals, there is minimal empirical evidence available that substantiates the recent proposal of social avoidance goals and mastery avoidance goals. Furthermore, due to the difficulties (which were reported earlier in the section on avoidance goals) in statistically defining performance goals, and since the instrument used for this study was developed prior to the recent surge of literature concerning avoidance goals, the present study focuses on the independent and interactive effects of mastery approach, performance approach, and social approach goals.

A second purpose for focusing upon positively oriented goals was to avoid methodological complexities. Negative items and negative constructs, when used alongside positive items and constructs, can lead to difficulties in model construction and validation, through the presence of negative item method factors, for example (Marsh, 1994; 1996). Finally, since mastery avoidance goals are rare and exclusive to a small sample such as experts in a particular domain, mastery avoidance goals were not included within the framework. For these reasons this study focuses on adaptive goals. Hence, reference to mastery goals, performance goals, and social goals in this study, represents mastery approach goals, performance approach goals, and social approach exclusively. These approach goals all represent adaptive goals that operationalise the need for seeking competence and are primarily concerned with goals that orient students towards academic achievement, in contrast to goals that orient students away from academic achievement.
2.3.6 Multiple goals

Two contrasting goals, mastery and performance goal orientations, have been the main focus of research studies examining the differences in students’ achievement behaviour. The majority of these studies have adopted correlation and regression techniques to determine how scores on each motivation goal scale affect scores on other criterion measures (e.g., Duda & Nicholls, 1992; Meece et al., 1988; Nicholls et al., 1985; Nolen, 1988; Pintrich & De Groot, 1990). Such research implicitly assumes of students, the independent pursuit of either a mastery goal or a performance goal (Meece & Holt, 1993). Few studies have sought to investigate the impact of individuals’s pursuit of multiple goals, on achievement (Steinberg, Singer, & Murphy, 2000).

Recently, however, researchers have acknowledged the possibility of students pursuing multiple goals (Ainley, 1993; Barron & Harackiewicz, 2001; Dowson & McInerney, 2001; Harackiewicz et al., 2002; Lemos & Goncalves, 2004; Lemos, 1996; Linnenbrink, 2005; Thomas & Barron, 2006; Urdan et al., 1993). That is, mastery and performance goals are not conceptualised as dichotomous but, rather as interacting simultaneously and varying in salience depending on task structure, the school environment, and the broader social and educational context (McInerney, Roche, McInerney, & Marsh, 1997; see e.g., Meece, 1991; Meece & Holt, 1993; Pintrich & Garcia, 1991; Wentzel, 1991a). In educational and sporting domains the conclusion has been that “optimal motivation was promoted by emphasising task goals and minimising ego goals” (Thomas & Barron, 2006, p.115). This conceptualisation of mastery and performance goals has been labelled the mastery goal perspective by a number of researchers (see for example Harackiewicz et al., 2002).

Research conclusions have progressed from the mastery goal perspective to consider the adaptive qualities of performance approach goals and whether optimal motivation can be achieved with the simultaneous pursuit of mastery and performance approach goals (Hodge & Petlichkoff, 2000; Sideridis, 2005; Thomas & Barron, 2006). This conceptualisation of simultaneously pursuing mastery and performance goals refers to the multiple goals perspective. Various patterns of relations between goals have
emerged in studies; further research is warranted to investigate and explain these patterns.

Results from Steinberg et al.’s (2000) study demonstrated that an individual pursuing mastery and performance goals simultaneously, attained greater sporting achievement compared with individuals adopting a single goal orientation. Concurrent pursuit of mastery and performance approach goals was found to be endorsed by high school students with a positive “present self-concept” (Anderman et al., 1999). Although the endorsement of a performance approach goal as beneficial may still be fiercely contested by some researchers, current studies extend the debate as to whether simultaneous adoption of performance approach and mastery goals is most adaptive (Linnenbrink, 2005).

Researchers assert that when examining the simultaneous pursuit of mastery and performance goals, students’ social goals should also be included (Blumenfeld, 1992; Dowson & McInerney, 2004; McInerney et al., 1998; Urdan & Maehr, 1995; Wentzel, 1994). Contemporary studies have examined the possibility of students adopting multiple goals, and a few have investigated the simultaneous interaction between mastery, performance and social goals (e.g., Dowson & McInerney, 1996a; Harackiewicz & Linnenbrink, 2005; Linnenbrink, 2005; McInerney et al., 1997; McInerney & Swisher, 1995). Urdan and Maehr (1995) believed that examining social goals within the framework of goal theory would provide a more thorough understanding of motivation and achievement in schools.

This study concurs with Urdan and Maehr (1995) and proposes that social goals in combination with academic goals can provide further insight into student achievement-related behaviour and academic achievement. Social dimensions of a school are assumed to interact with both mastery and performance goals and may be profoundly influential in affecting students’ attitudes toward schooling implicitly and learning explicitly (McInerney & McInerney, 1998). A number of recent studies have examined a goal model which considers the simultaneous interaction between academic goals and social goals (e.g., Dowson & McInerney, 1996b; McInerney & Swisher, 1995; McInerney et al., 1997). This conceptualisation of motivation is referred to as the personal investment theory of motivation. This approach considers
the possibility of students adopting multiple goals as well as the potential interaction between a variety of fundamental goals for students in school-related situations.

The goal structures identified within the personal investment model include task (mastery) goals, ego (performance) goals, social goals, and extrinsic rewards. Task goals within this framework refer to individuals experiencing adventure/novelty and striving for excellence. Ego dimension within this framework emphasises competition and power as motives. Social goals comprise affiliation and social concern, while extrinsic rewards refer to recognition and external incentives such as financial rewards (Maehr, 1984; Maehr & Braskamp, 1986; McInerney & Sinclair, 1991).

Maehr and Braskamp’s (1986) Personal Investment (PI) theory predated goal theory and built upon the earliest conceptualisations of achievement motivation. PI incorporated into its initial conception not only a multiple goal perspective (mastery and performance goals) but broadened the perspective to include social goals. Maehr and McInerney (2004) contend that PI is effectively a more complex integrative model which has the potential for far richer and more sensitive sources of information on determinants for motivated behaviour.

Essentially mastery, performance, and social goals from the Personal Investment model have been integrated to form a more inclusive multiple goal perspective in the present research study. Research provides strong evidence that students simultaneously pursue multiple goals (Lemos, 1993, 1996; Urdan & Maher, 1995). How these three goals (mastery, performance, and social goals) interact in achievement-related situations warrants investigation.

Recent research has commenced examining how students coordinate multiple goal pursuits and what strategies they employ to deal with managing multiple goals. In particular, Argyle, Furnham, and Graham (1981) define three central relationships among goals that provide an explanation for how goals may interact with one another.

- Independence, which relates to goals that neither facilitate nor impede upon each other,
• *instrumentality*, which relates to goals that facilitate each other, and
• *interference*, which relates to goals that impede or interfere with other goals.

Argyle et al.’s (1981) explanation of goal interaction has been superseded by Barron and colleagues’ (Barron & Harackiewicz, 2001; Thomas & Barron, 2006) comprehensive hypotheses on how goals potentially could relate.

Various patterns of results from research examining multiple goals have led to the formulation of more comprehensive hypotheses that build upon the initial explanations proposed by Argyle et al. (1981). Barron and colleagues (Barron & Harackiewicz, 2001; Thomas & Barron, 2006) argue that four hypotheses require testing in order to confirm or reject the benefits of multiple goals.

• an *additive goal hypothesis* maintains that a mastery and performance goal each have independent, positive effects for attaining a single achievement outcome,

• an *interactive goal hypothesis* maintains that, despite their independent effects, mastery and performance goals interact simultaneously such that individuals high in both mastery and performance goals are advantaged,

• a *specialised goal hypothesis* maintains that mastery and performance goals have various individualised effects on differing outcomes, and

• a *selective goal hypothesis* maintains one goal is more suitable for adoption given the context and idiosyncrasies of an individual. Individuals have the ability to shift goals in a situation and this is viewed as advantageous. A selective goal effect addresses Person X Context interactions (Thomas & Barron, 2006).

Only a few methodologically sound studies exist, that employ regression, structural equation modelling or cluster analysis to examine both independent and interactive goal effects. Of these, a small proportion advocate that mastery goals alone account for advantageous outcomes (e.g., Meece & Holt, 1993; Pintrich & Garcia, 1991). A more significant proportion advocate that the simultaneous pursuit of both mastery goals and performance goals accounts for more advantageous outcomes (e.g., Ainley, 1993; Barron & Harackiewicz, 2000; Harackiewicz et al., 1998; Harackiewicz,
Barron, Tauer, Carter & Elliot, 2000; Harackiewicz, Barron, Tauer & Elliot, 2002; Pintrich 2000c; Sideridis, 2005). For example, Harackiewicz et al. (2000) found in a longitudinal study that college students’ performance goals predicted student academic achievement, and mastery goals were found to be unrelated to achievement, whereas they predicted interest. In this example, instrumentality is evident since the two goals facilitate each other and they combine to provide optimal motivation and performance. Harackiewicz et al. (2000) concluded that students who pursued both goals were most likely to attain success in college.

Although the interaction among mastery and performance goals has been examined in the literature, there remains no conclusive position on how social goals interact with mastery and performance goals (Hicks, 1996; Hicks & Murphy, 1995; Hicks, Murphy, & Patrick, 1995). This study extends previous research as it examines the largely unexplored interaction between academic goals and social goals, and their effect on important educational outcomes, including students’ academic self-concept and academic achievement.

2.3.7 Motivational goals across time

In order to address the complex nature of academic motivation, it is necessary to examine the effects of motivation across time (Meece, Wigfield, & Eccles, 1990; Pokay & Blumenfeld, 1990). Little is known about the development of motivation across time (Anderman et al., 1999). Pokay and Blumenfeld (1990) provide evidence to suggest that motivation and achievement alter as a function of time. Schunk (2000) acknowledges the complex nature of motivation and advocates the need for more research to examine the long-term effects because the findings would contribute to useful implications for learning and teaching.

Bong (1996) recommends the use of repeated measures or longitudinal designs in order to examine the changing relations between motivation and academic achievement. The present study aims to contribute to the developing understanding of motivation across time by examining the stability of students’ academic and social goals and their interactive effects across three waves of data.
2.3.8 Sex differences

Contemporary studies have begun to investigate relations between students’ sex and their goal orientations (e.g., Anderman & Young, 1994; Kaplan & Maehr, 1996; Midgley & Urdan, 1995). Despite this research, the literature is ambiguous regarding whether, or how, sex differences may influence students’ motivation and achievement (Cole et al., 2001; Meece & Jones, 1996; Midgley, Arunkumar, & Urdan, 1996).

Of the limited research examining sex differences with respect to goal content, males have most often been associated with competitive or performance goals, whereas females have been associated with striving for affiliation or social goals (Giota, 2002; Wentzel, 1989). Concurring with these findings, Meece and Holt (1993) disclosed that males favoured competition and performance goals, whereas females tended to favour learning and mastery goals. A similar pattern of sex differences was substantiated with the work of Ve (1991). In general, Ve (1991) states that those who pursue performance goals have a desire to compete with others at school in order to obtain a good job, and those who pursue mastery and social goals focus on personal demand and social responsibility in order to learn at school so as to make a contribution to society as a valued member. These findings, according to Ve, are an indication of the motivation and ambition of females to comply with social norms or ideals (i.e., females enter the public forum and focus on the wellbeing of others) while males have a predisposition which is more technical (or more specialised) and their preference for pursuing goals is for more personal interest. Interestingly, Henderson and Dweck (1990) presented contrary results: they found that females were more inclined to employ extrinsic or performance goals.

Sex differences arise for students who endorse social goals (Hicks, 1996; Hicks & Murphy, 1995; Hicks et al., 1995). Ryan et al. (1997) found sex differences between adolescents’ social goals in their research study on goals and their relation to help-seeking behaviours. Although their definition of social goals relates to engaging for both academic and social purposes, whereas this study narrows the focus to academic purposes exclusively, their findings provide some insight into gender differences. Females in their study reported higher levels of value and desire for intimacy in peer relationships while males reported high levels of social status goals. They concluded
that since males in their study also reported higher on performance goals, males are more concerned with public image status than females. Patrick et al. (1997) demonstrated the adaptive nature of social goals when they reported that social goals for females influenced their feelings of competence beyond previous experiences of success.

Other research on sex differences suggests that males are less likely to acquire maladaptive attributions and inferior perceptions of academic competency (Zusho & Pintrich, 2001). These results are intriguing, given that females are more likely to pursue mastery goals which have been associated with adaptive motivational behaviours while performance goals, which are more commonly pursued by males, are associated with maladaptive motivational behaviours (DeShon & Gillespie, 2005; Ryan et al., 1997; Seifert, 2004). Questions remain about these disparities between males and females, so researchers need to pursue answers to the nature of sex differences when they arise, and as to whether these differences are authentic or rather are artefacts of methodology (Pajares & Valinate, 1999). Therefore a fundamental criterion for research on student motivation is to ensure instruments applied to measure motivation are well validated and are tested for sex invariance before judgements about sex differences are made.

Notwithstanding the significance of research examining effects of sex on goal orientations, studies of this nature have frequently overlooked the importance of examining the underlying factor structure of the instrument utilised in the study (Green, Martin, Marsh, & McInerney, 2006). Consequently it is assumed that the factor structure of the given instrument is equivalent for the various groups under investigation (i.e., males and females).

When interpreting results from studies examining sex differences, it is necessary to consider whether the research findings reflect a difference of degree on these dimensions or difference of kind (Martin, 2004). Most studies examining effects of sex on multiple dimensions of motivation are based around mean levels which only explicate whether motivation is higher for females than for males, or vice versa. Hence, differences of degree focus on the extent to which females are higher or lower than males on various motivational constructs.
With most research focusing on differences of degree, scant attention has been paid to sex differences of kind. Differences of kind determine whether the factor structure of a given instrument measures the same components of motivation with equal validity for males and females. Differences of kind examine whether qualitative differences exist between males and females such that they respond fundamentally differently to particular facets of motivation. Of central importance is whether the instrument utilised has the same underlying meaning for both males and females. Therefore, it is recommended that before examining differences of degree, researchers should first determine whether there are differences of kind.

Distinctions between differences of degree and differences of kind have significant implications for educators and researchers. For instance, if the difference between males and females is primarily a difference of degree, then educators may assume interventions and programs focusing on males are also appropriate for females. In contrast, if the difference is primarily a difference of kind, then programs aimed at males and females need to be qualitatively and fundamentally distinct, not only in intensity and duration, but also in “orientation, construction, and application” (Martin, 2004, p.133).

Hattie (1992) and Marsh (1993a) advise against comparing groups across sex unless adequate support for the invariance of factor structure across sex is demonstrated. Although these researchers refer specifically to self-concept, their results may be generalised to all educational measures including motivation (Marsh, 1993a). So, unless differences of kind are examined and found to be insignificant, it is unjustifiable to make comparisons between males and females, much less to draw conclusions about male and female levels of motivation.

Implications of research that exclusively attends to differences of degree and overlooks differences of kind are that it may mistakenly form judgements about sex differences that are unfounded. It is therefore unjustifiable to compare motivational responses between males and females unless there is adequate support for invariance across sex. For these reasons, it is important to determine whether any instrument measuring students’ motivational goals is equally valid for males and females.
2.3.9 Developmental and age differences

Minimal research has been conducted on age-related longitudinal developments of children’s goal orientations (Eccles et al., 1998), primarily because of the assumption that goals are a function of contextual and environmental factors (Zusho & Pintrich, 2001). More emphasis has been placed on the nature of the context and how contextual characteristics modify goal adoption than on understanding how children’s goal adoption may alter with age. Nevertheless, assumptions regarding goal adoption and both cognitive and contextual factors have emerged in studies such that mastery goals are believed to become less dominant as children grow and develop while performance goals become more salient as children move from primary school to secondary school (Dweck, 1999; Dweck & Leggett, 1988). Evidence pertaining to this pattern of goal adoption is from studies showing how secondary classrooms become more focused on competitive goal structures that promote the adoption of performance goals, relative to primary classrooms that emphasise mastery goal structures over performance goal structures (Eccles et al., 1998; Maehr & Middgley, 1996).

Emergence of goal orientation is not apparent until late childhood (Leicester, Kavussanu, & Delwyn, 2000) because its emergence is dependent on cognitive maturity; a prerequisite for goal development is the capacity to distinguish effort from ability. Nicholls and Miller (1983, 1984) show that children are incapable of differentiating between ability and effort until late childhood, around 12 years of age; consequently, high ability is equated with high effort at a young age. This finding may provide some evidence for why competence is not critical for young children’s self-esteem (Harter, 1990a) albeit judgements of competence in domains of importance predict self-esteem in both children and adolescents (Harter, 1993).

Researchers continue to deliberate over the conceptualisation of whether goals are stable or unstable. DeShon and Gillespie (2005), in their comprehensive review of goal theory, highlight substantial conceptual discrepancies among researchers as to whether goals remain stable across various domains, situations, and time, with time denoting potential developmental and age differences. Questions concerning whether goal orientations should be considered as a trait or state remain hotly contested. The “trait” definition refers to goal orientations as a personality variable
and this dispositional trait is manifested by consistent behavioural patterns in achievement situations. The “state” definition refers to goal orientations as person and situation-specific (Person X Situation interaction) such that individual differences and salient contextual factors influence goal adoption.

Trait conceptualisations of goals are perceived to be stable because of the small number of changes to goal adoption over long periods of time, whereas state conceptualisations of goals are perceived to be unstable because of the impact of situational cues which result in changes to goal adoption. The large majority of studies conceive goal orientations as a stable characteristic of an individual (see for example Ames & Archer, 1987; Bell & Kozlowski, 2002; Fisher & Ford, 1998). A smaller, yet significant number of studies conceive goal orientations to be a combination of both personal and situational factors (see for example Bandalos, Finney, & Geske, 2003; Breland & Donovan, 2005; Elliot & Thrash, 2002).

Mangos and Steele-Johnson (2001) report the large number of researchers that believe goal orientations become somewhat stable for older children. Their research demonstrates that as children age, they have a predisposition to adopt a particular goal response pattern; however, situational characteristics may result in the individual modifying or reducing the acuteness of the response pattern.

Xiang, Lee, and Bennett’s (2002) results indicate that older students (8th and 11th graders) were more inclined toward performance goals. These results are consistent with research literature that attests performance goals become more salient over the high school years (Chaumeton & Duda, 1988; Harter, 1981; Maehr, 1983; Nicholls et al., 1989). Essentially it is the reward structure of many high school settings that promotes performance goals. Classrooms offer very few rewards, so very few students can earn them; accordingly, any student’s reward is at the expense of others. Often, grades become more salient, opportunities for social comparison processes prevail and competition is enhanced in a high school setting, therefore inducing the pursuit of performance goals.
2.4 Students’ Self-Concept

2.4.1 Introduction to students’ self-concept

Much of the research in the late 20th century has been an investigation of how students form their self-concept (Blatchford, 1992; Keith & Bracken, 1996; Purkey, 1970; Wylie, 1974; 1989). In very general terms, self-concept may be defined as an individual’s self-perception. This perception is formed through “attitudes, feelings, and knowledge about our abilities, skills, appearance, and social acceptability” (Byrne, 1984, p.429). The perceptions held by an individual are derived from experiences with the social environment as information is supplied by significant others in the home, school and community (Hattie, 1992; Swann, 1983).

Social frames of reference indicate to individuals what they are capable of and what qualities they possess in particular situations. For instance, using objective criteria, an individual may conclude that they are accomplished at mathematics but when their frame of reference changes from set criteria to a peer who demonstrates superior mathematics performance, they may form a relatively negative mathematics self-concept. This process of comparison is sometimes referred to as an external frame of reference (Hau, Kong, & Marsh, 2000; Marsh, 1986a). Notwithstanding the importance of external frames of reference in forming self-concepts, individuals also compare self-perceived abilities in one facet (such as mathematics) with self-perceived abilities in another (such as English) and this internal process is the second basis from which self-concept formation occurs. This process of comparison is sometimes referred to as an internal frame of reference (Skaalvik & Skaalvik, 2002).

In considering both an external and internal frame of reference, it is possible that an individual with high ability in both English and mathematics may in fact have a negative self-concept in mathematics because they perceive that they are better at English (Moller, Strewblos, & Pohlmann, 2006). Thus it makes no difference as to whether a student is gifted or challenged. All individuals have high and low self-concepts because they perceive themselves to be better at one subject compared with another (McInerney & McInerney, 2006). Furthermore, self-concept formation is particularly reliant on how these two comparative processes are weighted in the formation of self-concept. Essentially, the internal/external frame of reference (I/E)
model predicts that gifted students will emerge with unrealistically low self-concepts in their weakest academic subjects, whilst poor students will emerge with unrealistically high self-concepts in their strongest academic subjects.

Marsh developed the Internal/External frame of reference model to account for relatively uncorrelated results between mathematics and English self-concepts (Marsh, 1986a). The Internal/External frame of reference model attempts to explain why mathematics and English self-concepts are so distinct from each other while mathematics and English achievement are highly correlated. The external process whereby an individual compares their perceived ability with others leads to substantially positive correlations between English and mathematics achievements but the internal process whereby an individual compares perceived ability in one subject relative to another leads to negative correlations between mathematics and English self-concept. The combined functioning of external and internal processes, reliant on the weighting of each, will lead to the near-zero correlations that prompted the development of the I/E model (Marsh, 1990a; Marsh, Byrne, & Shavelson, 1988; Marsh & Craven, 1997; Skaalvik & Rankin, 1990, 1992, 1995a; Tay, Licht, & Tate, 1995).

Although the I/E model is widely accepted as an explanation for how self-concept is formed, there have been some who suggest that internal comparisons of ability, whereby an individual perceives themselves as more competent in one domain relative to another domain, may not transpire for all individuals (Barker, Dowson, & McInerney, 2006a; Skaalvik & Rankin, 1992). This is because some individuals may perceive themselves to be equally good or bad in two domains. Skaalvik and Rankin (1992) found that subjective judgement of equal ability in two domains was shown to have no negative effects from achievement to non–corresponding self-concept. For this group of individuals there were also significant positive correlations between mathematics self-concept and English self-concept (corresponding with their positive achievement correlations $r = .69$). Future research should further investigate the potential for individuals to rank their perceived ability equally in one subject with another.
2.4.2 Multidimensionality of self-concept

“Another area in academic motivation research where distinction among constructs often gets blurred is that related to the self or to subjective perceptions” (Bong, 1996, p.152). Self-concept researchers distinguish between descriptive/evaluative and affective/motivational facets; but these are differentially categorised by researchers (see for example, Byrne, 1996a; Wigfield & Karpathian, 1991). This study pursues a descriptive/evaluative aspect of self-concept (e.g., “I am good at English”) as opposed to an affective/motivational aspect (e.g., “I am proud of my ability in English”; Rosenberg, 1979; Skaalvik, 1990). Descriptive components are inclusive of roles and characteristics that are socially ranked and valued. For instance, a person may like or detest their perception of themselves in a particular domain. These related feelings associated with descriptive/evaluative aspects give rise to emotional or affective reactions such as pride and humiliation. Thus, motivation to engage (or not) in tasks is significantly impacted by self-perceptions. Research conducted by Skaalvik, Valas, and Sletta (1994) examined the relations between self-perceptions and motivation to engage. Their findings strongly indicate that self-perceptions are predictive of students’ goal orientation.

In a classic review, Shavelson, Hubner, and Stanton (1976) reported that previous research on self-concept had been of a substantive nature, with insufficient attention devoted to methodological issues associated with the construct (Byrne & Worth-Gavin, 1996). Pre-1976 research emphasised a general or global and unidimensional construct, and did not differentiate among self-perceptions in physical, social, academic or other domains (Marsh, Perry, Horsely & Roche, 1995). Predictably, that research revealed inconsistent, confounded and ambiguous findings (Byrne, 1984; Hansford & Hattie, 1982; Shavelson et al., 1976; West, Fish & Stevens, 1980; Wylie, 1974).

Disconcerting findings from the unidimensional conceptualisation of self-concept prompted Shavelson et al. (1976) to define the construct of self-concept as multidimensional. Specifically, they proposed an empirical model describing self-concept as multidimensional and hierarchically ordered. General perceptions of self as a person (i.e., global self-concept) are posited at the apex of the structure. Moving downward, the model becomes increasingly differentiated, with general self-concept...
divided into two facets: academic self-concept and nonacademic (i.e., physical, social, emotional) self-concept. These facets are further divided into specific domains (e.g., mathematics self-concept, physical appearance self-concept). Initially there was little empirical support for the Shavelson et al. (1976) multidimensional model of self-concept. However, subsequent empirical studies were overwhelmingly consistent in supporting it (Byrne, 1984; Byrne & Shavelson, 1986; Dusek & Flaherty, 1981; Fleming & Courtney, 1984; Harter, 1982, 1984, 1985; Marsh, 1993a; Marsh, Barnes, & Hocevar, 1985; Marsh & Hocevar, 1985; Marsh & Shavelson, 1985; Shavelson & Bolus, 1982; Soares, 1982; Song & Hattie, 1985; Wigfield & Karpathian, 1991).

Initially Shavelson et al. (1976) postulated that various domains of academic self-concept (i.e., mathematics and English self-concepts) would moderately correlate and could be combined to form a single higher-order facet of academic self-concept, thereby demonstrating both its multidimensionality and hierarchical structure. Specifically, the hierarchical structure of self-concept was derived from the strength of correlations between self-concept facets (Byrne & Worth-Gavin, 1996).

Considering the voluminous literature on self-concept, only a limited number of studies provide evidence for a hierarchical academic self-concept (Barker et al., 2006a; Yeung, Chui, Lau, McInerney, & Russell-Bowie, 2000). To illustrate, after administering two multidimensional self-concept measures, Vispoel (1995) found strong evidence for the multifaceted nature of self-concept but only moderate evidence for a hierarchical structure. Marsh and Shavelson’s (1985) research also supported the multidimensionality of self-concept but support for the hierarchy proved to be more complicated than originally anticipated.

The hierarchy of self-concept remained unsubstantiated due to the unexpectedly weak and sometimes near-zero correlations between English and mathematics self-concept. As discussed above, Marsh reasoned that the weak correlations between mathematics and English occurred because of the internal/external comparison process. Furthermore, the hierarchy proved weak because of the clear differentiation between the two distinct subject domains (English and mathematics); hence, encapsulating different self-concepts across the domains was more problematic than
originally anticipated (Marsh, 1986a; 1990a). To address this, Shavelson and colleagues (1976) revised their initial model of self-concept by proposing two higher-order facets of academic self-concept (mathematics and verbal) instead of one general academic self component (Marsh et al., 1988; Marsh & Shavelson, 1985, 1986b).

Based on the revised self-concept model, Marsh developed the Self-Description Questionnaire instruments (including: preadolescence SDQ I; adolescence SDQII; young adulthood SDQIII; see Marsh, 1990b; 1993b; Marsh & Craven, 1997) which intended to capture the distinct multiple facets of self-concept. Subsequent empirical research is overwhelmingly consistent in supporting the multidimensionality of self-concept (Byrne & Shavelson, 1986; Harter, 1982, 1984, 1985; Marsh, 1993a; Marsh et al., 1985; Marsh & Hocevar, 1985; Marsh & Shavelson, 1985; Wigfield & Karpathian, 1991).

### 2.4.3 Age effects in self-concept

Shavelson et al. (1976) hypothesised that self-concept becomes increasingly differentiated with age. Empirical research, however, has shown this feature of self-concept to be more complex than initially assumed. Recent progress in the measurement of young children’s self-concept has revealed that children can reliably differentiate between multiple dimensions of self-concept at an earlier age than originally postulated (Byrne, 1996b; Crain, 1996; Craven, McInerney, & Marsh, 2000; Eccles, Wigfield, Harold, & Blumenfeld, 1993; Marsh, Barnes, Cains, & Tidman, 1984; Marsh, Craven, & Debus, 1991). Reports have shown that children’s self-perceptions become increasingly differentiated during primary school years (Harter, 1982; Harter & Pike, 1989), yet appear not to become more differentiated beyond preadolescence (Marsh, 1986b, 1990b). Wigfield and Karpathian (1991), on the other hand, contend that children’s academic self-concept increases with age and becomes more systematically related to their external academic achievement. They argue that “once ability perceptions are more firmly established the relation likely becomes reciprocal: Students with high perceptions of ability would approach new tasks with confidence, and success of those tasks is likely to bolster their confidence in ability” (p.255).
In summary of the research, there is evidence that self-concept of young children is positive until they reach middle childhood when it starts to decline through to at least adolescence then levels out, finally systematically increasing through early adulthood (Craven et al., 2000). The decline of self-concept during preadolescence indicates a curvilinear age effect whereby the decrease in self-concept must reverse at some stage during early or middle adolescence (Marsh, 1989). Substantial empirical support for this conclusion is lacking except in four studies (Marsh, Parker, & Barnes, 1985; Marsh, Smith, Marsh, & Owens, 1988; Piers & Harris, 1964; Simmons, Rosenberg, & Rosenberg, 1973) which support curvilinear age effects. To account for changes to self-concept at various ages, Wigfield and Karpathian (1991) called for models to consider developmental differences. Conclusive findings of age and sex effects on self-concept and academic achievement are lacking. Valentine, Cooper, and Bettencourt (2002) believe the relation between self-concept and achievement may be mediated through academic motivation. They argue that these relational variables may become stronger as school becomes more demanding. Hansford and Hattie (1982) provided empirical support for the moderating effects of age. Notably, the average correlation between self-concept and achievement was reliant upon the age of the sample. Specifically, secondary students revealed the strongest correlation between self-concept and achievement ($r = .52$), whereas preschool students revealed the weakest correlation ($r = .12$).

English and mathematics self-concepts are proposed to be the most influential factors within a preadolescent student’s academic self-concept (Hay, Ashman, & Kraayenoord, 1997; Marsh & Hattie, 1996). Boersma & Chapman (1992) also acknowledge the importance of these two subject domains. The present study investigates self-concepts in the domains of English and mathematics for adolescent students over a period of three years.

2.4.4 Gender effects in self-concept for adolescents

Previous research posited no sex differences in overall self-concept at any age level (Piers, 1984; Wylie, 1979). However, when a total score was formed for self-concept, Wylie (1979) noted that sex differences may be overlooked. Piers (1984) acknowledged a growing body of research highlighting sex differences in specific domains of self-concept. For example, by at least middle adolescence, girls have
consistently lower math self-concepts than boys (Byrne & Shavelson, 1987; Marsh, 1989; Marsh et al., 1984; Marsh, Parker, & Smith, 1983; Marsh & Smith, 1987; Meece, Parsons, Kaczala, Goff, & Futterman, 1982; Skaalvik & Rankin, 1994; Wigfield & Eccles, 1994). Furthermore, research conducted by Dusek and Flaherty (1981) and Marsh et al. (1984) found counter-balancing sex differences in specific domains (some favouring boys and others girls), to show stereotypic gender differences. Accordingly, in high school girls tend to have lower levels of self-concept in mathematics relative to boys (Meece et al., 1982).

When gender differences are identified in mathematics self-concept, they usually favour boys (Eccles et al., 1993; Johnsson-Smaragdi & Josson, 1995; Manger & Eikeland, 1997; Marsh, Smith, et al., 1988; Skaalvik & Rankin, 1994). Eccles, Adler, and Meece’s (1984) results suggest it is unclear as to whether girls have a higher verbal self-concept relative to boys. Several studies have failed to report gender differences in verbal self-concept (Eccles et al., 1993; Skaalvik & Rankin, 1994). One explanation for these findings, is that boys are more confident about their abilities in general compared with girls, so boys may have higher self-concepts in domains predominantly perceived as male areas (e.g., mathematics), but not necessarily lower self-concepts than girls in domains perceived as predominantly female (e.g., verbal; Skaalvik, 1997b).

However, some research exists that claims girls have higher verbal self-concepts. For example, Stevenson & Newman (1986) found that tenth grade boys have lower reading self-concepts than girls. Interestingly, responses across three different instruments concurred that boys reported having higher mathematics and general self-concepts whilst girls reported higher verbal and academic self-concepts (Marsh, Byrne, et al., 1988).

More recent reviews and studies (e.g., Marsh, Debus, & Bornholt, 2005; Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002; Watt, 2004) replicate the pattern of gender stereotypes found by Marsh and colleagues (Marsh, 1989; Marsh & Craven, 1997). As most of these studies have focused on mean levels of motivation when examining the effects of gender on the multiple dimensions of self-concept, few have tested for differences of kind. Marsh, Tracey, and Craven (2006) believe insufficient
attention has been paid to gender differences in the factor structure of self-concept, which Martin (2004) refers to as differences of kind. Differences of kind are examined in this study as they are integral to determining whether the factor structure of the given instrument measures the same components of self-concept with equal validity for males and females.

2.5 Summary of Chapter

This chapter has proposed an integrative model of student motivation, which explains the purpose for combining students’ goal orientations and academic self-concept into a more comprehensive model. It was proposed that students’ goal orientations and academic self-concept are interrelated and, when examined together, can provide a more thorough and complete explanation of student achievement than either set of variables taken alone. Arising from this review was a discussion on the multidimensional nature of students’ goals and academic self-concept. The intent of the next chapter is to examine the potentially hierarchical structure of students’ goal orientations and academic self-concept.
CHAPTER 3
HIERARCHICAL STRUCTURE OF GOAL ORIENTATIONS
AND ACADEMIC ACHIEVEMENT

3.1 Examining the Multidimensional and Hierarchical Structure of Students’ Goals

The examination of multiple goals (mastery, performance and social) allows for scrutiny of the individual goals, and some (first-order) interactions between them. An exclusive focus on goals at the first-order level, however, prevents investigation of the potential hierarchical structure of these goals and the full scope of (first- and second-order) interactions between them (McInerney, Marsh, & Yeung, 2003) and results in a fragmented and superficial view of student motivation. In contrast, examining a higher-order factor structure for goal orientations should enable a “common quality” of different goal orientations to be extrapolated, which quality represents a pooled or generalised notion of purposes for motivation, and which may be useful for explaining and predicting achievement outcomes. Positing a higher-order may also assist in accounting for how students coordinate multiple goals (Lemos & Goncalves, 2004).

Only a handful of recent studies have examined a possible hierarchy of students’ goals (Elliot, 2006; Elliot & Church, 1997; Elliot & McGregor, 1999; McInerney et al., 2003). Conceptualisations of the hierarchy in these studies differ in structure from each other and differ from the model in the present study. For instance, Elliot and colleagues integrated achievement motives (e.g., fear of failure and need for achievement) with goal orientations by postulating in their hierarchical model that achievement motives are antecedents of achievement goal pursuits. That is, the fear of failure and the need for achievement energises individuals and determines whether individuals are oriented towards either adaptive or maladaptive possibilities. In
Elliot and McGregor’s study (1999, p.628) “achievement motives are hypothesised to have distal (indirect) influence, and achievement goals a proximal (direct) influence on achievement relevant outcomes, and these motives and goals are viewed as working in tandem to regulate achievement behaviour”.

Instead of employing superior statistical procedures such as confirmatory factor analyses to test their model, Elliot and Church (1997) employed simultaneous regression analyses. Also deemed problematic in their hierarchical model is the conceptualisation of goals, which are construed as midlevel cognitive representations because they assume that individuals adopt either an adaptive or maladaptive approach. This assumption disregards much of the literature on multiple goal pursuits since it is possible for individuals to adopt conflicting goals simultaneously (Dowson & McInerney, 2001; Pintrich et al., 1993).

This study acknowledges the dichotomy of performance goals into approach and avoidance orientations but limits its focus to goals that orient individuals towards academic engagement. Unlike mastery, performance approach, and social goals, performance avoidance goals focus on avoidance of demonstration of low competence which often leads to poor academic engagement. Consequently, the hierarchical structure for this study emphasises only the approach forms of goal orientation, specifically: mastery goals, performance approach and social goals. No studies have attempted to explain adaptive multiple goal orientations as comprising mastery, performance approach and social goals until this study. It is hypothesised that, underlying all three adaptive goals is the purpose for achievement, but that the specific reason or content of these goals differs. Consequently the higher-order factor relates to purposes for achievement in academic tasks and the first-order discriminates the specific reasons.

This study builds on previous research by retaining a hierarchical model of students’ approach goals, and integrating it with a hierarchical model of students’ academic self-concept. Specifically, the higher-order models in this research posit a higher-order factor labelled “Purposes for achievement”. Thus, in the overall hierarchical structure, the distinguishing feature of each goal at the first-order level is its specific content, such that each individual goal represents a different purpose for
achievement. The overarching construct, in contrast, represents the fact that each goal is a purpose for achievement, regardless of its particular content. In this way, the model represents the opportunity to validate the theoretical structure of goal theory as a whole, which suggests that individual goals are integrated by their common definition as “Purposes for achievement”, but differentiated according to the different content of these purposes.

Figure 3.1 depicts the hierarchical structure discussed above. It shows that the associations between each of the first-order goals and the second-order factor “Purposes for achievement” have yet to be extensively explored in the literature. Moreover, because this higher-order factor has yet to be empirically tested, the structural inter-relationships between the first-order factors, specifically mastery, performance, and social goals, require investigation. Furthermore, even where correlations between multiple goals have been examined (e.g. Elliot, 2006; Elliot & Church, 1997; Pintrich, 2000b; Urdan, 1997), the ability of these correlations to imply the hierarchical structure suggested by goal theory has rarely been investigated (McInerney et al., 2003).

Figure 3.1. Hierarchical representation of students’ goals
3.2 Examining the Multidimensional and Hierarchical Structure of Students’ Academic Self-concept

Shavelson et al. (1976) proposed a multidimensional, hierarchical model of self-concept that fundamentally impacted on research on self-concept (Marsh & Hattie, 1996). Subsequent research has demonstrated this hierarchy to be fruitless because the weak correlations among the specific facets of self-concept (e.g., social, academic, physical, emotional) were in fact highly differentiated. According to Marsh and Shavelson (1985), in late adolescence there is even less evidence of a hierarchical organisation of self-concept. This is primarily due to subjects studied at high school being so distinct from each other, that attempting to represent self-concept in vastly different school subjects is problematic. Instead, Wigfield, Eccles, and Pintrich (1996) in their review of research, acknowledge a pattern of self-concept development from differentiated and hierarchical to differentiated into entirely distinct entities, and this pattern appears most strongly during adolescence (Skaalvik, 1997).

Predominant focus on the multidimensionality of self-concept in contemporary research has led to a lack of attention towards general self-concept and self-esteem in educational research (Skaalvik, 1997a). Moreover, despite the overwhelming number of studies reporting a weak hierarchy, there have been some exceptions where researchers have provided evidence for a hierarchy of academic self-concept. For instance, El-Hassan (2004) found support for a hierarchical structure of self-concept for adolescence since his findings provided evidence that academic self-concept was represented by English and mathematics self-concept. Positive correlations between English self-concept and mathematics self-concept were reported by Yeung et al., (2000) indicating that a higher-order factor represented these two distinct yet related self-concepts. Skaalvik and Rankin (1992) attest that when positive correlations between English and mathematics self-concepts are reported, this is an indication that not all students make internal comparisons whereby they judge their competence in one subject to be better than in another. Hence, positive correlations indicate that individuals may judge themselves as having equal ability in both subject domains.
Interactive effects of domain-specific self-concepts, their structural relationship to global self-concept, and the impact of this entire hierarchical structure have not been typically tested (although see Marsh & Yeung, 1998a; Lau, Yeung, Jin & Low, 1999, for some recent exceptions to this generalisation). An aim of this study is to test and evaluate an a priori hierarchical confirmatory factor analysis model that posits one higher-order factor (academic self-concept) that is consistent with the design of the SDQ and the Shavelson et al. (1976) model on which it was based. This study extends previous research by examining this hierarchical structure of self-concept alongside the hierarchical structure of goals.

Figure 3.2 is a pictorial representation of the literature reviewed above, and demonstrates that the multidimensional nature of self-concept is widely supported but the hierarchical structure needs further investigation.

![Figure 3.2. Hierarchical representation of students’ academic self-concept](image)

Few researchers have explored relations between self-concept and goals (although see Anderman et al., 1999; Martin & Debus, 1998; Skaalvik, 1997a; and Skaalvik et al., 1994; for some exceptions to this generalisation). Of these studies, most have been limited to an investigation of mastery and performance goals with self-concept, and did not include a hierarchical structure for either goals or self-concept. Within this context, the purpose of the present study was to build upon previous work by providing a measurement framework within which the interaction of multiple goals, domain-specific self-concepts, and their higher-order factors may be examined simultaneously.
3.3 Summary of Chapter

This chapter presented the potential for students’ goals and academic self-concept to be represented as multidimensional and hierarchically structured. This study confirms that few goal theory researchers have evaluated a hierarchical model of achievement goals. It proposes a hierarchy comprising multiple approach goals that focus on the differentiated purposes for achievement. In addition to the goals hierarchy was the proposed higher-order structure of self-concept that evaluates the potential for students’ academic self-concepts to be represented by two distinct subject domains, English and mathematics.

The first two chapters of the literature review have addressed the multidimensional and hierarchical structure of students’ goals and academic self-concept. The subsequent chapters of the literature review (Chapters Four and Five) focus on the independent and combined effects of goals and academic self-concept on academic achievement.
CHAPTER 4
RELATIONS BETWEEN GOALS AND ACADEMIC SELF-CONCEPT WITH ACADEMIC ACHIEVEMENT

4.1 Goals and Academic Achievement

Research on goal theory consistently maintains that mastery goals orientations may be robust predictors of academic success (Pintrich & Schunk, 1996). Since students have been shown to adopt multiple goal orientations, current research has begun to explore the independent and interactive effects of these goals on outcome measures such as academic performance and achievement (Barron & Harackiewicz, 2000; Harackiewicz et al., 2002; Hidi & Harackiewicz, 2000; Pintrich, 2000a).

Consistently, research on goal theory maintains mastery goals are associated with favourable cognitive, affective, and behavioural outcomes (Barker, Dowson, & McInerney, 2002; Harackiewicz et al., 2002). Intriguingly, the results from studies that examine the direct relationship between mastery goals and academic achievement and performance attainment show lack of a strong relationship between mastery goals and academic achievement (Meece et al., 2006). Meece et al. (2006) and Linnenbrink (2005) believe the form of measurement for academic achievement may be a reason for the absence of a clear relationship with mastery goals. They argue that measures of achievement are not designed to assess processes that align with a mastery goal such as deep understanding, challenge or complexity. When studies have assessed challenge, complexity and personal value, the correlation between academic achievement and mastery goals has been strongly positive (see for example Grant & Dweck, 2003).
Of the studies that have found a relationship between mastery goals and academic achievement, results have varied. Results reveal inconsistent findings such that some indicate a positive relationship between mastery goals and academic performance (Sideridis, 2004; Tanka & Yamauchi, 2001; Vansteenkiste, Simons, Lens, Soenens, & Matos, 2004) while the remainder report null results (Brett & VandeWalle, 1999; Lee, Sheldon, & Turban, 2003; Malka & Covington, 2005; Skaalvik, 1997b).

One study that reported the positive effects of mastery goals on academic achievement was that of Finney, Pieper, and Barron (2004). Their results concluded that mastery goals significantly predicted end of semester grades. Also reporting positive effects between mastery related behaviours and academic achievement was a study conducted by Aunola, Leskinen, and Nurmi (2006). They examined intrinsic motivation of primary aged students. Of particular importance is their finding that intrinsic motivation predicted mathematics performance. Their longitudinal data demonstrated that the higher the level of intrinsic motivation students reported, the more superior level of mathematical performance they exhibited later on. Positive relations between mastery goals and achievement have also been reported in non-academic domains. In a sports setting, individuals in the pursuit of a mastery goal performed better overall compared with individuals in the pursuit of a performance goal (Burton, 1989; Hall, 1990).

Previous research on relations between performance goals and academic achievement has revealed some ambiguous findings, since half of the existing studies examining performance goals report positive relations on measures of interest and achievement (Bouffard et al., 1998; Pintrich, 2000c; Urdan, 2004; Wolters, 2004; Wolters, Yu, & Pintrich, 1996), whereas the remaining half report negative and null effects (Elliot & Church, 1997; Kaplan & Maehr, 1999). Only Linnenbrink (2005) has reported negative relations between performance approach goals and academic achievement. Urdan (1997, p.108) questions whether performance goals are always “bad” and, importantly, whether this goal pursuit is unhealthy for all students all of the time.
Potentially adverse consequences of pursuing a performance approach goal are ardently contested and have evoked a lively debate between Midgley and her colleagues (Kaplan & Middleton, 2002; Midgley et al., 2001) and Harackiewicz, Barron, Pintrich, et al. (2002). Harackiewicz et al.’s perspective is that performance approach goals have either null or positive effects on motivation and achievement whereas Midgley et al.’s perspective is that the effects of a performance approach goal depend on previous record of achievement, age, perceived ability, and the cultural characteristics of an individual (Urdan & Mestas, 2006). Variation of performance approach goals and their effect on motivation and achievement warrants further consideration.

Inconsistent findings of performance goal studies may be a function of researchers not differentiating between performance approach and performance avoidance goals in their studies. Since contemporary research on goal theory began to dichotomise performance goals into performance approach and performance avoidance, more consistent results have emerged that demonstrate the deleterious effects of performance avoidance goals and the positive effects of performance approach goals (Harackiewicz, Barron, Tauer, & Elliot, 2002; Pajares & Valiante, 2001; Zusho, Pintrich, & Cortina, 2005).

Harackiewicz et al. (2000) examined performance approach goals over time and illustrated that performance approach goals predicted academic grades over a two-year period for college students. These results confirm that performance approach goals are critical to the success of college age students. Moller and Elliot (2006) reveal in their review of achievement goals that performance approach goals emerge as the strongest and most consistent positive predictor of performance attainment relative to other achievement goals. They highlight studies conducted which document improvements to exam performance for college aged students (Elliot & McGregor, 2001) and increases in mathematics exam performance for adolescent students who pursue performance approach goals (Cury et al., 2006).

Roeser et al. (1996) found that performance goals were positively correlated to academic self-efficacy and grade point average. Performance approach goals were associated positively with achievement (Elliot et al. 2005; Sideridis, 2005). Dweck
and Leggett (1988) and Nicholls (1984, 1989) obtained results which confirm students who are high in ability and oriented toward performance goals may have enhanced motivation and increased level of performance, as it is hypothesised these students may demonstrate their superior ability (Urdan, 1997). High levels of intrinsic motivation were affiliated with teaching practices that fostered performance goals (Harackiewicz & Elliot, 1993).

Limited research has been conducted on the simultaneous pursuit of multiple goals and their combined effect on academic achievement. Meece and Millers’ (1996) findings of students’ learning goals shifting toward work avoidant goals are consistent with Martin and Debus’ (1998) research, which examined students’ pursuit of dual motivational goals (including ego-orientation and task-orientation) on student performance. It was found that students who were highly motivated according to both goals performed poorly, relative to students who pursued one goal.

Unlike academic goals (e.g., mastery and performance goals), social goals are referenced directly to academic tasks and referenced to the individuals or groups associated with the academic tasks (Dowson, 1999; Dowson & McInerney, 2003). Social reasons for trying to achieve in academic situations are the dominant concerns for individuals pursuing social goals (McInerney et al., 1997; Urdan & Maehr, 1995). Few direct links between social goals and academic achievement have been established in the literature (Urdan & Maehr, 1995). Nonetheless, there is reason to suspect that social goals may be linked to achievement, either by supporting the positive effects of other goals on achievement, or ameliorating their negative effects (Barker, Dowson, & McInerney, 2005a).

Wentzel is one of the few researchers who has investigated social goals and performance attainment and who has demonstrated that social goals are integrally related to academic performance (Wentzel, 1993; 1996). In particular, student willingness to pay attention and cooperate during academic tasks has been shown to sustain efforts to achieve academically (Wentzel, 1996).
Social goals, as defined in the present study, were found in Dowson’s (1999) study to enhance English achievement both directly and indirectly through cognitive and metacognitive strategy use. The reverse was true for social goals and mathematics achievement. A negative direct effect between social goals and mathematics achievement was reported but an indirect effect through cognitive and metacognitive strategies outweighed this negative direct effect, such that the overall effect of students’ social goals on mathematics achievement was both positive and significant. It appears from these results that social goal pursuits for learning enhance achievement in English and, when accompanied with students’ strategic approaches to learning, can enhance mathematics performance.

Dated research had found it difficult to establish links between measures of achievement motivation and academic achievement. However, more recent research has provided stronger evidence validating relations between goal orientations and academic success (Harackiewicz, Barron, Tauer, et al., 2002). Furthermore, when investigating recent theoretical advances to theory it is necessary to employ new research methodologies. Hence, testing the multiple goal perspective requires hypothesis generation beyond the mastery and performance goal dichotomy. Additionally, research testing the multiple goal perspective should investigate the independent and interactive effects of mastery, performance, and social goals on various outcomes (Harackiewicz, Barron, Pintrich, et al., 2002). Examining all three goals provides a richer explanation for achievement-related behaviour. Although this study focuses on approach forms of motivation exclusively, and expands the multiple goal perspective to include social goals, it does examine the effects of all three positively oriented goals on academic achievement.
4.2 Academic Self-Concept and Academic Achievement

Numerous studies show persistent correlations between academic achievement and academic self-concept (Brookover & Passalaqua, 1981; Brookover, Paterson, & Thomas, 1962; Byrne, 1996b; Byrne & Worth-Gavin, 1996; Jones & Grieneeks, 1970; Marsh, 1993b; Marsh & Craven, 1997; Marsh & Yeung, 1997a; Maruyama, Rubin, & Kingsbury, 1981; Mujis, 1997; Skaalvik, 1990; Skaalvik & Rankin, 1990, 1995a, 1995b; Skaalvik et al., 1994). Academic achievement in specific domains is more highly correlated with academic self-concepts in the same domain (for example, English achievement and English self-concept).

A number of empirical studies have attempted to demonstrate how self-concept (differentiated into academic and non-academic self-concept) correlates in school-age children with other school variables such as achievement. Positive self-concept is assumed to be predictive of academic success whilst negative self-concept is assumed to be predictive of poor academic achievement (Purkey, 1970; Rosenberg & Gaier, 1977).

4.2.1 Causal ordering of academic self-concept and academic achievement

Numerous studies have attempted to answer one of the most vexing questions proposed in academic self-concept research: the causal orderings of academic self-concept and academic achievement. Researchers debate the causal ordering of academic self-concept and achievement (Shavelson & Bolus, 1982) and suggest that the ordering is yet to be clearly defined (Anderman et al., 1999; Pottebaum, Keith, & Ehly, 1986). Wigfield et al. (1996) consider that a conclusive model substantiating the causal direction of academic self-concept and academic achievement will be difficult to prove.

Various patterns of causation are argued by the researchers. Some argue that achievement affects self-concept (skill-development model), others maintain self-concept affects achievement (self-enhancement model), and still others assert achievement and self-concept affect each other (reciprocal relationship model). “The results have been contradictory” (Mujis, 1997, p.265). The controversy between the proponents of these models of self-concept and academic achievement is of practical
and theoretical importance. Surprisingly, few empirical studies have examined the patterns of causation (Helmke & van Aken, 1995). The majority of studies that have been conducted have implemented inappropriate designs for interpreting causal interpretations, for example, cross-sectional designs (Guay, Marsh, & Boivin, 2003). In a comprehensive review of the literature, Byrne (1984) presented a list of recommended prerequisites for studies examining the causal predominance of academic achievement and self-concept. Noted in the list was (a) the importance of substantiating a statistical relationship between the academic achievement and self-concept, (b) establishing clear time precedence in longitudinal studies, and (c) testing for causal flow using techniques such as confirmatory factor analysis. Studies that fulfil the above prerequisites are discussed below, with reference to the variety of proposed models.

The skill-development model maintains that past achievement, whether successful or unsuccessful, influences the formation of self-concept but self-concept does not influence achievement (Valentine & DeBois, 2005). Underpinning the skill-development model are principles of reflective appraisals (Rosenberg, 1979), social comparisons (Festinger, 1954), and internal/external frames of reference (Marsh, 1986a). These theoretical principles, although distinct, commonly predict that individuals' comparisons with significant others in relation to academic achievements cause changes to an individual’s self-concept. Newman (1984) found support for the skill-development model of causality since his results indicated a causal predominance of academic achievement over academic self-concept. Newman argued that changes in self-concept were a consequence of improvements in academic achievement. Interestingly, however, a re-analysis of Newman’s data by Marsh (1988) denoted findings which showed the opposite; that is, academic self-concept influenced subsequent academic achievement.

Self-enhancement programs (see Scheirer & Kraut, 1979) speculate that an improvement in self-concept will lead to improved academic performance (Helmke & van Aken, 1995) and that achievement does not influence self-concept. This model stemmed from self-consistency theory (Jones, 1973), which predicts that students with poor self-concepts avoid achievement-related situations that may modify their self-concept and for this reason they minimise effort to perform well.
The importance of protecting the self from consequences of failure has long been emphasised in research (Beery, 1975; Covington, 1984, 1992, 1997). Failure is often interpreted by individuals as indicative of low ability and, since ability is associated with self-worth, failure significantly impacts self-worth. Acknowledging self-worth theory and links to attribution theory, students with low expectations of success often impede successful performance by enabling avoidance type strategies that negatively impact on achievement and eventually demolish the desire to learn. Conversely, students with high self-concepts approach achievement-related situations that may modify their self-concept and for this reason they maximise efforts to perform well. Specifically, the self-enhancement model holds that positive self-beliefs promote increased levels of achievement. The self-enhancement model supports interventions and school reforms that are aimed at improving students’ self-concept because from this model’s perspective, they will result in improvements to students’ academic achievement (DuBois, 2001; Kahne, 1996).

Perhaps a more realistic compromise between the skill-development model and self-enhancement model is a reciprocal-effects model. The reciprocal-effects model potentially accounts for evidence supporting both of the above sets of causal orderings (skill-development and self-enhancement models). Marsh (1984) proposed such a reciprocal-effects model, which claims academic self-concept and academic achievement are mutually reinforcing and changes in one will produce changes in the other.

Marsh and Yeung (1997b) supported this relationship in their examination of the causal ordering of self-concept and achievement but found only one of four effects of prior self-concept on subsequent achievement was statistically significant. Marsh (1987) believes the form of measurement for academic achievement determines the strength of the relationship between self-concept and achievement. Paths from self-concept to achievement are strongest when achievement is measured from school-based assessment tasks, whereas the path is weaker for low-stakes standardised tests, where students are availed of few opportunities or incentives to study for these tests. Consequently, attributes such as study practices, effort, and persistence are unlikely to influence test performance. Conversely, these attributes are likely to be employed for school-based examinations which impact upon test performance. School grades
therefore typically take into account these attributes (e.g., students are penalised for incomplete assignments or late submissions, careless mistakes, but rewarded for diligence and hard work). Effects of self-concept on subsequent achievement should therefore be stronger when achievement is determined by high-stakes school grades rather than low-stakes standardised tests (Marsh, 1993b; Marsh & Yeung, 1997b; 1998b; but also see Helmke & van Aken, 1995).

In this review of existing research on causal ordering of self-concept and academic achievement it is apparent that many studies focus on the more general academic self-concept rather than examining the specific facets of academic self-concept (for example, English self-concept and mathematics self-concept) and their effect on specific domains of academic achievement. Even fewer studies have tested causal ordering of these variables for non-English speaking students. Future research would welcome cross-cultural causal models to examine the generalisability of causation in non-Western countries. Marsh and Craven (2006) highlight the need for researchers of causal ordering effects of self-concept and academic achievement to examine moderating and mediating variables. They also encourage researchers to evaluate the adequacy of the self-development, self-enhancement, and reciprocal-effects model using their prototype model. This prototype model, as well as recent advances in conducting analyses of causal ordering, is described in detail in the relevant methodology chapter.

4.2.1.1 Developmental effects on the pattern of causal ordering
Research on self-concept and academic achievement has predominantly focused on answering the vexed question of the causal ordering of these constructs. As reviewed above, a number of competing models are proposed to explain the relations. Recently a developmental perspective has accounted for mixed causality findings by suggesting that as children age and develop, their perceptions of self, which become more differentiated, result in changes to the causal flow (Chapman & Tunmer, 1997; Guay et al., 2003; Jacobs et al., 2002; Skaalvik & Hagtvet, 1990; Wigfield & Karpathian, 1991).
Developing understandings of competence continually change during early and late childhood (Marsh & Shavelson, 1985). Compared with younger children, older children have more negative self-concepts which are more highly correlated with external academic outcomes. Consequently, as children develop, their appraisals of academic self-concept become more reliable and stable and less positive, such that they begin to correlate with teacher ratings (Marsh & Craven, 1997; Marsh, Craven, & Debus, 1998; Wigfield et al., 1997).

Processes of ageing and development also influence children’s appraisals as they begin to systematically relate to external outcomes, and these judgements of relative strength and weakness meld into their self-concept. Progressive differentiation of multiple dimensions of self, plateaus during preadolescence when social comparison processes and cognitive maturity are adequately developed. This pattern of differentiation led to the formation of the differential distinctiveness hypothesis (Marsh & Ayotte, 2003). Essentially, this theoretical model explains how facets of self-concept become increasingly defined as children develop. Emergence of this developmental pattern has led researchers to propose that young children’s academic achievement affects their academic self-concept (which explicitly denotes application of the skill-development effects model of causation) but, as children grow older, the causal flow changes to a reciprocal-effects model (whereby not only does academic achievement affect academic self-concept but academic self-concept affects subsequent achievement). It has been speculated that by late adolescence, self-concept of ability may actually become predominant over academic achievement (Skaalvik, 1997a).

Valentine and colleagues (2001; Valentine & DuBois, 2005; Valentine, DuBois, Cooper, 2004) considered the potential moderating effects of age in their meta-analysis of tests of the reciprocal-effects model using self-beliefs and academic achievement. Although their research encapsulates a more general self construct, their results provide insight into the possible effects of age on this construct and academic achievement. Valentine (2001) predicted the relationship between self-beliefs and achievement would be weaker for primary-school aged students and stronger for middle and high school students but his findings determined that age and school level were unrelated to the effects of academic self-beliefs on academic
achievement. A meta-analysis led Valentine to conclude that there was insufficient evidence to support the hypothesis that relations between self-beliefs and achievement vary as a function of age.

Complicating conclusions from the developmental perspective are very recent findings that ascertain young children’s self-concept is differentiated at an earlier age than previously reported (Marsh & Craven, 2006; Marsh et al., 2005; Marsh, Ellis, & Craven, 2002; Marsh, Tracey, & Craven, in press). Serious implications arise with recent developments in the measurement of young children’s self-concept and affiliated findings that demonstrate that children as young as four can differentiate among the multiple dimensions of self. Marsh et al. (1999) contend that although progressively with age, academic achievement and academic self-concept relate more strongly, there is insufficient evidence to establish whether causal relations between these variables alter with age or if the differences indicate underlying processes or researchers’ inability to accurately measure these constructs with younger children (Marsh, Trautwein, Lüdtke, Köller, & Baumert, 2005). Notably, conclusions from the developmentalists regarding causal relations between self-concept and achievement, which postulate a skill-development model for younger children, may now be premature due to more reliable and valid measures being established which were developed after many of these causal studies. However, for adolescents reciprocal-effects causal ordering remains the preferred explanation (Marsh & Craven, 2006).

4.3 Summary of Chapter

Chapter 4 reviewed the literature on relations between goals and academic achievement and academic self-concept and academic achievement. Research shows a weak relationship between mastery goals and academic achievement; however, performance goals have been shown to relate more strongly to academic achievement. There are no conclusive findings on relations between social goals and academic achievement because very few studies have examined this relationship. In contrast, relations between academic self-concept and academic achievement have been extensively researched. Studies have extended beyond correlations to examining the vexed question on causal ordering of the variables. There is a strong
argument that during adolescence, the relationship between academic self-concept and academic achievement is reciprocal (Marsh & Craven, 2006).

Chapter 5 proceeds with a review of the literature on relations between goal orientations and academic self-concept. The research findings reviewed in Chapters 4 and 5 are utilised to form hypotheses on how goals and academic self-concept relate, to affect subsequent academic achievement.
CHAPTER 5
CAUSAL RELATIONS

The previous chapter demonstrated that substantial research has been conducted on the relations between self-concept and academic achievement, as well as relations between goal orientations (mastery goals and performance goals) and academic achievement (Gottfried, Fleming, & Gottfried 2001; Marsh & Craven, 2005). Regrettably, few direct links between social goals and academic achievement have been established in the literature (Urdan & Maehr, 1995). Few studies have attempted to relate both goal theory, confined to mastery and performance goals, to academic self-concept and academic achievement, and even fewer studies have assessed the causal ordering of these variables on academic achievement. Direct evidence of causal ordering of goals (of any kind), self-concept (in any domain) and achievement is almost absent. However, based on the few correlational studies available and findings from experimental studies it is feasible to form hypotheses for how these variables may be causally related. Consequently, relations established in the literature between academic self-concept and students’ goals are reviewed and studies that relate to similar constructs (e.g., self-efficacy, self-esteem, intrinsic motivation) have also been included in this review. These research findings are then utilised to form hypotheses of competing models of causality which are later empirically tested.

5.1 Relations Between Goals and Academic Self-concept

Studies have repeatedly shown strong relations between students’ academic self-concept and a variety of motivational indicators. Some examples include students’ ratings of effort (Skaalvik & Rankin, 1995a), teachers’ ratings of level of engagement, persistence in classroom activities (Skaalvik & Rankin, 1996a), and measures of intrinsic motivation (Meece et al., 1988). Specific to the limited
research on the relations between goal theory and self-perceived abilities, mastery goals and performance goals have been found not to correlate significantly with self-perceived abilities, or the relations have been found to be weak (Ames & Archer, 1988; Nicholls, 1989; Nicholls et al., 1985).

Significant correlations of self-perceived ability with mastery goals are more frequently positively associated (Meece et al., 1988; Nicholls, 1989; Duda & Nicholls, 1992; Skaalvik & Rankin 1994, Skaalvik, 1996). Specifically, Wolters et al. (1996) showed that students high in mastery goals but low in performance goals were the highest in self-efficacy, task value and strategy use. Research shows inconsistent relations between performance goals and students’ self-perceived abilities. For example, Ames and Archer’s (1988) and Schunk and Swartz’s (1993) studies reported relatively weak correlations between perceived ability and performance goals. In contrast, Nicholls’ (1989) findings indicated positive correlations between the two variables.

Pajares et al. (2000) revealed that task goals were associated positively with self-efficacy and self-concept, whereas performance approach goals were associated negatively with self-concept. Relations between self-perceptions and intrinsic motivation have been demonstrated to increase across school years (Bouffard, 2000). Bouffard’s finding is consistent with researchers who contend that students’ self-perceptions of competence and intrinsic motivation fuel each other along the school years (Skaalvik & Rankin, 1995a; Stipek, 1992).

Students who acknowledge higher feelings of efficacy toward their schoolwork endorsed mastery goals and perceived the learning environment as fostering mastery goals (Ames & Archer, 1988; Midgely, Anderman, & Hicks, 1995; Park, Pintrich, & Midgley, 1992). Conversely, those students were less likely to adopt performance goals and perceived the learning environment as de-emphasising performance goals (Ames & Archer, 1988; Midgely, Anderman, & Hicks, 1995; Park, Pintrich, & Midgley, 1992).
Dweck and colleagues have theorised that students who pursue performance goals are more vulnerable to changes in their self-esteem because their self-worth is contingent on external validation (Burhans & Dweck, 1995; Dweck, 1999; Molden & Dweck, 2000; Mueller & Dweck, 1998). Linkage between self-esteem and performance goals, as well as self-esteem and mastery goals, was directly examined by Robins and Pals (2002). They hypothesised that since the pursuit of a performance goal elicits a vulnerability to helplessness, then these individuals are more likely to experience shame and distress in academic settings and should experience more negative effect. They hypothesised that, conversely, the pursuit of a mastery goal will elicit feelings of determination and inspiration so these individuals should experience more positive effects. Consistently with these predictions, their findings show that students pursuing performance goals were more likely to be distressed and upset, relative to those who pursue a mastery goal. They also acknowledged the positive effect of pursuing a mastery goal because these individuals were more likely to feel determined, enthusiastic, excited and strong. Interestingly, Robins and Pals (2002) used growth curve modelling to examine the cumulative implications of these variables for self-esteem over the long-term. On average, their results showed that students in pursuit of a mastery goal had relatively higher self-esteem than performance oriented individuals and were on an upward trajectory relative to performance oriented individuals, this disparity increasing over four years.

Kaplan and Maehr (1999) conducted a study that was underpinned by Anderman and Maehr’s (1994) theoretical model, which proposes that goals (task and ego goals) and self-processes (academic self-efficacy) mediate between students’ perceptions of the school environment (emphasising either task or ego goals) and affective (attitudes and effect) and behavioural (learning strategies, choice and preferences) outcomes. Results stemming from this study showed the adaptive nature of task goals and the questionable nature of ego goals. In sum, schools that emphasise task goals influence students’ adoption of task goals and this goal pursuit positively relates to self-efficacy and GPAs. Findings for ego goals were not as ubiquitous as those for task goals. Kaplan and Maehr’s results from hierarchical multiple regression on goal orientations as predictors of academic self-efficacy, showed positive but
nonsignificant relations between adopting an ego goal and predicting academic self-efficacy. This result was replicated for African and Euro-American students.

Caution is warranted when interpreting and generalising findings from Kaplan and Maehr’s two process models, primarily due to the small sample and the inability of the models to reach criterion values for the goodness of fit indices. Overall findings suggest that school task goal emphasis and academic self-efficacy combined, cause students to adopt task goals. This pattern however does not appear for ego goals, as the relation between ego goal adoption and self-efficacy was unrelated for Euro-Americans but negatively related for African Americans. Data for this study was collected on one occasion and is correlational in nature, such that interpretations of processes involved are limited. Studies that collect data across multiple waves can provide insight into the causal predominance of these variables and the processes involved so as to make predictions for how these constructs relate across time.

Boekaert (1993) developed a model of effective-learning processes which proposes that self appraisals of ability to meet demands of a task give rise to positive or negative emotions, depending on whether the appraisal is positive or negative, and these effects predict task related behaviour. When an individual perceives an important task as demanding and consider themselves as capable of meeting the task requirements, intense positive emotions arise, accompanied by mastery oriented self regulatory processes. Alternatively, when an individual construes an important task as demanding and perceives themselves as incapable of meeting the task requirements, intense negative emotions arise which are accompanied by the deployment of coping strategies or stress reduction approaches. Based on Boekaert’s model, positive perceptions of ability may lead individuals to pursue mastery goals, while poor perceptions of ability may lead individuals to pursue performance goals, and these are more likely to be performance avoidance goals than performance approach goals as the focus is on avoiding failure.

Extrapolated from Treasure and Biddle’s (1997) findings on goal orientations and self-esteem were results showing task goals predicted global self-esteem both directly and indirectly through self-perceived ability and physical self-worth. Interestingly, perceived ability mediated the effects of ego orientation on physical
self-worth. Overall they contended that, for elementary aged children, task goals appear to facilitate physical self-worth and global self-esteem. Unlike Treasure and Biddle who found only task goals predicted self-esteem, Kavussanu and Harnisch (2000) found ego goals also predict self-esteem. In particular, these researchers found that students with high ability perceptions who pursued either a task goal or ego goal had higher self-esteem. Kavussanu and Harnish (2000) explained that ego goals have adaptive motivational patterns similar to task goals and these patterns are most similar for individuals with high ability perceptions.

5.1.1 Mastery goals and academic self-concept
Studies indicate that the effect of academic achievement on motivation is mediated through academic self-concept (Norwich, 1987; Skaalvik & Rankin, 1995a, 1996). Ames’ (1990) experimental research found that after one year, students encouraged to foster mastery goals demonstrated stronger preferences for challenging tasks, greater propensities to apply effective cognitive strategies, enhanced intrinsic motivation, and higher self-concepts of ability. The present study suggests, therefore, that manipulating mastery goals may result in more positive self-concepts and academic cognition.

In pursuing issues on classroom contexts, Aunola et al., (2006) found that levels of intrinsic motivation for mathematics increased in classrooms where the teacher acknowledged the development of self-concept as an integral pedagogical goal. Importantly, the results from this study highlight that the pedagogical goals reported by teachers (which included enhancing self-concept) also impact the development of their students’ intrinsic motivation, and that intrinsic motivation predicted mathematics performance outcomes for the future.

Kaplan and Maehr (1999) found that holding task goals was a significant positive predictor for measures of wellbeing and Grade Point Average (GPA). Among high school aged students, MacIver, Stipek, and Daniels (1991) found a causal relationship between academic self-concept and intrinsic motivation. They showed that self-perceptions of ability predicted directional changes in intrinsic motivation. Skaalvik and Rankin (1996) also identified indirect and direct effects of persistence and engagement in classroom tasks (i.e., mastery goal-type behaviours) on
achievement, with the indirect effect of mastery goals being mediated through self-concept of ability.

According to Marsh’s internal/external frame of reference model, it is likely that mastery goals relate closely to internally referenced processes. An internal frame of reference relates to individuals comparing their own perceived ability in one subject domain with their perceived ability in another domain. Mastery oriented individuals focus on effort, and on seeking competence. They are self focused, so that improvement and competency is judged on the basis of their own previous achievements rather than on their own achievement relative to others. It appears that mastery goals are closely associated with the processes that align with Marsh’s internal frames of reference.

5.1.2 Performance goals and academic self-concept

Research studies that examine performance goals and their relationship with self related constructs have reported mixed findings. A valid explanation for inconsistent results of the relations between academic self-concept and performance goals may be attributed to difference in measurement (Skaalvik, 1997a). Research considering the dichotomy of performance goals into performance approach and performance avoidance may hypothesise academic self-concept to be positively associated with performance approach and negatively associated with performance avoidance.

Students oriented toward either a performance approach or avoidance goal are concerned with how well others are performing relative to oneself. Students with a predisposition to focus on comparisons and who hold low ability perceptions may attempt to avoid looking stupid, predicting a negative correlation between ability perceptions and performance avoidance goals. In contrast, it may influence students with high ability perceptions to attempt to outperform others, predicting a positive correlation between ability perceptions and performance approach goals. Congruent with this explanation, self-perceived abilities have been found to relate positively with performance approach goals and negatively with performance avoidance goals (Skaalvik, 1996b; Skaalvik, 1997c; Skaalvik & Rankin, 1994).
Elliot and Moller (2003) reviewed studies that examined the effects of performance goals on self-efficacy. These researchers found no research reporting negative effects but 4 studies which reported null effects (i.e., Middelton & Midgely, 1997; Middelton & Midgely, 2002; Pajares, Britner, & Valiante, 2000; VandeWalle, Cron, & Slocum, 2001). Overwhelmingly, 10 studies reported positive relations between performance approach goals and self-efficacy (i.e., Bong, 2001; Church, Elliot, & Gable, 2001; Elliot & Church, 1997; Pajares et al., 2000; Skaalvik, 1997c; Sideridis, in press; Smith, Duda, Allen, & Hall, 2002; Smith, Sinclair, & Chapman, 2002).

The direct relationship between performance goals and self-concept was investigated by Conway and Howell (1989). Specifically they examined positive bias in the recall of self-referent words under performance orientation and non-performance orientation conditions. Results attest that individuals conditioned to a performance goal recalled significantly more self-referent words than non-performance conditioned individuals. Conway and Howell (1989) postulated that performance oriented individuals access a more positive self-schema, which was argued to be attributable to either (a) impression management in the face of a threat to the self-concept (Singer & Salovey, 1988) or (b) a sense of challenge that activated positive cognitive information (Smith & Ellsworth, 1985).

Although yet to be empirically tested, theoretically there is a strong link between performance goals and external comparisons from Marsh’s frames of reference model. According to Marsh’s internal/external frame of reference model, it is likely that performance goals relate closely to externally referenced processes. An external frame of reference relates to individuals comparing their own perceived ability in one subject domain with their classmates’ performance in the same subject. Similarly, performance oriented individuals are motivated to achieve by making external comparisons in an attempt to outperform others and to demonstrate their ability relative to others. They are others-focused, so success is judged on the basis of their perceived ability relative to their classmates’ abilities. Performance goals are closely associated with external comparisons, which are used to form academic self-concepts. This could explain why in the reported research, performance goals more often relate positively to self-concept.
5.1.3 Social goals and academic self-concept

This researcher of the present study is not aware of any studies that examine relations between academic self-concept and social goals (as defined in this study), other than the research conducted by the researcher and her colleagues (see for example, Barker, Dowson, & McInerney, 2004a, 2004b, 2006a, 2006b). Barker and colleagues exclusively examined correlations between students’ mathematics and English self-concepts and social goals and showed that social goals positively and strongly relate to mathematics self-concept but that the correlation for English self-concept is weaker. Strong relations between mathematics self-concept and social goals could arise as a result of external comparisons by students. Similarly to performance goals, social goals are also externally referenced. External comparisons may be more salient in mathematics due to the evaluative and competitive nature of the subject (Aunola et al., 2006).

Despite the lack of research on social goals and academic self-concept, there is a study that has researched social goals and self-efficacy (Patrick et al., 1997). Since the social goals and self construct examined in Patrick et al.’s (1997) research are similar but not identical to those investigated in this study, it is important to review this research and subsequently make some inferences regarding how social goals and academic self-concept may be related.

Patrick et al. (1997) highlight the importance of social goals as they influence students’ academic efficacy. Their findings indicate that social responsibility goals and social intimacy goals are related significantly to academic efficacy. Motivational theorists need to seriously consider the contribution that students’ social goals make to their beliefs about achievement behaviour at school because Patrick et al. provide empirical evidence that students’ evaluations of ability to complete academic tasks are related to their motivation to be socially responsible. These results signify the value of pursuing research that considers social goals in relation to academic aspects of school, not simply researching social relationships. Patrick et al. recommend that researchers “pay greater attention to students’ social relationships, beyond noting generally that school is a social place” (p.120).
The literature reviewed thus far provides strong evidence for an integrative model of student motivation by showing how each of the constructs relates with the other. Chapter 4 commenced with a review of the literature that highlighted the relationship between students’ multiple goals and academic achievement as well as the relationship between academic self-concept and academic achievement. Reviewed in this chapter, was the relationship between self-concept and students’ goal orientations. Findings from all of these studies have been considered in the formation of three competing hypothesised models of causation. These hypothesised models are justified below and addressed in the hypothesis chapter that follows.

5.2 Rationale for Competing Models of Causality

5.2.1 Causal ordering 1: Goals, self-concept, and achievement
Correlations between self-concept and goal orientations provide important information about their relationship but do not provide evidence for how they are causally related. A rationale for how goals could potentially be causally predominant over academic self-concept in affecting academic achievement is considered below.

5.2.1.1 Mastery goals, self-concept, and academic achievement
Nicholls (1984a) argued that the different achievement goals adopted by individuals influence conceptions of competence and govern the degree of success within an achievement setting. Since goals affect learning and performance, it is likely that they also contribute to adolescents’ wellbeing. Behavioural, coping and emotive processes are all influenced by the various goal pursuits. For example, mastery goals differ from performance goals in the degree to which students evaluate events in relation to the self, especially to one’s perceived competence (Kaplan & Maehr, 1999).

In an achievement-related context, students may construe a task to be competitive and the main objective of outperforming others is construed to be the purpose for achievement. That is, success is determined upon social comparisons. In terms of developing a positive self-concept, this perception about the task is unquestionably hazardous, since outperforming others is a limited commodity. Only a few students will experience success since most end up “losers” to some degree, a factor that
probably influences their sense of self. Covington (1992) highlights that even “winners”, to maintain their position, may resort to cognitive and behavioural processes that are counter productive to long-term growth and wellbeing. So, the goals pursued by individuals influence perceptions of ability, especially when not all individuals experience success.

Ames (1990) conducted a study in which a goal theory perspective was fostered by teachers at a primary school. A vast number of strategies representative of a mastery goal were adopted by classroom teachers. After one year of implementing the advised strategies, students demonstrated enhanced preference for challenging tasks, applied more effective cognitive strategies, were more intrinsically motivated and had higher self-concepts of ability. Results from Ames’ study demonstrate that a classroom setting that fosters a mastery goal orientation can induce a positive self-concept.

Similar findings to Ames were evident in the experimental study conducted by Schunk (1996). In that study, fourth grade students learning six mathematics fractional skills were conditioned to either a mastery goal orientation or a performance goal orientation. Before each of the six lessons, the teacher varied the instructions such that the mastery condition were informed to try and learn how to solve the fraction problems, while the performance condition were informed to try and solve the fraction problems. After six days of conditioning, the students were asked to judge their ability to solve mathematics fraction problems. Students conditioned to the mastery goal orientation reported higher self-efficacy and correctly solved more problems than did the students conditioned to the performance goal orientation. These results assume that the goal pursued by a student affects important educational outcomes including students’ self-efficacy and performance attainment.

Students approaching a task with a mastery goal deploy adaptive patterns of behaviour such as engaging in deep cognitive processing strategies, including linking new material with previous knowledge and attempting to understand complex tasks (Anderman & Maehr, 1994; Dowson & McInerney, 2003). These students may perceive themselves as more capable, due to their effective employment of learning
strategies and, hence, this may positively affect their academic self-concept and academic achievement. More research findings on achievement motivation demonstrate that mastery oriented students are more likely to succeed than to fail (Sideridis, 2004; Vansteenkiste et al., 2004). It is reasonable, therefore, to hypothesise that these students have positive self-concepts due to more frequent experiences of success. Students with positive self-perceptions persevere when confronted with challenging tasks, and eventually succeed (Assor & Connell, 1992; Bandura, 1986; Berry & West, 1993; Boggiano, Main & Katz, 1988; Bouffard, 2000; Bouffard-Bouchard & Pinard, 1988; Entwistle, Alexander, Pallas & Cadigan, 1987; Harter, 1990a, 1992). Since these students more readily have positive self-concepts, it is also likely they experience increased academic performance. These motivational properties of self-concept have been substantiated in research studies that find a positive self-concept leads to increases in academic attainment (DuBois, 2001; Kahne, 1996; Marsh & Craven, 2005).

Mastery oriented individuals focus on the intrinsic value of a task whereas performance oriented individuals derive their motivation from an investment of self-esteem (Plant & Ryan, 1985). Success for mastery oriented individuals derives from effort, whereas for performance oriented individuals success is based on ability levels (Skaalvik, 1997c; Treasure & Roberts, 1994; Walling & Duda, 1995). Failure for mastery individuals tends not to be attributed to lack of ability, and from a self-concept perspective, these individuals are not particularly vulnerable to threats to their self-concept. It can be further proposed that, because of this invulnerability, mastery oriented individuals are more inclined to invest effort through the adoption of effective learning strategies to assist them in achieving. That is, the pursuit of a mastery goal impacts positively on an individual’s self-concept, which consequently enhances their achievement.

Contrary to many studies examined above, Meece and Miller (1996) reveal that increases in students’ learning goals were not associated with enhanced ability perceptions. As expected, they found a significant decline of ability competence for students who became less learning oriented and more work avoidant but, interestingly, students who demonstrated minimal change in their learning orientations reported the highest level of confidence in their abilities. These findings
are puzzling, since mastery goals were associated with a positive self-concept but, when higher levels of mastery goals were identified, levels of self-concept remained steady and did not lead to significant positive changes in self-concept.

In the event that a mastery oriented individual fails at a given task, then the feedback is interpreted as diagnostic rather than reflecting lack of ability. Failure does not hold ability-related implications for individuals who pursue a mastery goal, so they are less vulnerable to threats to their self-concept and are more likely to preserve their perceptions of ability. In summary, individuals who pursue a mastery goal perceive themselves as more capable, primarily because they have a greater propensity to apply effective cognitive strategies and invest effort to complete tasks. These qualities of a mastery goal can result in individuals’ forming more positive evaluations of themselves.

In consideration of the above findings, it is hypothesised that the pursuit of a mastery goal influences self-concepts in academic domains such as mathematics and English, which in turn predict students’ academic achievement in the respective domains.

5.2.1.2 Performance goals, self-concept, and academic achievement

Some research on achievement motivation demonstrates that performance oriented students are less likely to succeed academically (Barker et al., 2002). When performance oriented individuals fail, they are more vulnerable to changes to their self-concept. They attribute poor performance to lack of ability, and since perceptions are formed through attitudes, feelings, and knowledge about skills (Byrne, 1984), these individuals’ self-concepts more readily fluctuate. It is reasonable to hypothesise, therefore, that these students have lower self-concepts. Students with negative self-perceptions give up when confronted with challenging tasks and are more likely to fail (Assor & Connell, 1992; Bandura, 1986; Berry & West, 1993; Boggiano et al., 1988; Bouffard, 2000; Bouffard-Bouchard & Pinard, 1988; Entwistle et al., 1987; Harter, 1990, 1992). Research on low self-concept has been demonstrated to affect academic achievement adversely.
It is important to note, however, that evidence shows performance goals are not necessarily inimical to successful functioning in an educational setting. In a review of achievement motivation research, Harackiewicz et al. (1998) reported performance goals were adaptive in terms of cognitive engagement, self-regulation, learning strategies and performance (see also Harackiewicz, Barron, Carter, Lehto & Elliot, 1997; Midgley & Urdan, 1995; Roeser et al., 1996; Skaalvik 1997c, 1997b). Harackiewicz et al. (1998) highlighted that the extent to which performance goals are adaptive or maladaptive is largely dependent upon the educational setting. For instance, Harackiewicz and colleagues demonstrated that competitive settings for those high in achievement orientation can beneficially affect performance goal oriented individuals through their motivation and performance (Elliot & Harackiewicz, 1994; Epstein & Harackiewicz, 1992). Although a performance goal can be adaptive, a performance oriented individual grounds success and failure essentially in terms of ability (see Middleton & Midgley, 1997). Therefore, if a performance goal oriented individual regularly outperforms their peers, then they are likely to compare and evaluate themselves positively and this can lead to the development of a positive self-concept.

5.2.1.3 Social goals, self-concept, and academic achievement

Social goals are a relatively recent topic for investigation so there are few studies that examine the effects of social goals on other important variables (although see Hicks et al., 1995; and Ryan et al., 1997; for two exceptions). Of the limited research relating to social goals, it has been shown that students’ preference for working with peers can heighten motivation, which supports and extends learning (Eccles et al., 1998; Zusho & Pintrich, 2001). Perhaps working with friends and facilitating others provides positive exchanges for students pursuing a social goal. Students may receive recognition of their assistance from their teachers as well as from their peers. These positive interactions and experiences could contribute to the formation of a positive self-concept. On the other hand, facilitating others may elicit unhealthy comparisons between peers and induce negative exchanges. Furthermore, the preoccupation with facilitating others may detract from the importance of attaining competence and understanding for themselves, leading to the decline of their own self-concept. It is therefore hypothesised that the pursuit of a social goal causes changes to self-concept, and these changes could be either negative or positive. The
direction of change to one’s self-concept will depend on the quality of the interactions as well as the recognition received.

In consideration of the above discussion, it is hypothesised that students’ goal orientations influence self-concepts in academic domains such as English and mathematics; these in turn predict students’ academic achievement in the respective domain. Figure 5.1 depicts this causal relationship. According to the domain-specificity of self-concept, specific subject domains (e.g., mathematics self-concept) correlate most strongly with academic achievement from the same subject domain (e.g., mathematics achievement; Byrne & Worth-Gavin, 1996). This study also proposes that student goal orientations affect students’ mathematics and English self-concepts, which in turn predict their achievement in corresponding subject domains.

**Figure 5.1.** Goal orientations causally predominant. MAS = Mastery goal, PER = Performance goal, SOC = Social goals, ESC = English self-concept, MSC = Mathematics self-concept, EACH = English achievement, MACH = Mathematics achievement, T1 = Time 1, T2 = Time, T3 = Time 3.

### 5.2.2 Causal ordering 2: Self-concept, goals, and achievement

In contrast to the above proposed causal ordering of goals and self-concept and their effect on academic achievement, the following section proposes a rationale for the causal predominance of self-concept over goals.
5.2.2.1 Self-concept, mastery goals, and academic achievement

Valentine and DuBois (2005) acknowledge in their review of research on self-beliefs the importance of examining moderating variables in an effort to further explain how self-beliefs and academic achievement are related. They provide an example of how positive academic self-beliefs may increase academic motivation, which in turn may improve academic achievement. Valentine and DuBois (2005) encourage investigators to “include these variables more frequently when studying the relationship between self-beliefs and achievement” (p. 72). This section will examine research that provides evidence for the causal predominance of self-concept over goals.

A general consensus in contemporary motivational research is that low self-perceptions of ability have dire consequences for motivation, such that these beliefs detrimentally influence task engagement, effort expenditure, and persistence in the face of difficulty (Graham & Weiner, 1996; Skaalvik, 1997a). For instance, Skaalvik et al. (1994) demonstrated that perceptions of self predicted students’ goal orientation.

Self-perceived abilities have been reported to relate systematically with measures of intrinsic motivation (Gottfried, 1990; Harter & Connell, 1984; Meece et al., 1988; Skaalvik & Rankin, 1996a). The outcome of academic achievement on motivation has been demonstrated in a sparse number of studies, to be mediated through academic self-concept (Norwich, 1987; Skaalvik & Rankin, 1995a, 1996a). MacIver et al. (1991) proposed a causal relationship between self-perceived abilities and intrinsic motivation. The MacIver et al. (1991) findings indicated self-perceived abilities predicted the directional change of intrinsic motivation. Skaalvik & Rankin (1996a) identified an indirect and direct effect of persistence and engagement in classroom tasks on achievement; the indirect effect was mediated through self-concept of ability.

A high self-concept of ability may be a favourable precondition for the initiation and persistence of effort in learning and achievement situations (Helmke, 1989, 1991, 1992). Evidence shows that mastery oriented students have a strong “sense of
competence and self-determination that gives rise to mastery goal pursuit” (Seifert, 2004, p.346). These individuals believe they are masters of their own fate because they are confident in their own capabilities (high self-concept). Accordingly, mastery oriented individuals believe they are competent and demonstrate a strong sense of control, primarily as a result of their healthy attributions. These individuals often attribute successes to internal causes such as ability and effort (Krause, Bochner, & Duchesne, 2006; Woolfolk, 2006). Weiner (2000) argues that internal and external causes are closely related to self-esteem so, when an individual attributes success to internal factors, success will contribute to feelings of pride and increased motivation.

It appears that a mastery pattern of behaviour is driven by a strong sense of self (Seifert, 2004). Therefore, it is reasonable to hypothesise that students with a high self-concept will orientate themselves towards a mastery goal. For instance, a positive mathematics self-concept has been shown to relate to students’ perseverance when confronted with challenging tasks (Berry & West, 1993; Bouffard, 2000).

5.2.2.2 Self-concept, performance goals, and academic achievement

Individuals of low self-concept have a predisposition to threats to their self-worth (Martin, 1998; Thompson, 1994) and are more inclined than individuals higher in self-concept to engage in strategies that verify and reinforce their low self-concept (Baumeister, Tice, & Hutton, 1989). Often associated with performance goals is the deployment of less sophisticated strategy use and a “tendency not to process information related to success” (Seifert, 2004, p.346). It could be argued then, that individuals low in self-concept deploy behaviour patterns associated with a performance goal such as showing preference for simple and less complex tasks, displaying withdrawal of effort if there is a chance of failure, and demonstrating lack of enthusiasm when completing tasks (Ames, 1992; Dweck & Leggett, 1988; Nicholls, 1989).

Performance oriented individuals attribute their successes and failures to external and uncontrollable factors in an attempt to maintain positive ability perceptions (self-concept), but maintaining this positive sense of self does not always seem to be the case for performance oriented individuals, as evidenced in Seifert’s (2004) research. He found that performance oriented individuals often perceive themselves as less
competent and make more negative self-statements. A performance pattern of behaviour can be driven by poor sense of self, so students with a low self-concept may avoid critical learning situations which could threaten their self-concept, hence may show less effort at school and, as a result, adopt a performance goal.

It is also feasible that a performance pattern of behaviour would be driven by a strong sense of self. Individuals who maintain a high ability perception by regularly outperforming their peers may in fact make positive self-statements. If these individuals regularly demonstrate their high ability relative to others, and form a positive self-concept as a result of their frequent success, it is likely that these students will value tasks that provide opportunities to reference themselves to others and continue to pursue a performance goal.

Skaalvik et al. (1994) demonstrated that perceptions of self predicted students’ goal orientation. For instance, an individual with a high self-concept may focus on outperforming others, which would predict a positive path between self-concept and performance approach goals. Supporting this prediction is the research that has found positive correlations between academic self-concepts and performance approach goals (see for example Nicholls, 1989). Hence, a performance pattern of behaviour can also be driven by a positive sense of self.

5.2.2.3 Self-concept, social goals, and academic achievement

It is hypothesised that social goals emerge principally as a consequence of academic self-concept. According to this model, developing a strong self-concept will affect subsequent social goal pursuits. A proportion of the literature on social goals highlights the benefits of working with peers, especially for adolescents since they are more inclined to prefer working and assisting their peers to complete tasks (Ellis, Marsh, & Craven, 2005). If students evaluate themselves positively, and are encouraged to develop enhanced self-concepts, then it is likely that these students will feel more confident in their ability, and will be more likely to pursue a social goal because they feel confident in helping their peers.
In accordance with the literature, it is hypothesised that students’ mathematics and English self-concepts influence goal orientations which, in turn, predict student academic achievement. Figure 5.2 depicts this causal flow.

Figure 5.2. Domain-specific self-concepts causally predominant. MAS = Mastery goal, PER = Performance goal, SOC = Social goals, ESC = English self-concept, MSC = Mathematics self-concept, EACH = English achievement, MACH = Mathematics achievement, T1 = Time 1, T2 = Time, T3 = Time 3.

5.2.3 Causal ordering 3: Reciprocal Causality

The final rationale for the potential causal flow of goals and self-concept is the reciprocal-effects model. This alternative model is perhaps a compromise between the two earlier proposed models since it provides evidence supporting both competing causal flows discussed in the above two sections. The section below proposes a rationale for the reciprocal-effects model.

5.2.3.1 Reciprocal relationship between goals, self-concept, and academic achievement

Self-concept researchers distinguish the self-concept-motivation relationship implicitly and explicitly. For example, the widely used SDQ instrument has mathematics and verbal self-concept scales which integrate measures of self-perceived ability and motivational/emotional items (Skaalvik, 1997a). A few studies have demonstrated through factor analysis that the self-concept and motivation items form separate scales, yet remain strongly correlated (Barker et al., 2006a; Skaalvik &
Perhaps goals influence self-concept over time but self-concept also influences goal pursuits over time.

Contradictory evidence in the literature dealing with the causal ordering of goals, self-concept, and achievement suggests that there may be no clear-cut causal ordering of these variables; that is, self-concept and goals may be reciprocally or non-recursively related. Such a relationship would potentially account for evidence for both sets of ordering in the literature. For this reason, it is proposed that a reciprocal relationship between goals and academic self-concept ought to be investigated as an alternative to the two causal orderings proposed above. Figure 5.3 assumes students’ domain-specific self-concepts affect subsequent academic achievement and that this is mediated through the goal orientations, and that students’ goal orientations affect subsequent academic achievement and this is mediated through domain-specific self-concepts.

Figure 5.3. Reciprocal-effects model of goals and self-concept affecting subsequent academic achievement. MAS = Mastery goal, PER = Performance goal, SOC = Social goals, ESC = English self-concept, MSC = Mathematics self-concept, EACH = English achievement, MACH = Mathematics achievement, T1 = Time 1, T2 = Time, T3 = Time 3.
A central aim of this study is to investigate the relationships between students’ domain-specific self-concepts and goal orientations and examine how these two sets of motivational variables interrelate to affect academic achievement. Thus, this research study hypothesises three competing models of causality:

a) goal orientations affect academic self-concepts, which affect subsequent academic achievement,
b) academic self-concepts affect goal orientations, which affect subsequent academic achievement and,
c) goal orientations, academic self-concepts and academic achievement affect each other such that they are reciprocally related over time.

5.3 Summary of Chapter

This chapter has substantiated relations between students’ goal orientations and academic self-concept, and the form and nature of these relationships were examined. Additionally, goal orientations and domain-specific self-concepts were examined in terms of how they directly and indirectly relate to academic achievement. A series of three competing models which derives from the conceptual review of the relations between each factor, has been presented. These three hypothesised competing models are explored in the empirical components of this study. The following chapter draws together and discusses research issues associated with these models in preparation for their subsequent statistical evaluations.
CHAPTER 6
HYPOTHESES AND RESEARCH QUESTION

6.1 Overview

Although students’ goal pursuits and academic self-concept are interrelated and have been implicitly linked, few research studies have examined the relation between them and even fewer studies have investigated their combined effect on academic achievement (Skaalvik, 1997a, 1997b). This study is designed to examine the causal relations among students’ adaptive goal orientations, students’ academic self-concepts and academic achievement in mathematics and English domains. Employing substantially improved methodologies to examine these relations, this study avoids methodological limitations from previous research by:

(a) utilising a measurement instrument that operationalises students’ goals as multidimensional and comprising academic goals as well as social goals,

(b) utilising a multidimensional self-concept measurement instrument with demonstrated construct validity,

(c) combining the General Achievement Goal Orientation Scale (GAGOS) and Academic Self-Description Questionnaire II (ASDQII) instruments with the purpose of providing a more integrative model of student motivation,

(d) targeting two domain-specific facets of academic self-concept rather than poorly-defined global measures of self-concept,

(e) comprising a large sample size and,

(f) following recent guidelines proposed by Marsh et al. (1999) for analysing longitudinal causal structural equation models and applying Marsh and Craven’s (2006) evaluation procedures to assessing these models, thereby applying a rigorous research design.
The purpose of this chapter is to present: a) the statement of the problem to be investigated; b) the aims of this study; c) the specific hypotheses and the research question that will be tested; and d) rationales for each hypothesis and research question, in the context of extant research literature. Hypotheses are posed where previous research provides evidence for predictions. The research question is posed where previous research results do not inform directionality of predictions.

6.2 Statement of the Problem

Are high school students’ academic achievements in English and mathematics affected by both students’ approach goals and academic self-concepts such that: (a) approach goals affect subsequent domain-specific self-concepts which then influence subsequent academic achievement or; (b) domain-specific self-concepts affect subsequent approach goals which then influence subsequent academic achievement or; (c) approach goals, domain-specific self-concepts and academic achievement affect each other such that they are reciprocally related?

6.3 Aims

Utilising recommended research methodologies, this study aims to:

1. Test whether approach achievement goals can be conceptualised as comprising mastery, performance and social goals and test whether these goals are multidimensional and hierarchically structured for high school students.
2. Test whether academic self-concept can be conceptualised as comprising English self-concept and mathematics self-concept and test whether academic self-concept is multidimensional and hierarchically structured for high school students.
3. Test whether the models detailed in Aims 1 and 2 remain invariant across sex such that differences of kind are investigated.
5. Test causal relations between students’ approach goals, domain-specific self-concepts and academic achievement in mathematics and English, thereby testing whether: (a) goal orientations (mastery, performance, and social goals) affect academic self-concepts (mathematics and English self-concepts), which in turn influence subsequent academic achievement in two corresponding academic domains (mathematics and English achievement), (b) academic self-concepts affect subsequent goal orientations, which in turn influence subsequent academic achievement and, (c) goal orientations, academic self-concepts and academic achievement are all mutually reinforcing such that they are reciprocally related over time.

6.4 Statement of Hypotheses

6.4.1 Hypothesis 1: Measurement of students’ goals and academic self-concept
This study examines academic goals and social goals as well as English and maths self-concepts within the context of the one instrument. It is hypothesised that: (a) despite being combined in the one measurement instrument, the General Achievement Goal Orientation Scale (GAGOS) and the Academic Self Description Questionnaire II (ASDQII), will maintain scale independence; (b) students’ multiple approach goals, as operationalised in the GAGOS, are represented by mastery goals, performance approach goals, and social goals, thereby demonstrating their multidimensionality; and (c) academic self-concept can be represented by two distinct subject domains, English and mathematics, thereby demonstrating the multidimensional nature of students’ academic self-concept.

6.4.1.1 Rationale for Hypothesis 1a
Drawn from their original instruments, the GAGOS and ASDQII, have been combined with the purpose of forming an integrative instrument that measures students’ adaptive cognitive dimensions of academic motivation. Specifically, the combined instrument measures both students’ goals and academic self-concept. To determine the validity of combining the GAGOS and ASDQII in the one instrument, it is essential to assess the psychometric properties of these combined measures (items and scales) and demonstrate that academic achievement motivation remains independent from academic self-concept.
Students’ goals and academic self-concept are interrelated. As discussed in the review of the literature, there are two explanations for how they might relate. The first explanation assumes that perceptions of a task (i.e., perceived as competitive or non-competitive) can influence perceptions of self. For instance, if one perceives a task to be competitive in nature, this may cause the individual to form negative self-perceptions of ability (e.g., Harackiewicz et al., 1998). The alternative, but complementary explanation assumes that perceptions concerning “Why am I doing this?” (goal orientation), and perceptions concerning “Can I do this?” (self-concept), may interact reciprocally to influence both academic engagement and academic achievement. For instance, one individual may perceive that the purpose of a task is to demonstrate competitive superiority (i.e., “I am doing this to win”), but be unsure that they have the ability to “win”.

Since students’ goals and self-perceptions are related to task engagement and motivation, it is important to determine whether and how the instruments designed to measure each construct are similar yet distinct. The GAGOS and ASDQII are related, as both instruments measure students’ adaptive cognitive dimension of academic motivation (Martin, 2003). Measurements from both instruments can predict effort expenditure, task choice, strategy use, and persistence (Aunola et al. 2006; Robins & Pals, 2002; Skaalvik et al., 1994). The instruments are distinct such that the ASDQII measures perceptions of self in two academic domains (mathematics and English) whilst the GAGOS measures various purposes for engaging in academic tasks (mastery, performance approach and social orientations). Specifically, the ASDQII pursues a descriptive/evaluative aspect of self-concept that directs respondents to evaluate themselves in mathematics and English domains. Related feelings associated with descriptive/evaluative aspects give rise to affective reactions which impact student engagement. Building on this, the GAGOS measures a variety of purposes for this engagement. Consequently, it is hypothesised that although students’ goals and academic self-concepts are related, the measurements drawn from their original instruments (GAGOS and ASDQII) will remain independent when combined to form an integrative model of adaptive motivation.
6.4.1.2 Rationale for Hypothesis 1b
Research on goal theory continues to evolve and important developments in conceptualising goal pursuits have arisen (Urdan & Mestas, 2006). Researchers have recently argued that social goals warrant inclusion within the goal theory framework because like academic goals (mastery and performance goals) they facilitate individuals to organise and direct behaviour in order to achieve in academic situations (Covington, 2000; Urdan & Maehr, 1995). A distinguishing feature of this study and the related instrument designed to measure students’ multiple goals (GAGOS), is the exclusive focus on adaptive goals. Adaptive goals express students’ varying purposes for engaging in achievement-related situations rather than attending to maladaptive goals that express purposes for avoiding achievement situations. Consequently, multiple adaptive goals in this study comprise mastery goals, performance approach goals, and social goals.

6.4.1.3 Rationale for Hypothesis 1c
Shavelson et al.’s (1976) model of self-concept included the assumption that self-concept is multifaceted and not unidimensional. Data from research studies show distinct partitioning between English and mathematics self-concepts such that demonstrating a general self-concept factor has proved more complex than originally anticipated, leading Marsh and Shavelson (1985) to revise the original model. Relatively recently researchers have designed instruments that measure specific facets of self-concept. Based on the Shavelson model, Marsh designed the SDQ instrument and subsequently the ASDQ instrument with the intent to measure the specific facets of self-concept. The present study utilises the well validated ASDQII instrument and extracts the items that measure high school students’ English and mathematics self-concepts.

6.4.2 Hypothesis 2: Coordination of multiple goals
Given the current surge in literature postulating that students pursue multiple goals (Harackiewicz & Linnenbrink, 2005), it is hypothesised that correlations among the goals will be positive such that: (a) students pursuing performance approach goals will also pursue mastery goals, (b) students pursuing mastery goals will also pursue social goals, and (c) students pursuing performance goals will pursue social goals.
6.4.2.1 Rationale for Hypothesis 2

Current research suggests that students adopt multiple goals; however, debate concerning whether these multiple goal pursuits are beneficial remains largely unanswered (Thomas & Barron, 2006). Traditionally, the multiple goal perspective has exclusively examined the simultaneous interaction of mastery goals and performance approach goals and has overlooked the importance of investigating other significant goal pursuits which impact motivation and achievement. This study includes social goals within the multiple goal perspective. Importantly, goals in this study are adaptive and are positively oriented as they relate to varying purposes for achievement. These approach goals are likely to interact positively and can provide insight into how students are motivated and how they achieve at school.

6.4.3 Hypothesis 3: Stability of students’ goals and academic self-concept

In testing the stability of high school students’ goals and academic self-concept, two hypotheses are considered: (a) students’ goals remain stable across the three waves of data and (b) students’ English self-concept and maths self-concept remain stable across the three waves of data.

6.4.3.1 Rationale for Hypothesis 3

Guay et al. (2003) report that in their study for students in Grades 2 through 4, measures of academic self-concept become increasingly reliable and stable as the children grow older. As children grow older and develop, it appears that their self-concept becomes more stable (Skaalvik, 1997a). Similarly to self-concept, goal pursuits also become increasingly stable as children grow older and develop (Jagacinski, Madden, & Reider, 2001). Although there is an absence of consensus as to whether goal orientations are stable, only a handful of studies have demonstrated the instability of goals (DeShon & Gillespie, 2005), while the vast majority demonstrate goals to be stable across time (Button, Mathiey, & Zajac, 1996).
6.4.4 Hypothesis 4: Hierarchical structure of students’ goals

The three adaptive goals in this study all direct and energise an individual to engage in academic tasks. Although all three are positively oriented, the specific reason or content for each goal varies, such that the purpose for engaging in academic tasks differs among the three adaptive goals. It is hypothesised that students’ goals are hierarchically structured such that a higher-order factor represents purposes for engagement and the first-order factors represent the three varying purposes for engagement. Figure 6.1 depicts the three first-order factors (mastery, performance, and social goals) and one higher-order factor (purposes for achievement).

![Figure 6.1. Hypothesised hierarchical model of approach goals](image)

6.4.4.1 Rationale for Hypothesis 4

Mastery oriented individuals perceive purposes for engaging in academic tasks so as to master a skill or activity in an attempt to seek competence. Performance approach individuals perceive purposes for engaging in academic tasks so as to attain favourable judgements of competence by outperforming others. Social oriented individuals perceive purposes for engaging in academic tasks so as to work with friends or to help their peers complete tasks because they are concerned with social reasons for attempting to achieve in academic situations. Underlying these three adaptive goals is the purpose for engagement in academic situations. Therefore, the higher-order factor for the three adaptive goals encapsulates reasons for engagement. The lower order factors therefore delineate among these varying purposes for engagement. The content and reasons for engagement are distinct for each of these adaptive goals.
6.4.5 Hypothesis 5: Hierarchical structure of students’ academic self-concept

Marsh and Shavelson (1985) revised the original model of self-concept predominantly as a result of the weak hierarchy of self-concept. Comparably with most self-concept research, it is hypothesised that the correlations between English and mathematics self-concept will be weak and may even be negatively correlated, and therefore it is further hypothesised that there will be minimal evidence for a hierarchy of academic self-concept that encapsulates both English self-concept and maths self-concept. Figure 6.2 depicts the two first-order factors (English and mathematics self-concepts) and one higher-order factor (academic self-concept).

![Hypothesised hierarchical model of academic self-concept](image)

Figure 6.2. Hypothesised hierarchical model of academic self-concept

6.4.5.1 Rationale for Hypothesis 5

In school settings the hierarchy of academic self-concept has been found to be typically weak. This especially applies for domain-specific self-concepts which are very distinct, especially in adolescence, where subject domains are more clearly differentiated. The hierarchy is weak due to low correlations between English and maths self-concept being reported as nonpositive (often near zero). Although it is a reasonable assumption that self-concepts in various domains should be correlated, the evidence for this is weak and has not only led to the revision of Shavelson’s original model but has also directed Marsh to develop the internal/external (I/E) frames of reference comparison process. The I/E model accounts for weak to near zero correlations between English and mathematics self-concepts by suggesting individuals compare their self-perceived skills in one subject with self-perceived skills in another subject and use this internal relativistic impression as a basis for
arriving at self-perceptions of ability in particular domains. Hence, individuals with high ability in English and mathematics will nevertheless have a more negative self-concept in the subject that they perceive themselves to be not as good at. Therefore this study predicts that the correlation between English and mathematics will be weak or even negative.

6.4.6 Hypothesis 6: Invariance across sex

In testing for invariance of students’ goals and academic self-concept across sex, two hypotheses are considered: (a) that the number of underlying factors is equivalent, and (b) that the pattern of factor loadings is equivalent.

6.4.6.1 Rationale for Hypothesis 6

Research studies of students’ goals and academic self-concept frequently report differences of degree between males and females. Before determining differences of degree, however, researchers must test differences of kind, that is, that the factor structure of the given instrument is equivalent for various groups being investigated (e.g., males and females). Green et al. (2006) have demonstrated that males and females do not respond fundamentally differently to key facets of motivation. Marsh et al. (1984) and Marsh et al. (1998) have demonstrated males and females do not respond fundamentally differently to key facets of academic self-concept.

6.4.7 Hypothesis 7: Domain-specificity of academic self-concept and corresponding academic achievement

On the basis of the internal/external frames of reference model, it is hypothesised that academic achievement in each school subject correlates more highly with the corresponding academic self-concept scale than with any other self-concept scale. Two hypotheses are proposed: (a) English self-concept will correlate positively with English achievement and negatively correlate with maths achievement, and (b) Maths self-concept will correlate positively with maths achievement and negatively with English achievement. Figure 6.3 depicts the hypothesised pattern of relations between domain-specific self-concepts in English and mathematics and achievement in the same domains.
6.4.7.1 Rationale for Hypothesis 7

Repeatedly, studies purport to show moderate-to-strong correlations between academic self-concept and academic achievement. These correlations are strongest between matching areas of achievement (e.g., English achievement) with their respective self-concept (e.g., English self-concept), whereas substantially weaker correlations have been found between non-matching areas of academic achievement and self-concept (see for example Marsh, Trautwein, et al., 2004). This pattern of results demonstrates that self-concept is domain-specific with respect to achievement.

Furthermore, support for the internal/external frames of reference model will be evident if paths from maths self-concept to maths achievement and paths from English self-concept and English achievement are substantially positive. This is due to the external comparisons process, where perceptions of good maths skills contribute to better maths self-concept. This external comparisons process also applies to good English skills as they too can contribute to increases in English self-concept. According to the internal comparison process, paths from maths achievement to English self-concept and paths from English achievement to maths self-concept are likely to be negative. Specifically, good maths skills are likely to lead to reduced English self-concepts (once the positive effects of good English skills are controlled). Likewise, good English skills are likely to lead to reduced maths self-concepts.
6.5 Research Question

The chief aim of this study is to examine the causal relations of students’ goals, academic self-concept and academic achievement. To date, no study examining these variables has employed the prerequisites recommended by Marsh et al. (1999); in fact, few studies examining causal relations among motivational variables have satisfied the essential guidelines. These prerequisites and their application to this study are discussed in Chapter 8 in detail. In satisfying and to some degree exceeding the recent methodological advances in longitudinal panel designs, this study questions: What is the causal ordering of students’ goals, domain-specific self-concepts and academic achievement in English and mathematics? Three alternative explanations for the possible causality of these constructs are discussed below.

6.6 Rationale for Alternative Competing Models of Causality

Relative to the few studies on academic self-concept and students’ goal orientation, most have researched global measures of academic self-concept, not domain-specific self-concepts (i.e., English self-concept and maths self-concept). The researcher of this study is aware of no studies that have investigated causal relations between domain-specific self-concepts and student goal orientations. Therefore, hypotheses proposed have been formulated using available correlational and experimental studies which investigate relations between goal orientations and global academic self-concept and other related self constructs.

6.6.1 Causal ordering 1: Goals, self-concepts, and academic achievement

Mastery oriented individuals view effort as the primary basis of academic outcomes, consequently, their ability remains unthreatened in achievement-related situations (Martin, 1998). These individuals perceive themselves as more competent since they focus on attributes they have control over such as effort, learning strategies, and task mastery. Mastery goals have adaptive qualities which promote challenge and persistence. In accordance with this reasoning, Pajares et al. (2000) found a positive correlation between task goals and self-concept. Mastery oriented individuals’ beliefs and characteristics harvest cognitive growth and development (Seifert, 1997).
Adaptive motivational patterns include adopting greater preference for challenge (Seifert, 1995), using more positive self-statements (Seifert, 1997), employing more strategy use, especially deeper levels of processing (Pintrich & Garcia, 1991), and reporting more positive affect (Seifert, 1995). Consequently, mastery oriented individuals are more willing to select and complete challenging tasks that require the deployment of learning strategies. As a result of exerting effort and engaging in strategy use, these individuals successfully complete tasks and acknowledge their success as a combination of effort and strategy use. Hence, task completion is accompanied by feelings of satisfaction, being proud and worthy, and increased competence (Borkowski, Carr, Rellinger, & Pressley, 1990). These beliefs and behaviours of a mastery oriented individual are self-enhancing and cause increases to self-concept in subject domains where a mastery goal is adopted.

It is projected that the adaptive qualities of a mastery goal enhance feelings of competence and that these increases in self-concept positively cause changes in subsequent academic achievement. Therefore, it is proposed that mastery goals positively influence English and maths self-concepts and these self-concepts positively affect achievement in the corresponding academic domain. It is further predicted that the causal path from mastery goals to English self-concept will be a stronger positive path than the path from mastery goals to maths self-concept. According to this prediction, qualities of a mastery goal are more congruent with the subject domain of English than maths. For instance, English classes tend to be concerned with expressions of opinions and feelings, and tasks are more often cooperatively structured (Dowson, 1999) so that the emphasis is on understanding and appreciating, all of which are concerns for a mastery oriented individual.

Due to the adaptive nature of mastery goals, the causal paths from mastery goals to English and mathematics self-concepts will both be positive. In sum, it is proposed that mastery goals fuel positive changes to English and maths self-concepts through their adaptive form and that these positive self-concepts cause increases in subsequent academic achievement within the corresponding academic domain.
Unlike mastery individuals, performance approach oriented individuals view ability as the primary basis of academic outcomes; consequently, their level of ability is frequently threatened in achievement-related situations (Martin, 1998). On the basis that performance approach individuals consider ability to be the predominant cause of success, these individuals become more vulnerable since they perceive failure as reflecting poor ability. In accordance with this reasoning Pals and Robins (2002) found that performance orientated individuals experience more negative affect. Perceptions of poor ability contribute to the development of low self-concepts. Therefore, it could be proposed that for many performance approach oriented individuals, a performance goal is negatively associated with self-concept. However, most research, with a few exceptions (e.g., Ames & Archer, 1988; Pajares et al., 2000), has reported a positive correlation between performance approach goals and academic self-concept, so the above rationale appears counterintuitive to results of most correlational studies (Hagen, 1994; Shih & Alexander, 2000; Skaalvik, 1997c).

Conversely, a number of performance approach individuals may in fact have a high self-concept (Nicholls, 1989; Skaalvik, 1997a). This is because some students will regularly outperform their peers. Winning and outperforming others is a limited commodity but a few performance approach oriented individuals will experience this form of success. These high achieving performance approach individuals will be less threatened and will thrive in achievement-related situations as they perceive themselves as more capable and possessing high ability. For these individuals, a performance approach goal can fuel increases to their self-concept, which can cause improvements in subsequent academic achievement.

Adoption of a performance goal can be a self-protective process (Seifert, 1997). This self-protective process may result in improvements to one’s academic self-concept. In the case of failure, a performance approach oriented individual is self-protective as they may not exert effort needed to outperform a peer and may cite lack of effort rather than ability as the cause for losing. Thus, the student maintains their sense of self by self-protecting when they attribute losing or not outperforming others to withdrawal of effort (Seifert, 1995). Accordingly, performance approach goals may relate positively to academic self-concept. However this path will not be as strong as it is for mastery goals and academic self-concept.
Recently, performance approach goals have been associated with adaptive motivational patterns such as cognitive engagement (Meece et al., 1988; Wolters et al., 1996), positive affect (Linnenbrink & Pintrich, 2002; Seifert, 1995), employment of learning strategies (Seo & Kim, 2001), and persistence (Elliot & McGregor, 1999; Sideridis, 2005). On the basis of this recent research, it is proposed that performance approach goals positively influence both English and maths self-concepts and that these self-concepts positively influence achievement in the corresponding academic domain. It is further predicted that the causal path from performance approach goals to maths self-concept will be a stronger positive path than the path from performance approach goals to English self-concept. According to this prediction, qualities of a performance approach goal are more congruent with the subject domain of maths than English. For instance, maths requires more individualistic approaches to learning, which centre on accuracy. There are more opportunities for social comparisons, as material is often quantitatively measured through tests (Aunola et al., 2006; Dowson, 1999). These class structures promote performance approach goals as they emphasise social comparison and these individuals enjoy and take pleasure in competing (Linnenbrink & Pintrich, 2002).

Due to the adaptive motivational patterns associated with performance approach goals, the causal path from performance goals to English self-concept will be positive but weaker than the causal path from performance goals to maths self-concept. In sum, it is proposed that performance approach goals fuel positive changes to English and maths self-concepts through their adaptive form and these positive self-concepts cause increases in subsequent academic achievement within the corresponding academic domain.

Social goals in this study focus on working with peers and align closely with social affiliation goals and social concern goals which have been shown to relate strongly with mastery goals (Anderman & Anderman, 1999; Hinkley et al., 2001). In order to work cooperatively and to assist peers, it is essential that social oriented individuals seek understanding and task mastery. Therefore, social oriented individuals view effort as a significant determinant for understanding. Social oriented individuals engender adaptive qualities which promote effective approaches for learning (Dowson, 1999). It is projected that these adaptive qualities, in addition to them
observing peers’ appreciation and improvement, lead to enhanced feelings of competence which cause increases in English and maths self-concepts. Increases in English and maths self-concepts cause increases in subsequent achievement in the corresponding academic domain. Therefore, it is proposed that social goals are positively associated with both English and maths self-concepts and these self-concepts positively influence achievement in the corresponding academic domain.

6.6.2 Causal ordering 2: Self-concepts, goals, and academic achievement

In contrast to the above causal ordering model, it is plausible that self-concept is predominant and its effects on achievement are mediated through the adopting of achievement goals. For example, Elliot and colleagues (Elliot & Church, 1997; Elliot & Harackiewicz, 1996) projected that perceived competence be treated as an antecedent of achievement goals rather than as a moderating variable. Dai (2000) assumes that self-perceptions of competence regulate goal adoption, regardless of the individuals’ level of achievement. This research demonstrates that academic self-concept drives students’ selection of goal adoption.

It is hypothesised that a high maths or English self-concept will cause students to pursue a mastery goal. Seifert (2004) found that a strong sense of competence causes students to adopt motivational patterns consistent with a mastery goal pursuit. Having a high self-concept in English or maths facilitates effective thought processes (Seifert, 2004). These positive thoughts concerning competence encourage an individual to believe they are masters of their own fate and have control over their learning and effort expenditure. Accordingly, mastery oriented individuals engage in tasks to seek further mastery and competence. They employ effective learning strategies and value tasks for interest's sake. Helmke (1989, 1991, 1992) acknowledges that a high self-concept is a favourable antecedent for the initiation of persistence and effort for learning. Well documented in the literature is the influence of self-concept and self-efficacy on effort expenditure (Dai, 2000). Each of these characteristics, specifically, positive thoughts, effort expenditure, and control processes, explicates features of a mastery goal. In accordance with this reasoning, academic self-concept has been found to relate positively with mastery goals (Duda & Nicholls, 1992; Skaalvik, 1996).
It is further predicted that the causal path from English self-concept to mastery goals will be stronger than the causal path from maths self-concept to mastery goals. This argument is parallel to that proposed above for the first hypothesised competing model. Specifically, the subject domain of English is more congruent with features of a mastery goal. Mastery goals are heightened in contexts where individuals are encouraged to understand, and where social comparisons are reduced. In English classes mastery goals are regularly fostered since the focus is on expressing opinions and feelings, and tasks are more often open ended and structured to be cooperative (Dowson, 1999).

It is argued above that students’ English and maths self-concepts will cause students to pursue mastery goals. It is further hypothesised that a mastery goal pursuit will cause improvements to subsequent academic achievement in both English and mathematics domains. This reasoning is supported by research studies that find positive correlations between mastery goals and academic achievement (Church et al., 2001; Kaplan & Maehr, 1999). Dowson (1999) found stronger positive correlations between mastery goals in English than maths achievement. On the basis of this research, it is proposed that the causal path from mastery goals to maths achievement will remain positive but be weaker than the path from mastery goals to English achievement.

It is hypothesised that high and low maths or English self-concepts cause students to pursue performance goals. A performance pattern of behaviour may be driven by a strong sense of self as well as a poor sense of self. A student with a strong sense of self has high ability perceptions and these students are attracted to opportunities to display their ability relative to others. Furthermore, these individuals strive to outperform their peers as they perceive their ability to be high and gravitate toward pursuing performance approach goals. Due to their high self-concepts, they value tasks that provide opportunities to reference themselves to others. Skaalvik (1997c) demonstrated performance approach goals positively correlated with self-perceived abilities and reasoned that individuals with high ability perceptions focus on outperforming others. Hence, a performance approach pattern of behaviour can be driven by a strong sense of self. It is therefore proposed that the path from English and maths self-concept to performance goals will be positive.
A student with a poor sense of self may have low ability perceptions and these students may be driven to adopt performance goals due to the appealing self-protective processes associated with a performance goal. Self-protective processes such as reducing effort, employing maladaptive learning strategies and displays of helplessness when faced with the possibility of losing, are characteristic of a performance approach goal (Kaplan & Midgely, 1997; Martin, 1998; Seifert, 1997). Thus, a student with a low self-concept pursuing a performance goal self-protects by withdrawal from the task. It is hypothesised that a performance pattern of behaviour can be driven not only by a strong sense of self but by a poor sense of self also.

It is further predicted that the causal path from maths self-concept to performance goals will be stronger than the causal path from English self-concept to performance goals. This argument is parallel to that proposed above for the first hypothesised competing model. Specifically, the subject domain of maths is more congruent with features of a performance goal. Performance goals are heightened in contexts where the emphasis is on accuracy, individualistic approaches to learning are fostered and social comparisons occur. In maths classes performance goals are fostered since the focus is on obtaining the correct answer and there are more opportunities for social comparisons (Aunola et al., 2006; Dowson, 1999).

Recent research provides strong evidence that a performance approach goal governs adaptive motivational patterns (Elliot & Church, 1997; Harackiewicz, Barron, Pintrich, et al., 2002; Kaplan & Middleton, 2002; Midgley et al., 2001). Additionally, studies have shown positive associations between performance goals with outcomes closely related to achievement such as academic self-efficacy, GPAs, and test scores (Church et al., 2001; Harackiewicz, Barron, Carter, Lehto, & Elliot, 1997b; Midgely et al., 1995; Skaalvik, 1997a; Wolters et al., 1996). In addition to predicting that maths and English self-concepts cause students to adopt performance goals, it is also predicted that performance approach goals increase subsequent academic achievement. Although there are inconsistent findings reporting negative and null effects of performance goals on achievement, more recent research which dichotomises performance goals into approach and avoidance, predominantly shows the positive effects of performance approach goals on academic achievement (Harackiewicz et al., 2000; Roeser et al., 1996; Sideridis, 2005; Skaalvik, 1997a).
It is predicted that the pursuit of social goals emerges primarily as a consequence of students’ maths and English self-concepts. It is proposed that positive feelings of self in a subject domain increase the likelihood that a student will adopt a social goal. When a student has a high self-concept, they may choose to invest in a task for the purpose of facilitating their peers’ understanding and to work cooperatively with them to help them understand. Various forms of social goals, associated with helping peers and facilitating peers’ understanding (e.g., social concern), have been shown to relate strongly with mastery goals (Hinkley et al., 2001). Akin to mastery goals, social goals represented in this study are proposed to engender adaptive qualities such as investment in effort, with the central purpose of applying this acquired understanding to assisting peers with task requirements. If students feel confident in their ability then they will be more inclined to pursue social goals because they believe they have the capacity to facilitate their peers’ achievement. In accordance with this reasoning, self-concepts in maths and English cause students to pursue social goals.

Scarcely apparent in the research on social goals is the link with academic performance (Dowson, 1999; Wentzel, 1996). Wentzel (1993, 1996) proposes that social goals are integrally linked to academic achievement. One study that directly associated social goals and academic self-concept was research performed by Dowson (1999). Dowson reported a negative direct effect between social goals and mathematics achievement; however there was an indirect effect through cognitive and metacognitive strategies which outweighted the negative direct effect such that the overall effect of students’ social goals on maths achievement was both positive and significant. Based on these findings, it is hypothesised that the path from students’ social goals will be negative such that social goals will cause decreases to subsequent mathematics achievement. The reverse was true for social goals and English achievement in Dowson’s study. He found social goals increased English achievement both directly and indirectly through cognitive and metacognitive strategy use. Based on these findings, it is hypothesised that the path from students’ social goals to English achievement will be positive, such that social goals will cause increases to subsequent academic achievement.
6.6.3 Causal ordering 3: Reciprocal causality

The third and final causal ordering concedes that there may not be any clear cut ordering of goals (mastery, performance, and social), self-concept (maths and English), and academic achievement. It is proposed that the variables are reciprocally or non-recursively related such that both causal relationships hypothesised above would potentially explain the longitudinal causal relations among the variables. Reciprocal causality assumes that specific goal pursuits affect academic achievement over time, and that this relationship is mediated through domain-specific self-concepts and equivocally, domain-specific self-concepts affect academic achievement over time and this relationship is mediated through specific goal pursuits.

The pivotal research question for this study is concerned with the possible causal ordering of students’ goals, academic self-concept and academic achievement. A limited number of studies have shown how goals and self-concept relate with each other and a larger number of studies report how each construct relates to academic achievement. The vexed question as to how these constructs relate and importantly how they relate over a period of three years is directly investigated in this study. Since there has been a limited number of studies that considered the mediating effects of goal orientations on domain-specific self-concept and academic achievement, and a minimal number of studies have studied the mediating effects of domain-specific self-concept on goal orientations and academic self-concept, a number of competing models have been proposed to explain the possible relations. These three competing models, as detailed above comprise: (a) goal orientations affect domain-specific self-concepts, which affect subsequent academic achievement; (b) domain-specific self-concepts affect goal orientations, which affect subsequent academic achievement; and (c) goal orientations, domain-specific self-concepts and academic achievement affect each other such that they are reciprocally related over time.
6.7 Summary of Chapter

This chapter presented seven hypotheses and a research question. In general the hypotheses relate to the potential multidimensionality and hierarchical structure of goal orientations and academic self-concept and whether they remain invariant across sex. The research question investigates how goals and self-concept are causally related over time to affect academic achievement. The following chapters address each of the hypotheses and research question.
CHAPTER 7
METHOD ORIENTATION: SAMPLE, PROCEDURE, MATERIAL, AND ANALYSES

This chapter presents an overview of the characteristics of the participants, an outline of the survey procedure, a description of the survey, and a brief orientation to the statistical procedures used to analyse the data. More specific details of the sample composition appear in the following chapters.

7.1 Sample and Procedure

In the first year of the study, respondents were students in Years 7, 8, and 9 from nine high schools in rural and urban New South Wales, Australia. These schools are broadly representative of the diverse school settings in that State. In general, the respondents represented a multicultural background of Australian Aboriginal, Anglo-Australian, Middle Eastern, Asian and European origins. Details of the location, number of students and percentage for each of the nine schools are presented in Table 7.1

Table 7.1
Origins of Respondents

<table>
<thead>
<tr>
<th>School</th>
<th>Locality</th>
<th>Number of respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SW Sydney</td>
<td>190</td>
<td>18.9</td>
</tr>
<tr>
<td>2</td>
<td>SW Sydney</td>
<td>185</td>
<td>18.5</td>
</tr>
<tr>
<td>3</td>
<td>SW Sydney</td>
<td>78</td>
<td>7.8</td>
</tr>
<tr>
<td>4</td>
<td>SW Sydney</td>
<td>33</td>
<td>3.3</td>
</tr>
<tr>
<td>5</td>
<td>SW Sydney</td>
<td>177</td>
<td>17.7</td>
</tr>
<tr>
<td>6</td>
<td>East Sydney</td>
<td>49</td>
<td>4.9</td>
</tr>
<tr>
<td>7</td>
<td>Western NSW</td>
<td>16</td>
<td>1.6</td>
</tr>
<tr>
<td>8</td>
<td>Western NSW</td>
<td>79</td>
<td>7.9</td>
</tr>
<tr>
<td>9</td>
<td>Western NSW</td>
<td>194</td>
<td>19.4</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1001</td>
<td>100</td>
</tr>
</tbody>
</table>
Surveys were administered to students with intact class groups or, where numbers were small, as in the rural centres, in full school groups. Ethical procedures to conduct the study were followed: permission was obtained from the Department of Education and Training (DET) and the University of Western Sydney’s Human Ethics Committee. Informed consent forms were completed by parents of the students, and all students were told that their completion of the survey was voluntary. Students were briefly informed of the purpose for the survey, but specific issues of interest to the researcher were not disclosed to the students. Students were informed that the researcher was interested in what they liked and disliked at school with the view to assisting educators improve student motivation. This standardised explanation of the purpose, as well as instructions for how to complete the survey, were delivered before each session. The survey was read aloud to the students to
(a) ensure that most participants completed the survey within the time allotted,
(b) overcome the reading and language difficulties of some students,
(c) ensure consistency with the procedure from school to school, and
(d) assist students with learning difficulties. At each session there were at least two research assistants present to assist the students completing the surveys, but school teachers were not involved in the administration of the survey. Researchers collected the surveys from all students before they left the room.

7.2 Materials

Aside from the demographic and background details, items on all subscales were responded to using a 5-point Likert-type rating scale (1 = Strongly disagree; 5 = Strongly agree).

7.2.1 Achievement Motivation

Central to the purpose of the present study was an exploration of three positively oriented goals (mastery, performance, and social goals). These goals are “positively oriented” in the sense that they express students’ purposes for achieving, rather than their purposes for avoiding achievement (such as is the case with work-avoidance and often performance-avoidance goals). Thus, the present study was primarily concerned with students’ goals that orient students towards academic achievement, in
contrast to goals that orient students away from academic achievement. For this reason, avoidant-type goals were not included in this study. An additional purpose for focusing upon positively oriented goals was to avoid methodological complexities. Negative items and negative constructs, especially when used alongside positive items and constructs can lead to difficulties in model construction and validation (e.g., through the presence of negative item method factors; Marsh, 1994; 1996).

The nature of students’ motivation was evaluated using the GAGOS developed by McInerney (2001). Recently designed, this instrument was developed for a specific purpose. The GAGOS was initially designed to scrutinise goal theory as it applies to achievement motivation. A rationale for, and relevant history of the GAGOS is furnished below.

Although studies examining goal theory typically validate hypothesised models using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), this type of analysis does not demonstrate whether the measures truly capture mastery, performance and social motivation. Type and level of motivation are typically inferred from items and clusters of items (scales). In addressing these concerns, McInerney developed the GAGOS.

The GAGOS measures three general goal orientations (general mastery, general performance and general social goals). Rather than inferring motivation, as is the approach of other motivation instruments, the GAGOS intentionally denotes the term “motivated” at the beginning of each item stem (i.e., I am most motivated when…). Respondents subsequently acknowledged whether they were most motivated in a mastery, performance or social goal situation. The term “motivation” was explained to students at the commencement of the survey. The explanation referred motivation to feeling energised and being enthusiastic. Although a recent instrument, the GAGOS has demonstrated sound psychometric properties (Barker et al., 2004; Barker, Dowson, & McInerney, 2005b; Barker, McInerney, & Dowson, 2002; Barker, McInerney, & Dowson, 2003). As DeShone and Gallespie (2005) highlight in their expansive review of goal theory research, the large proportion of studies that use self-developed measures especially designed for their particular research study
are almost always unvalidated. This validation process can not be underestimated for the GAGOS. Specifically, the GAGOS comprises five items measuring general mastery, eight items measuring general performance, five items measuring general social goals, five items measuring global motivation and three items measuring valuing motivation. The present study is concerned with the relations between academic self-concept and three specific goal constructs. These were extracted from the GAGOS instrument, are described below and presented in Table 7.2.

7.2.1.1 Mastery goals
Mastery goals are self-referenced and have been defined as “striving for competence defined in terms of learning and improvement” (Harackiewicz & Linnenbrink, 2005, p.76). Sample GAGOS items for mastery goals are “I am most motivated when I see my work improving” and “I am most motivated when I solve problems”. Items were therefore generated for the GAGOS mastery goal scale that broadly surveyed ways in which a mastery goal orientation might be reflected, such as acquiring new knowledge and skills to solve problems (Harackiewicz et al., 2002). All five items were similarly phrased, as all stems commenced with “I am most motivated when”.

7.2.1.2 Performance goals
Unlike mastery goals, which are self-referenced, performance goals are referenced relative to others such that they are externally referenced. It is no surprise that performance goals have been defined as aiming to “gain favourable judgements of their competence by performing as well as they can compared to others” (Barron & Harackiewicz, 2001, p.706). Sample GAGOS items for performance goals are “I am most motivated when I am competing with others” and “I am most motivated when I am doing better than others”. Items were therefore generated for the GAGOS performance goal scale that broadly surveyed ways in which a performance goal orientation might be reflected, such as competing with others, seeking public approval, doing well relative to others and seeking rewards (Harackiewicz & Linnenbrink, 2005).

7.2.1.3 Social goals
Social goals encompass an inclusive paradigm and have therefore been defined as “social purposes that students may perceive for engaging in academic work” (Urdan
& Maehr, 1995, p.213). Sample GAGOS items for social goals are “I am most motivated when I am helping others” and “I am most motivated when I work with others”. Items were therefore generated for the GAGOS social goal scale that broadly surveyed ways in which a social goal orientation might be reflected, such as in seeking to help others and showing empathy for the interest of others.
<table>
<thead>
<tr>
<th>Subscale</th>
<th>GAGOS</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastery</td>
<td>Numerical Identifier</td>
<td>“I am most motivated when I see my work improve”</td>
</tr>
<tr>
<td>goals</td>
<td>MAS27</td>
<td>“I am most motivated when I am good at something”</td>
</tr>
<tr>
<td></td>
<td>MAS32</td>
<td>“I am most motivated when I solve problems”</td>
</tr>
<tr>
<td></td>
<td>MAS37</td>
<td>“I am most motivated when I am becoming better at my work”</td>
</tr>
<tr>
<td></td>
<td>MAS42</td>
<td>“I am most motivated when I am confident that I can do my school”</td>
</tr>
<tr>
<td></td>
<td>MAS50</td>
<td></td>
</tr>
<tr>
<td>Performance goals</td>
<td>PER58</td>
<td>“I am most motivated when I receive rewards”</td>
</tr>
<tr>
<td></td>
<td>PER62</td>
<td>“I am most motivated when I receive good marks”</td>
</tr>
<tr>
<td></td>
<td>PER72</td>
<td>“I am most motivated when I am noticed by others”</td>
</tr>
<tr>
<td></td>
<td>PER78</td>
<td>“I am most motivated when I am competing with others”</td>
</tr>
<tr>
<td></td>
<td>PER83</td>
<td>“I am most motivated when I am in charge of a group”</td>
</tr>
<tr>
<td></td>
<td>PER90</td>
<td>“I am most motivated when I am praised”</td>
</tr>
<tr>
<td></td>
<td>PER95</td>
<td>“I am most motivated when I am doing better than others”</td>
</tr>
<tr>
<td></td>
<td>PER98</td>
<td>“I am most motivated when I become a leader”</td>
</tr>
<tr>
<td>Social goals</td>
<td>SOC35</td>
<td>“I am most motivated when I work with others”</td>
</tr>
<tr>
<td></td>
<td>SOC55</td>
<td>“I am most motivated when I am in a group”</td>
</tr>
<tr>
<td></td>
<td>SOC67</td>
<td>“I am most motivated when I work with friends at school”</td>
</tr>
<tr>
<td></td>
<td>SOC101</td>
<td>“I am most motivated when I am helping others”</td>
</tr>
<tr>
<td></td>
<td>SOC108</td>
<td>“I am most motivated when I am showing concern for others”</td>
</tr>
</tbody>
</table>
7.2.2 Academic self-concept

Recent research on the multidimensionality of self-concept focuses on domain-specific self-concepts (Lau et al., 1999). Marsh’s (1989) Self-Description Survey (SDQ) measures students’ self-concept in a variety of non-academic and academic domains. The SDQ comprises seven non-academic scales (e.g., physical appearance and physical ability) and three academic scales (e.g., mathematics, verbal and general school self-concepts). Marsh and colleagues (Marsh, 1989; Marsh, Relich, & Smith, 1983) designed the SDQII survey in order to examine adolescents’ multidimensional self-concept between the ages of 12 and 18 years (Gonzalez-Pienda et al., 2002). Based on the SDQII, Marsh (1990c) developed the Academic Self-Description Questionnaire II. The ASDQII examines academic self-concepts in specific domains, including English and mathematics. The full ASDQII comprises 136 items that measure a variety of domains, but this study focuses on English and mathematics self-concept. Five items measured English self-concept (e.g., “I am good at English”) and five items measured math self-concept (e.g., “I am good at mathematics”). The ten ASDQII items are presented in Table 7.3.

7.2.2.1 English self-concept

English self-concept was assessed from a descriptive/evaluative aspect (e.g., “I am good at English”) as opposed to an affective/motivational aspect (e.g., “I am proud of my ability in English”; Rosenberg, 1979; Skaalvik, 1990). Descriptive components relate to perceptions of self in particular domains that are formed from roles and characteristics that are socially ranked and valued. The items from the ASDQII for English self-concept reflect self-conceptions of students’ English abilities.

7.2.2.2 Mathematics self-concept

Parallel with the English self-concept subscale, mathematics self-concept assesses descriptive/evaluative aspects (e.g., “I am good at mathematics”) that relate to perceptions of self in the domain of mathematics. The items from the ASDQII for mathematics self-concept reflect self-conceptions of students’ mathematical abilities.
Table 7.3

*Items from the Academic Self-concept Subscales for English and Mathematics*

<table>
<thead>
<tr>
<th>Subscale</th>
<th>ASDQII</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>English self-concept</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESC1</td>
<td></td>
<td>“I am good at English”</td>
</tr>
<tr>
<td>ESC2</td>
<td></td>
<td>“I have always been good at English”</td>
</tr>
<tr>
<td>ESC3</td>
<td></td>
<td>“Work in English is easy for me”</td>
</tr>
<tr>
<td>ESC4</td>
<td></td>
<td>“I get good marks in English”</td>
</tr>
<tr>
<td>ESC5</td>
<td></td>
<td>“I learn things quickly in English”</td>
</tr>
<tr>
<td>Mathematics self-concept</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSC1</td>
<td></td>
<td>“I am good a mathematics”</td>
</tr>
<tr>
<td>MSC2</td>
<td></td>
<td>“I have always been good at mathematics”</td>
</tr>
<tr>
<td>MSC3</td>
<td></td>
<td>“Work in mathematics is easy for me”</td>
</tr>
<tr>
<td>MSC4</td>
<td></td>
<td>“I get good marks in mathematics”</td>
</tr>
<tr>
<td>MSC5</td>
<td></td>
<td>“I learn things quickly in mathematics”</td>
</tr>
</tbody>
</table>

### 7.3 Data Analyses and Model Assessment

Data were analysed using SPSS for Windows® (Pedhazur & Pedhazur-Schmelkin, 1991) and LISREL® 8.54 (Jöreskog & Sörbom, 1989a; 2003). Reliability estimates of the scales were examined using Cronbach’s alpha. Most analyses entailed confirmatory factor analysis (CFA) and structural equation modelling (SEM) using LISREL, which determines how closely a sample covariance matrix compares with a hypothesised matrix (Kelloway, 1998). Models were estimated using Maximum Likelihood Estimation (MLE). MLE is one of seven choices for parameter estimation provided by LISREL, is the default method of estimating structure (path) coefficients in SEM and the most commonly used (Anderson & Gerbing, 1988; Kelloway, 1996). MLE has been utilised in this study because it is both efficient and an unbiased estimator for continuous latent variables. MLE formulates estimates based on maximising the probability (likelihood) that the observed covariances are drawn from a population assumed to be identical to that reflected in the coefficient
estimates. Hence, MLE selects estimates which have the greatest probability of replicating the observed data (Pampel, 2000). MLE is known to be consistent and asymptotically efficient. In using MLE, all parameters are estimated simultaneously (Kelloway, 1998).

Due to the large numbers of parameters to be estimated in the causal models, and the consequent necessity for a large sample size in order to increase the reliability of the parameter estimates, Full Maximum Likelihood Estimation (FIML) was conducted. Arbuckle (1996) and Enders and Bandalos (2001) contend that FIML is a superior method for treating missing data. An underlying assumption of FIML is that absent data is missing completely at random. However, this was not applicable to all cases in this study’s data set. For instance, a number of schools were unable to provide any achievement data across one or more data collection points. Therefore, an important consideration when conducting FIML is the nature of the missing data. It would be inappropriate to provide replacement values for such missing cases due to the lack of information for these cases in the data set. Consequently, listwise deletion was employed for these cases and then FIML was conducted to replace subsequent missing values for other variables.

After conducting FIML, the raw data was inputted into PRELIS® (Jöreskog & Sörbom, 1988; 2003) with the purpose of producing a covariance matrix to conduct analyses using LISREL. To determine goodness-of-fit for the models a number of alternate indices were proposed. These indices are flagged in this section and discussed in the following chapter. A useful index is the Tucker-Lewis Index (TLI). The TLI is relatively independent of sample size and enforces a penalty with the addition of variables to a given model (Marsh, Balla, & Hau, 1996; McDonald & Marsh, 1990). Concurring with these authors, the Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA) are also considered as valuable measures of goodness-of-fit. Ideally, the TLI and CFI should be equal to or above .9. Recently it has been proposed, however, that the .90 criterion may tend to over-reject acceptable models (Hu & Bentler, 1995). Consequently, TLIs and CFIs in the high .80s have been deemed acceptable. Values of .05 up to .08 for the RMSEA are indicative of a reasonable fit (Byrne, 1998; Raykov & Marcoulides, 2000).
7.4 Brief orientation to CFA and SEM

According to Byrne (1998), in CFA the researcher postulates relations between observed measures and underlying factors a priori, based on knowledge of theoretical structures. The validity of a solution based on this hypothesised factor structure is then statistically tested. In the CFA models performed in this study, it was hypothesised that:

a) each measured variable would have a non-zero loading on the factor it was designed to measure and a zero loading on all other factors,
b) the factors in all cases would be correlated,
c) and the error terms—known as uniquenesses—for each measured variable would be uncorrelated.

Furthermore, using CFA procedures, higher-order factors can be generated so that underlying first-order factors can be represented by a higher-order factor. Higher-order factors account for covariances between a range of first-order factors. Figure 7.1 depicts a CFA structure in which a higher-order factor is represented by two first-order factors for which there are five indicators each.

SEM refers to the causal relationships among latent factors generated in the CFAs (see Figure 7.2). In SEM a series of interrelated regression equations based on the proposed model estimate the fit between the data and the model. As with CFAs, goodness of fit indices aid in the evaluation of model fit. The typical SEM model represents a one-step (simultaneous) analysis which takes into account the interactive effects of all relationships among variables in the analysis. Recently there have been developments in the application of SEM for the analysis of longitudinal panel designs which apply specifically to this study. In line with these developments, Longitudinal Structural Equation Modelling (LSEM) should ideally involve:

a) latent constructs being inferred on the basis of multiple indicators;
b) controlling for method-halo effects associated with the same measure collected on multiple occasions by correlating uniquenesses;
c) gathering data on three or more occasions and establishing clear time intervals of approximately one school year, or preferably more, between collection occasions;
d) commencing with CFA models to evaluate measurement issues and then progressing to a full-forward SEM model, and
e) using a large and diverse sample size to substantiate the use of SEM and the generality of the findings.

Figure 7.3 depicts LSEM with three waves of data for two variables.

Figure 7.1. Pictorial representation of a higher-order factor structure
Figure 7.2. CFA/Measurement component and structural component of SEM
Figure 7.3. Causal ordering of two variables over three waves
7.5 Summary of Chapter

This chapter presented an overview of the characteristics of the participants and outlined the survey and its implementation. This chapter also provided a brief orientation to statistical procedures to be conducted, and presented an overview of the indices that will be employed to evaluate how well each hypothesised model fits the data. The following chapter presents a detailed overview of the research program and highlights recent advances in analysing longitudinal structural equation models that have been applied to the present research study.
The intent of this chapter is to present an overview of the research program. It highlights recent advances in analysing longitudinal structural equation models and demonstrates how relevant guidelines have been applied to the present research study. Section 8.1 presents ten recommended guidelines proposed by Marsh et al. (1999) for analysing causal relations between self-concept and academic achievement, most of which apply to the present study. Section 8.2 presents a prototype proposed by Marsh and Craven (2006) for evaluating causal models that facilitate researchers in forming judgements concerning the causal flow of hypothesised models. These guidelines and the prototype are then directly related to the analyses conducted in the present research study and are examined below.

8.1 Advances to Analysing Longitudinal Structural Equation Models

A primary goal of this research is to examine the causal ordering of students’ motivational goals, domain-specific self-concepts and academic achievements. Critiques and reviews of causal ordering studies involving academic self-concept have led to advances in both analyses and methodological approaches such that a clear set of guidelines has been formulated (Guay et al., 2003). Many studies that examine causation of self-concept and academic achievement are problematic because they have not applied these necessary statistical criteria. Byrne (1984), in a review of literature, noted that studies are unsuited to interpreting causal ordering unless they

- demonstrate a statistical relation between the constructs,
- establish precedence of time, and
• test causal models using sophisticated analyses such as structural equation modelling.

Subsequent research has led to further refinements to analysing longitudinal causal ordering (see for example Marsh et al., 1999) and to the formation of a prototype model (see for example Marsh and Craven, 2006) for evaluating the causal relations between self-concept and academic achievement.

Significant methodological advances in the analysis of longitudinal structural equation modelling have been led by Marsh et al. (1999). Due to these advances, earlier research has become obsolete and precludes conclusive findings on causal relations between self-concept and achievement. To avoid future methodological pitfalls, Marsh et al. (1999) recommend ten guidelines for an ideal study that supersedes earlier methodologies. These researchers are aware of no studies that fulfil all the guidelines, and pragmatically suggest that fulfillment may never be attained. The ten recommended guidelines are now discussed with reference to their application in the present study.

1. Latent constructs (e.g., self-concept) should be inferred by at least three items to the respective factor. Although it is ideal to have at least three indicators per factor, obtaining multiple indicators for achievement nevertheless remains problematic. Difficulties arise with achievement data because typically schools use a total achievement test score, whereas researchers would benefit from constructing multiple indicators instead of utilising total scores. School grades assessing progress or comprehensive examinations allow for the construction of multiple indicators; however, schools often report only a final school grade, which makes obtaining multiple measures difficult. Marsh et al. (1999) advise against general measures of achievement and self-concept, and endorse domain-specificity for both measures.
In this study goal orientations were inferred by at least four indicators and the domain-specific self-concepts were all inferred by five indicators. Achievement data in this study were only inferred by one indicator, due to schools’ inability to provide achievement scores in addition to achievement ranks. Consequently, English achievement and mathematics achievement in this study were inferred by ranks exclusively.

2. Building on the concern for multiple indicators is the need to address method-halo effects. Method-halo effects relate to parallel measures collected on multiple occasions. For instance, participants are provided with the same survey items on multiple occasions. These parallel items are likely to be correlated, and consequently the model should specify these relations. If they remain unspecified, then systematic positive biased estimates of stability may result (Marsh & Hau, 1996). Therefore a strong recommendation for avoiding method-halo effects is to correlate uniquenesses between the repeated measures.

Chapter 11 directly addresses method-halo effects by comparing a model with correlated uniquenesses with a model specifying no correlated uniquenesses, to demonstrate the impact of method-halo effects on parallel measures collected across different points in time. Thereafter, all analyses involving multiple measures on multiple occasions include correlated uniquenesses, as recommended by Marsh et al. (1999).

3. Despite no decisive conclusions on the frequency of collecting data and the optimal intervals between each collection point, Marsh et al. (1999) recommend collecting data on at least two occasions (e.g., a two-wave study) with a data span of more than one school year between each collection point.

Data were collected for the present study across three time waves, with a data span of one year between each collection point. This should provide adequate time for the relations between the constructs to demonstrate potential changes.
Longitudinal causal ordering should proceed in four distinct phases. The first phase involves basic confirmatory factor analyses for each wave of data, to resolve measurement issues. Phase 2 entails testing more complicated CFAs which involves simultaneously examining relations of all variables across all data waves. The purpose of this large CFA is to examine relationships among the variables across the various time waves but also to address remaining measurement issues. Phase 3 entails testing a full-forward model which specifies correlations among factors within parallel waves, in addition to all paths from all constructs in each wave to all constructs in subsequent waves freely estimated. Finally, Phase 4 entails testing a full-forward model and exploring alternative SEM models. The role of a researcher, according to Marsh et al. (1999), is to investigate alternative leads and offer defensible explanations for these.

These four sequential phases of analyses have been applied to this study. A rationale for these phases of analyses, specific details on how the analyses were conducted, the results and discussion of them are comprehensively examined in the relevant chapters. Phases 1 and 2 relate to the measurement model because they focus solely on the links among factors and their measured variables. Phase 1 corresponds with Chapters 9 and 10, while Phase 2 corresponds with Chapter 11. A general discussion of the results from the straightforward and more complicated measurement models follows in Chapter 12.

Phases 3 and 4 relate to full structural equation models because they comprise both a measurement model and structural model where the structural model specifies relations among the latent variables themselves (Byrne, 1998). Chapter 14 examines the full-forward model from Phase 3 and the alternative nested models from Phase 4.

Although unrelated to Marsh and Byrne’s fourth guideline, but related to the measurement model of goals and domain-specific self-concepts, an additional analysis was conducted after Phases 1 and 2. This additional measurement model tested the potential for a hierarchical representation of goals and academic self-concept, since the researcher was interested in exploring the structure of goals and self-concept. Accordingly, Chapter 13 examines the possibility of a hierarchical representation of students’ goals and academic self-concept following Phase 2, which
tests the complex measurement model, and precedes Phase 3, which examines the structural components of the model.

4. Generality of findings can only be achieved with a substantially large and diverse sample. Sufficient sample size and diversity also provides the freedom to explore an extensive range of models that can be compared and contrasted.

A substantial sample size of 535 respondents was utilised to examine the measurement and structural models.

5. To address caveats in research that predominantly focus on global measures of self-concept or specific measures of self-concept within a domain (e.g., English self-concept and achievement), there is an appeal to extend research to include more than one academic domain into the research (e.g., English and mathematics self-concept and English and mathematics achievement).

This study directly addresses the sixth guideline as the measurement and structural models include domain-specific self-concepts in English and mathematics and corresponding domain-specific academic achievement in the same domains.

6. It is necessary for future research to attempt to explain how self-concept influences subsequent achievement through examining intervening variables that may mediate the effect of prior self-concept on academic achievement. For instance, Harter (1986) demonstrated that increases in self-concept led to increases in motivation which contributed to better achievement outcomes. Unfortunately, this research preceded current advances in structural equation modelling. Consequently, Marsh et al. (1999) believe future studies should investigate a broad array of variables related to educational psychological constructs that may mediate the effect of self-concept on subsequent achievement.
This study directly addresses the seventh guideline since one of the three proposed competing models tests whether self-concept and academic achievement is mediated through goal orientations. Additionally, the study investigates whether this causal flow is a better representation of the data compared with the two alternative models.

7. In addition to exploring issues of mediation, it is valuable to assess moderating variables. Unlike mediating variables, which assume that underlying processes of self-concept contribute to changes in achievement, moderating variables (also referred to as background variables) refer to individual differences that interact with self-concept and the manner in which they influence academic achievement. While substantial work has been conducted on moderating variables and their influences on mean levels of self-concept, little research attempts to explain whether relations between self-concept and achievement vary as a function of the background variables of gender, age, ethnicity, culture, educational status etc. Therefore researchers should determine whether self-concept and the manner in which it influences achievement is a function of moderating variables.

The present study only examines mediating variables, not moderating variables, and therefore does not apply Marsh and Byrne’s eighth recommendation for future research directions.

8. Measures of academic self-concept become increasingly defined as children age and develop, such that they are able to differentiate between self-concepts in specific domains. Interestingly, competency and affect components of self-concept appear to be indistinguishable because they remain highly correlated. A number of researchers (e.g., Marsh, Craven, & Debus, 1999) contend that the competency component of self-concept is more likely to correlate highly with performance attainment (e.g. test scores and grades) whereas the affective component is more likely to correlate highly with coursework selection and to influence preferences for subjects to be studied. A new direction for the self-concept researcher is to evaluate the validity of separating these two components and to determine their alignments with
alternative motivational theories for which related distinctions are of central importance and can be tested.

The ninth guideline is not applicable to the present study examining causal relations between goals and domain-specific self-concepts and their combined effect on academic achievement. Therefore this recommended new direction has not been addressed in this study.

9. Contending with the distinction between competency and affect is the developmental perspective on this issue. Supporters of the developmental perspective propose that children’s appreciation of competence varies as a function of age. Research demonstrates that, compared with older children, younger children exhibit inflated positive self-concepts that are less likely to be dependent on external academic outcomes (Wigfield & Karpathian, 1991). As a consequence, the causal flow for young children aligns with the skill development model of causation. “Once ability perceptions are more firmly established the relation likely becomes reciprocal: Students with high perceptions of ability would approach new tasks with confidence, and success on those tasks is likely to bolster their confidence in their ability” (Wigfield & Karpathian, 1991, p.255). Marsh and Byrne support extant findings of a reciprocal effect for older children but challenge them in respect of the feasibility of reciprocal effect sizes being larger for younger children also and this is justified by the instability and the continual formation of these constructs over time. Marsh et al. (1999) believe new alternative methods of analyses may be required to pursue developmental perspectives. For instance, they advocate longitudinal data that spans more than 1 to 3 years and propose multicohort-multioccasion designs, which may be a better method, so as to take advantage of the cross-sectional (multiple age cohorts) and longitudinal (multiple occasion) data that is available within the same study (see for example Guay et al., 2003).

Despite agreeing with the importance of testing developmental perspectives, this study only meets some of the necessary criteria to test this. In particular, the sample size, although large and diverse, could not be split for the purpose of testing
multicohort-multioccasion because of the substantial number of paths to be estimated in the hypothesised models.

8.2 Model Evaluation

In order to assess the full-forward model proposed in Marsh and Byrne’s fourth guideline, Marsh and Craven (2006) describe a prototype causal ordering model procedure (Figure 8.1) to facilitate researchers in their evaluation and judgements of causal ordering. This procedure is explained below.

Common to the self-enhancement, skill-development and reciprocal effects models is that all three predict that the path of each T1 variable on the parallel T2 and T3 variables is substantially positive (solid gray horizontal paths in Figure 8.1). Discrimination among the three models occurs with the cross-paths relating prior achievement to subsequent self-concept and vice versa.

The skill-development model can be identified by three paths from prior achievement to subsequent academic self-concept (three paths represented by dashed black lines in Figure 8.1) which are all positive. Identifiably, the path from T1 achievement to T2 academic self-concept and the path from T2 achievement to T3 academic self-concept are both predicted to be significantly positive. Since the effects of T1 achievement to T3 academic self-concept are likely to be ameliorated due to the mediated effect through T2 constructs, the path from T1 achievement to T3 academic self-concept is considered less important.

The self-enhancement model can be identified by three paths from prior academic self-concept to subsequent achievement (three paths represented by solid black lines in Figure 8.1), all of which are positive. Identifiably, the path from T1 academic self-concept to T2 achievement and the path from T2 academic self-concept to T3 achievement are predicted to be significantly positive. Since the effects of T1 academic self-concept to T3 achievement are likely to be ameliorated due to the mediated effect through T2 constructs, the path from T1 academic self-concept to T3 achievement is considered less important.
The reciprocal effects model can be identified by including the positive paths from both the skill-development model and self-enhancement model. In sum, paths leading from prior achievement to subsequent academic self-concept (skill-development) and prior academic self-concept to subsequent achievement (self-enhancement) will all be positive. The ameliorating effects from the other two models also apply to the reciprocal effects model, since the effects of T1 constructs on T3 constructs are mediated through the T2 constructs.

Figure 8.1. Marsh and Craven’s causal ordering prototype model for evaluating the full-forward model. ASC = Academic self-concept, ACH = Academic achievement, T1= Time 1, T2 = Time 2, T3 = Time 3.

Although the procedure described above applies to causal relations between academic self-concept and academic achievement, parallel procedures were applied when examining paths in the full-forward model from the present study. Specifically, Chapter 14 applies these procedures when evaluating the full-forward model, which includes goals, domain-specific self-concepts, and academic achievement.
8.3 Overview of Analyses

Primarily this study aims to examine the causal ordering of students’ goal orientations, domain-specific self-concepts and academic achievement. Recent recommendations for analysing and evaluating causal ordering in studies were reviewed above and have been applied, where relevant, to this study. Below is an overview and rationale for how analyses proceeded in the present research study.

The phases applied to this study comprise:

Phase 1: Conduct straightforward CFA models to address measurement issues. Data from each collection point should be tested independently in a CFA model and potential measurement errors should be resolved at this phase.

Phase 2a: Conduct more complicated CFA models, comprising all variables across all waves so as to examine simultaneous interactions among the variables. This phase also provides another opportunity to address measurement errors that may arise, before moving on to structural models. It has been demonstrated that potential problems and their solutions are typically more easily resolved for CFA models than for SEM models (Marsh et al., 1999).

Phase 2b: Conduct higher-order analyses to examine the potential for students’ mastery, performance, and social goals to be represented by a higher-order factor related to purposes for achievement and examine the potential for students’ English and mathematics self-concepts to be represented by a higher-order factor related to academic self-concept.

Phase 3: Conduct a full-forward SEM model where all possible paths are estimated. Coincidentally, the full-forward SEM model corresponds mathematically with the large CFA model from Phase 2.

Phase 4: Conduct a test where alternative causal SEM models are compared with the full-forward model from Phase 3. Testing alternative models entails constraining certain paths in the full-forward model. The alternative models are nested within the full-forward model, which can be used as a point of comparison with the purpose of determining which model explains the data best.
The above phases based on recommendations from Marsh et al. (1999) have been sequentially addressed in the chapters that follow. Table 8.1 presents a synopsis of the analyses conducted in this study.
Table 8.1

Synopsis of Analyses

<table>
<thead>
<tr>
<th>PHASE</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1: Confirmatory Factor Analysis</td>
<td>Conduct simple CFA models to resolve potential measurement problems before pursuing more complicated SEM models.</td>
</tr>
<tr>
<td></td>
<td>Examine the psychometric properties of the combined GAGOS-ASDQII instrument.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter and Data Wave</th>
<th>Numerical Identifier and Sample</th>
<th>Model Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 9 - Wave 1</td>
<td>Focus Sample</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M1aT1</td>
<td>Hypothesised (5 factor) model for the full set of 28 items</td>
</tr>
<tr>
<td></td>
<td>M1bT1</td>
<td>Null (no factor) model for the full set of 28 items</td>
</tr>
<tr>
<td></td>
<td>M2aT1</td>
<td>Refined (5 factor) model with the revised set of 23 items</td>
</tr>
<tr>
<td></td>
<td>M2bT1</td>
<td>Null model with the five poorly fitting items from M1aT1 deleted</td>
</tr>
<tr>
<td></td>
<td><strong>Independent Sample</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M3aT1</td>
<td>Refined model for the independent sample</td>
</tr>
<tr>
<td></td>
<td>M3bT1</td>
<td>Null model for the independent sample</td>
</tr>
<tr>
<td></td>
<td><strong>Focus Sample</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M4aT1</td>
<td>Refined model for males</td>
</tr>
<tr>
<td></td>
<td>M4bT1</td>
<td>Null model for males</td>
</tr>
<tr>
<td></td>
<td>M4cT1</td>
<td>Refined model for females</td>
</tr>
<tr>
<td></td>
<td>M4dT1</td>
<td>Null model for females</td>
</tr>
<tr>
<td></td>
<td>M5T1</td>
<td>M4aT1 true test of invariance across sex</td>
</tr>
<tr>
<td>Chapter 10 - Wave 2</td>
<td>Focus Sample</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M2aT2</td>
<td>Refined (5 factor) model with the revised set of 23 items</td>
</tr>
<tr>
<td></td>
<td>M2bT2</td>
<td>Null model</td>
</tr>
<tr>
<td></td>
<td><strong>Independent Sample</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M3aT2</td>
<td>Refined model for the independent sample</td>
</tr>
<tr>
<td></td>
<td>M3bT2</td>
<td>Null model for the independent sample</td>
</tr>
<tr>
<td></td>
<td><strong>Focus Sample</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M4aT2</td>
<td>Refined model for males</td>
</tr>
<tr>
<td></td>
<td>M4bT2</td>
<td>Null model for males</td>
</tr>
<tr>
<td></td>
<td>M4cT2</td>
<td>Refined model for females</td>
</tr>
<tr>
<td></td>
<td>M4dT2</td>
<td>Null model for females</td>
</tr>
<tr>
<td></td>
<td>M5T2</td>
<td>M4aT2 True test of invariance across sex for the refined model</td>
</tr>
</tbody>
</table>
**Chapter 10 - Wave 3**

*Focus Sample*
- M2aT3: Refined (5 factor) model with the revised set of 23 items
- M2bT3: Null model with the five poorly fitting items from M1aT1 deleted

*Independent Sample*
- M3aT3: Refined model for the independent sample
- M3bT3: Null model for the independent sample

*Focus Sample*
- M4aT3: Refined model for males
- M4bT3: Null model for males
- M4cT3: Refined model for females
- M4dT3: Null model for females
- M5T3: M4aT3 true test of invariance across sex for the refined model

---

**PHASE**  
Phase 2a: Complicated CFAs

**PURPOSE**
Conduct more complicated CFAs to further address potential measurement problems. Examine the multidimensionality and stability of students’ goals and academic self-concept across three waves.

---

<table>
<thead>
<tr>
<th>Chapter and Data Wave</th>
<th>Numerical Identifier and Sample</th>
<th>Model Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 11 - Waves 1-3</td>
<td><em>Focus Sample</em></td>
<td></td>
</tr>
<tr>
<td>M6</td>
<td>Refined model with no correlated uniquenesses</td>
<td></td>
</tr>
<tr>
<td>M7</td>
<td>M6 with correlated uniquenesses</td>
<td></td>
</tr>
<tr>
<td>M8</td>
<td>M7 True test of invariance across sex</td>
<td></td>
</tr>
<tr>
<td>M9a</td>
<td>Refined model with the addition of achievement ranks</td>
<td></td>
</tr>
<tr>
<td>M9b</td>
<td>M9a True test of invariance across sex</td>
<td></td>
</tr>
<tr>
<td><strong>PHASE</strong></td>
<td><strong>PURPOSE</strong></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Phase 2b: Higher-order Confirmatory Factor Analysis</td>
<td>Conduct higher-order analyses to examine the potential hierarchical representation of students’ goals and academic self-concept.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter and Data Wave</th>
<th>Numerical Identifier and Sample</th>
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<td>Chapter 13 - Wave 1</td>
<td>Focus Sample</td>
<td>Hypothesised 23 item 2 factors</td>
</tr>
<tr>
<td></td>
<td>M10aT1</td>
<td>Null model</td>
</tr>
<tr>
<td></td>
<td>M10bT1</td>
<td>M9aT1 true test of invariance across sex</td>
</tr>
<tr>
<td></td>
<td>M10cT1</td>
<td>M9aT1 true test of invariance across sex</td>
</tr>
<tr>
<td>Chapter 13 - Wave 2</td>
<td>M10aT2</td>
<td>Hypothesised 23 item 2 factors</td>
</tr>
<tr>
<td></td>
<td>M10bT2</td>
<td>Null model</td>
</tr>
<tr>
<td></td>
<td>M10cT2</td>
<td>M9aT2 true test of invariance across sex</td>
</tr>
<tr>
<td>Chapter 13 - Wave 3</td>
<td>M10aT3</td>
<td>Hypothesised 23 item 2 factors</td>
</tr>
<tr>
<td></td>
<td>M10bT3</td>
<td>Null model</td>
</tr>
<tr>
<td></td>
<td>M10cT3</td>
<td>M9aT3 true test of invariance across sex</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>PHASE</strong></th>
<th><strong>PURPOSE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 3: Structural Equation Modelling</td>
<td>Conduct a full-forward SEM model where correlations among factors within the same wave, as well as paths from all constructs in each wave to all constructs in subsequent waves are freely estimated.</td>
</tr>
</tbody>
</table>

<table>
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<th>Chapter and Data Wave</th>
<th>Numerical Identifier and Sample</th>
<th>Model Description</th>
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</thead>
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<tr>
<td>Chapter 14 - Waves 1-3</td>
<td>Focus Sample</td>
<td>Full-forward SEM model</td>
</tr>
<tr>
<td></td>
<td>M11</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>PHASE</strong></th>
<th><strong>PURPOSE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 4: Structural Equation Modelling</td>
<td>Conduct tests where alternative causal SEM models are compared with the full-forward model from Phase 3. Testing alternative models entails constraining certain paths in the full-forward model. The alternative models are nested within the full-forward model and therefore can be used as a point of comparison. Parameter estimates and fit indices are compared between the full-forward model and alternative models.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter and Data Wave</th>
<th>Numerical Identifier and Sample</th>
<th>Model Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 14 – Waves 1-3</td>
<td>Focus Sample</td>
<td>Alternative causal model with Self-concept T1, Goals T2 and achievement T3</td>
</tr>
<tr>
<td></td>
<td>M12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M13</td>
<td>Alternative causal model with Goals T1, Self-concept T2, and achievement T3</td>
</tr>
</tbody>
</table>
8.4 Summary of Chapter

This chapter provided a review and rationale for how causal ordering analyses should proceed. In this study it was argued that analyses should proceed with an examination of the integrative measurement model of student motivation and advance to full structural models. The following chapter provides specific details of the demographics and composition of the schools and participants involved and then addresses measurement issues of the integrative model of student motivation by examining the psychometric properties of the survey instruments used in this study.
CHAPTER 9
CONFIRMATORY FACTOR ANALYSES TIME 1

The results in this chapter are based on the Time 1 data and are presented in three sections. Section 9.1 presents the methodology of and results from analysis of the focus sample for the first wave of data using the combined GAGOS–ASDQII instrument. The focus sample comprised students for whom three waves of data, including achievement ranks, were available. The central objective of this component was to examine the psychometric properties of both students’ goals as defined by the GAGOS and students’ academic self-concept as defined by the ASDQII when combined in the one instrument. An important goal was to determine whether the combined instruments provide a reliable and valid measure. Also of significance in this section was the refinement of items, particularly for the recently designed GAGOS, whereas the ASDQII has been well established in research studies and proven to be psychometrically sound.

Section 9.2 of the methodology and results presents findings of the refined instrument with the focus sample and then replicated with an independent sample. Unlike the focus sample, achievement ranks were unavailable for respondents from the independent sample. The central objective of this section was to cross-validate the model to avoid the possibility of capitalising on chance variation within a sample due to post-hoc model modifications.

Section 9.3 presents a test for factor invariance across sex for the refined model with the focus sample group. The central goal of this section was to assess whether males interpret motivation and self-concept differently than do females.
9.1 Testing and Refining the Combined GAGOS-ASDQII Instrument

The first phase of the study was to determine the psychometric properties of the focus sample using the combined GAGOS–ASDQII. Although research has been conducted on relations between (a) academic achievement motivation and academic achievement and (b) academic self-concept and academic achievement, there have been few studies that combine all three variables: academic achievement motivation, academic self-concept and academic achievement. As a consequence of combining these variables, it is essential to determine whether the psychometric properties of these measures (items and scales) drawn from their original instruments remain independent when used in the one instrument. Hence the purpose was to examine whether the combined instrument reliably and validly measures the underlying constructs.

Unique to this study is the inclusion of social goals into the goal theory framework. This theoretical conceptualisation requires empirical support. Specifically, the author wished to examine whether multiple goals (mastery, performance and social goals) represent three distinct goals that delineate different purposes for achievement. In addition, the author also wished to examine whether academic self-concept could be represented by two specific domains (mathematics and English).

9.2 Method

9.2.1 Sample

This research was part of a larger scale study. Although a total of 9 Australian high schools were involved over the three waves, not all of these data were available for LSEM analyses. The focus sample was selected from schools which provided complete data over three years. An independent sample was formed from the four schools that provided incomplete data required for the LSEM (i.e., achievement ranks were unavailable). Table 9.1 presents the composition of the focus and independent samples. Consistently with other longitudinal designs, there was a problem with the attrition of the sample over time. Almost half of the sample was lost when only 5 of 9 schools provided achievement ranks for all three waves.
Consequently the focus sample comprised 535 secondary students in Year 7 \( (n = 195, 36\%) \), Year 8 \( (n = 179, 34\%) \) and Year 9 \( (161, 30\%) \) from five high schools (Schools 1, 2, 3, 4, and 6). More than half of the respondents \( (n = 315, 59\%) \) were male, 220 were female (41%). The mean age of respondents was 13.0 years (SD = 1.0). The composition of the independent sample is described in more detail in the later section on cross-validation.

Table 9.1

Sample Composition

<table>
<thead>
<tr>
<th>Year</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T1</td>
<td>T2</td>
<td>T3</td>
</tr>
</tbody>
</table>

**Focus Sample**

<table>
<thead>
<tr>
<th>Year</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 7</td>
<td>195 (36%)</td>
<td>195 (36%)</td>
<td>195 (36%)</td>
</tr>
<tr>
<td>Year 8</td>
<td>179 (34%)</td>
<td>179 (34%)</td>
<td>195 (36%)</td>
</tr>
<tr>
<td>Year 9</td>
<td>161 (30%)</td>
<td>161 (30%)</td>
<td>179 (34%)</td>
</tr>
<tr>
<td>Year 10</td>
<td>161 (30%)</td>
<td>161 (30%)</td>
<td>179 (34%)</td>
</tr>
<tr>
<td>Year 11</td>
<td>161 (30%)</td>
<td>161 (30%)</td>
<td>161 (30%)</td>
</tr>
<tr>
<td>Number</td>
<td>535</td>
<td>535</td>
<td>535</td>
</tr>
<tr>
<td>Ratio</td>
<td>59/41</td>
<td>59/41</td>
<td>59/41</td>
</tr>
<tr>
<td>Age – mean</td>
<td>13.0</td>
<td>14.3</td>
<td>15.1</td>
</tr>
<tr>
<td>Age – std dev</td>
<td>1.0</td>
<td>1.0</td>
<td>0.9</td>
</tr>
</tbody>
</table>

**Independent Sample**

<table>
<thead>
<tr>
<th>Year</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 7</td>
<td>182 (39.1%)</td>
<td>182 (39.1%)</td>
<td>182 (39.1%)</td>
</tr>
<tr>
<td>Year 8</td>
<td>167 (35.8%)</td>
<td>167 (35.8%)</td>
<td>182 (39.1%)</td>
</tr>
<tr>
<td>Year 9</td>
<td>117 (25.1%)</td>
<td>117 (25.1%)</td>
<td>167 (35.8%)</td>
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<tr>
<td>Year 10</td>
<td>117 (25.1%)</td>
<td>117 (25.1%)</td>
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<td>Year 11</td>
<td>117 (25.1%)</td>
<td>117 (25.1%)</td>
<td>117 (25.1%)</td>
</tr>
<tr>
<td>Number</td>
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<td>Ratio</td>
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<td>Age – mean</td>
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</tr>
<tr>
<td>Age – std dev</td>
<td>0.9</td>
<td>1.0</td>
<td>0.9</td>
</tr>
</tbody>
</table>
9.2.2 Overview of analyses for Time 1

CFAs using LISREL (Jöreskog & Sörbom, 1989a; 2003) and Reliability Analyses (Pedhazur & Pedhazur-Schmelkin, 1991) using SPSS were used to determine the psychometric properties of the 28 items of the combined GAGOS–ASDQII scales. The models tested were highly restrictive, since each item was allowed to load exclusively on the factor which it was designed to measure. (The LISREL syntax generated to test the hypothesised and refined first-order measurement models is included in Appendices A and B respectively). Initially, four nested models were tested in a structural approach to determining the properties of the combined scales. These models were:

Model 1a (M1aT1): the hypothesised (5-factor) model for the full set of 28 items at Time 1.

Model 1b (M1bT1): the null (no factor) model for the full set of 28 items at Time 1.

Model 2a (M2aT1): the hypothesised (5-factor) model with the revised set of 23-items at Time 1.

Model 2b (M2bT1): the null model with the 5 poorly fitting items from M1aT1 deleted at Time 1.

Once a valid and reliable measurement model was established, it was necessary to cross-validate the measurement model. This analysis involved:

Model 3a (M3aT1): the hypothesised (5-factor) model with the 5 poorly fitting items from M1aT1 deleted at Time 1 for the independent sample.

Model 3b (M3bT1): the null model with the 5 poorly fitting items from M1aT1 deleted at Time 1 for the independent sample.

When the measurement model demonstrated a good fit to the independent sample it was integral to this study to examine whether the refined measurement model was invariant across sex. This process entailed two steps. The first was to examine the measurement model in two separate tests, first for the male sample and second for the female sample. This process provides an overview of how consistent the models are for males compared with females. The first step of testing invariance involved:

Model 4a (M4aT1): the hypothesised (5-factor) model with the poorly fitting items from M1aT1 deleted at Time 1 for males.
Model 4b (M4bT1): the null model with the 5 poorly fitting items from M1aT1 deleted at Time 1 for males.

Model 4c (M4cT1): the hypothesised (5-factor) model with the poorly fitting items from M1aT1 deleted at Time 1 for females.

Model 4d (M4dT1): the null (5-factor) model with the poorly fitting items from M1aT1 deleted at Time 1 for females.

The second step after establishing that the separate samples for males and females were consistent was a true test of invariance. This final step involved:

Model 5 (M5T1): test of invariance for the hypothesised (5-factor) model with the poorly fitting items from M1aT1 deleted at Time 1 for males and females.

9.2.3 Overview of confirmatory factor analysis and goodness-of-fit

According to Byrne (1998), in Confirmatory Factor Analyses (CFAs) the researcher, based on a knowledge of theoretical structures, postulates relations between observed measures and underlying factors a priori. The validity of a solution based on this hypothesised structure is then statistically analysed. CFAs permit the researcher to identify the number of factors (or latent variables) measured by a given set of items (or indicators). In addition, the researcher specifies what items load on which factors (Fleishman & Benson, 1987). CFAs provide some indication of how, and to what extent, items or scales (a collection of items) measure a given construct for select groups.

Goodness-of-fit indices are used to determine how closely the matrix of implied variances and covariances compares with the matrix of empirical sample variances and covariances (Kelloway, 1998). Best possible fit for a given data set is obtained when parameter estimates minimise the implied discrepancy between the two matrices. In the present study, a number of parameters were taken into account in establishing goodness-of-fit. Parameter estimates examined were:

a) factor loadings, which specify relations between items and factors;

b) factor correlations, which specify relations between factors;

c) squared multiple correlations which specify the amount of variance associated with each item that may be attributed to underlying factors; and
d) error variances, or uniquenesses, which specify the amount of variance associated with each item not explained by underlying factors. Values obtained for each parameter should be permissible; that is, there should be no impossible values such as negative item or factor variances.

Once the feasibility of the model’s parameters has been determined, overall measures of model fit may be applied. The most traditional measure of a model’s overall fit is the Chi square statistic. This test computes the discrepancy between the matrix of implied variances and covariances to the matrix of empirical sample variances and covariances so as to provide a value for the ratio of the Chi square statistic for a specific model to the degrees of freedom associated with that model (Marsh et al., 1996; Mueller, 1996; Pedhazur & Pedhazur Schmelkin, 1991). Contrary to traditional hypothesis testing, a nonsignificant Chi square indicates that there is no significant discrepancy between the implied covariance matrix and the empirical sample covariance matrix. In other words, the model can reproduce the population covariance matrix adequately (Kelloway, 1998).

Problematic to the Chi square statistic is its sensitivity to increased sample size (Loehlin, 1998). With very large samples, it is possible to obtain a highly significant chi-square which deems the model a poor fit with the data when the opposite may be the case. Given the difficulties with the chi square test, a number of alternate fit indices are used in the present study: the Normed Chi square ($\chi^2$/df), Goodness-of-Fit Index (GFI), Tucker-Lewis Index (TLI), the Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA).

Also deemed problematic with the chi square statistic are the imposed increases to the chi square for model complexity, which can lead to the likelihood of model rejection. To address this, the normed chi square (which involves dividing the chi square statistic by the degrees of freedom of the model) provides a chi square measure per degree of freedom. This division process reduces sensitivity to both sample size and model complexity. Ideally the chi square and degrees of freedom ratio should be larger than 1.0 but smaller than 3.0 (Kline, 1998).
The GFI, TLI, CFI and RMSEA provide appropriate indices to assess overall model fit (Byrne, 1998). Kelloway (1998, p.27) describes the GFI as “a ratio of the sum of the squared discrepancies to the observed variances” since the GFI measures the proportion of the variance and covariance that the hypothesised model proposes to explain. Values above .90 indicate reasonable fit to the data (Loehlin, 1998; Raykov & Marcoulides, 2000).

Null models serve as a valuable baseline for comparing alternative models to assess improvements in fit (Byrne, 1998; Raykov & Marcoulides, 2000). Typically, the researcher compares a baseline model that is represented by a model with no hypothesised factor structure and this baseline model can provide a poor fit to the data. Poor fit can be established in a null model because all variables are typically specified to be uncorrelated (Kelloway 1998). For models hypothesised a priori to have no underlying factor structure, however, null models can provide a good fit to the data. The TLI and the CFI both compare a null model with a hypothesised model. These indices were computed using formulae given in Marsh et al. (1996). The TLI and CFI should ideally be greater than .90 (Hu & Bentler, 1999).

Criterion values for the RMSEA can be set to take into account some error of approximation in the implied population covariance matrix, thus relaxing the stringent requirement that the model holds exactly in the population. The RMSEA should ideally be less than .05. However, values between .05 and .08 indicate reasonable fit (Byrne, 1998).

Although CFAs are labelled “Confirmatory”, typically CFA researchers do not test one model alone (a strictly confirmatory approach), but often make post-hoc adjustments to models in order to make models fit sample data better. Thus, many CFA studies are really quasi-confirmatory or even outright exploratory (Byrne, 1998). In this study a quasi-confirmatory approach was applied only for the first wave of data for the focus sample. However, for the first wave for the independent sample and for the second and third waves, a strictly confirmatory approach was followed for the first-order CFAs. Thus the first-order CFA models for the sub-group at Time 1 and all subsequent waves (Time 2 and Time 3) were estimated
without modification. This strictly confirmatory approach is a feature of this study, and represents a strong test of the factorial validity of the instrument.

**9.2.4 Item deletion**

A chief objective of model testing and refinement was to ensure that the combined GAGOS-ASDQII instrument was robust psychometrically. Items loading on their designated factors were scrutinised to evaluate their contribution to the substantive model for consideration. Items with low factor loadings, high uniquenesses, and relatively high modification indices were identified and potential theoretical explanations for why these items were poorly fitting considered, before the possibility of deletion. Also considered during model testing were the updated standards for causal models proposed by Marsh et al. (1999), which recommend latent constructs being inferred by at least three items per factor but preferably by even more. Therefore it was desirable to fit at least three items for each of the 5-factors.

**9.2.5 Summary of refinement analyses**

The first phase of data analysis was to remove items that were not loading particularly well on hypothesised subscales (Raykov & Marcoulides, 2000). This process involved examining results from (a) the first-order CFA with the combined GAGOS-ASDQII and (b) Cronbach’s alpha coefficients given the removal of each item from the subscale. Cronbach’s alpha tests the extent to which multiple indicators for a latent variable associate with each other. Indicators with a Cronbach’s alpha of .7 judge the set of indicators as a reliable measure. The results of the fit statistics are discussed below and Cronbach’s alpha coefficients are displayed in Table 9.2. Also presented is a comprehensive rationale for retention and removal of items in each of the five subscales.
Table 9.2

*Item analysis for GAGOS–ASDQII*

<table>
<thead>
<tr>
<th>Item</th>
<th>Alpha with item removed</th>
<th>Alpha with all items present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastery Goals</td>
<td></td>
<td>.69</td>
</tr>
<tr>
<td>I am most motivated when I see my work improve</td>
<td>.60</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I am good at something</td>
<td>.63</td>
<td></td>
</tr>
<tr>
<td><em>I am most motivated when I solve problems</em></td>
<td>.74</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I am becoming better at my work</td>
<td>.61</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I am confident that I can do my school work</td>
<td>.64</td>
<td></td>
</tr>
<tr>
<td>Performance Goals</td>
<td>.81</td>
<td></td>
</tr>
<tr>
<td><em>I am most motivated when I receive rewards</em></td>
<td>.79</td>
<td></td>
</tr>
<tr>
<td><em>I am most motivated when I receive good marks</em></td>
<td>.80</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I am noticed by others</td>
<td>.78</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I am competing with others</td>
<td>.79</td>
<td></td>
</tr>
<tr>
<td><em>I am most motivated when I am in charge of a group</em></td>
<td>.78</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I am praised</td>
<td>.78</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I am doing better than others</td>
<td>.78</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I become a leader</td>
<td>.78</td>
<td></td>
</tr>
<tr>
<td>Social Goals</td>
<td>.74</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I work with others</td>
<td>.68</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I am in a group</td>
<td>.66</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I work with friends at school</td>
<td>.67</td>
<td></td>
</tr>
<tr>
<td>I am most motivated when I am helping others</td>
<td>.73</td>
<td></td>
</tr>
<tr>
<td><em>I am most motivated when I am showing concern for others</em></td>
<td>.73</td>
<td></td>
</tr>
<tr>
<td>English Self-concept</td>
<td>.87</td>
<td></td>
</tr>
<tr>
<td>I am good at English</td>
<td>.83</td>
<td></td>
</tr>
<tr>
<td>I have always been good at English</td>
<td>.85</td>
<td></td>
</tr>
<tr>
<td>Work in English is easy for me</td>
<td>.86</td>
<td></td>
</tr>
<tr>
<td>I get good marks in English</td>
<td>.83</td>
<td></td>
</tr>
<tr>
<td>I learn things quickly in English</td>
<td>.84</td>
<td></td>
</tr>
<tr>
<td>Mathematics Self-concept</td>
<td>.91</td>
<td></td>
</tr>
<tr>
<td>I am good at mathematics</td>
<td>.88</td>
<td></td>
</tr>
<tr>
<td>I have always been good at mathematics</td>
<td>.89</td>
<td></td>
</tr>
<tr>
<td>Work in mathematics is easy for me</td>
<td>.89</td>
<td></td>
</tr>
<tr>
<td>I get good marks in mathematics</td>
<td>.89</td>
<td></td>
</tr>
<tr>
<td>I learn things quickly in mathematics</td>
<td>.89</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* * = item removed following first CFA
9.3 Results

Model 1a T1 (M1aT1) tested the hypothesis of 28 items loading on 5-factors. Figure 9.1 presents the path diagram for the first-order CFA (M1aT1). Specifically, this figure presents three first-order factors inferred from the GAGOS (mastery goals, performance goals, and social goals) as well as two first-order factors inferred from the ASDQII (English self-concept and mathematics self-concept). A total of five items measure students’ mastery goals, eight items measure students’ performance goals, another five items measure students’ social goals, while academic self-concept is measured by ten items, half of which are English self-concept and the remaining half measure mathematics self-concept. Results indicate that the model fits the data marginally well. The RMSEA for example, is greater than .05 but the TLI and CFI are slightly above .9. The Chi square/degrees of freedom ratio for M1aT1 is greater than 3.

The correlations between the variables are presented in Table 9.3. The positive correlation between mastery goals and performance goals ($r = .50$) suggests that respondents who adopted a mastery goal were likely to adopt a performance goal and this indicates that students can pursue multiple goals. Correlations between performance goals and social goals ($r = .43$) also support multiple goal pursuit because respondents who adopted a performance goal were also likely to adopt social goals. Mastery goals were more highly correlated with English self-concept than with mathematics self-concept, while the inverse was true for performance goals. Social goals correlated weakly with mathematics self-concept and even more weakly correlated with English self-concept.
Figure 9.1. First-order CFA/Measurement Component for M1aT1. MAS = Mastery goals, PER = Performance goals, SOC = Social goals, ESC = English self-concept, MSC = Mathematics self-concept, T1 = Time 1, T2 = Time 2, T3 = Time 3.
Table 9.3

Correlations Among the 5-factors for M1aT1

<table>
<thead>
<tr>
<th></th>
<th>Mastery goals</th>
<th>Performance goals</th>
<th>Social goals</th>
<th>English self-concept</th>
<th>Mathematics self-concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastery goals</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance goals</td>
<td>.50***</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social goals</td>
<td>.28***</td>
<td>.43***</td>
<td>.06</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>English self-concept</td>
<td>.38***</td>
<td>.19***</td>
<td>.16**</td>
<td>.19***</td>
<td>1.00</td>
</tr>
<tr>
<td>Mathematics self-concept</td>
<td>.20***</td>
<td>.22***</td>
<td>.16**</td>
<td>.19***</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Note. Coefficients are significant at *p < .05. **p < .01. ***p < .001.

9.3.1 Justification for item deletion or retention

The performance goal subscale comprised 8 items. Following the first-order CFA, three items (PER58T1, PER62T1 and PER83T1) were removed from the subscale. The first basis upon which these items were dropped from the original subscale was the enhanced reliability given their removal (whereas removal of most other items reduced reliability). A second basis for removal was the conceptual overlap among items. Specifically, item PER83T1 (“I am most motivated when I am in charge of a group”) was similar to another item that related to managing a group (“I am most motivated when I become a leader”) and therefore removed due to conceptual redundancy. Additionally, a number of similar items related to seeking rewards from others from a performance orientation PER90T1 (“I am most motivated when I am praised”), PER58T1 (“I am most motivated when I receive rewards”) and PER62T1 (“I am most motivated when I receive good marks) were considered conceptually redundant and therefore the two weakest items (PER58T1 and PER62T1) were removed. Furthermore, the high modification index (which indicates relationships between uniquenesses and between items, and pinpoints which of these parameters, if freed, would lead to an improved chi square value—Jöreskog & Sörbom, 1989a, 1989b) for the items (PER83T1, PER58T1 and PER62T1) suggested a good degree of overlap.

The mastery goal subscale comprised 5 items. Only one item (MAS37T1) was removed. The first basis upon which the item was considered for deletion was due to the enhanced reliability of the subscale given its deletion. Secondly, the factor loading for the item was comparably low and proved to be a poor item as the squared
multiple correlations revealed that the item explained only 13% of the variance on the latent construct. The fact that the item proved problematic could be attributed to the fact that the remaining four items relate to seeking competence and feelings associated with increasing competence (i.e., improving, being good at something, becoming better and being confident). In contrast, MAS37T1 relates to solving problems and appears to be more negatively phrased, compared with the remaining items from the subscale. Lastly, the modification index revealed that relaxing the large modification index for MAS37T1 would substantially improve the overall model fit.

The social goal subscale comprised 5 items. Although there were two poorly fitting items from the subscale (SOC101T1 and SOC108T1), only one was removed, since it is preferable to maintain more than three items per subscale (Marsh et al., 1999). The first basis upon which to address item deletion was enhanced reliability. Both items provided equal improvement to the subscale reliability with deletion. The second basis was to examine factor loadings. Both items revealed factor loadings below .5. Examination of the modification indices demonstrated that the largest modification index was associated with SOC108T1. Hence, this item was deleted from the subscale. Perhaps this item was misinterpreted by respondents, as they may have misunderstood the phrase “showing concern for others”. The phrase may be open to different interpretation as to how one actually demonstrates “concern for others”.

Although most of the factor loadings and $R^2$ were large for each of the subscales, smaller values were evident for SOC101, indicating this subscale is not as highly related to its factor as were the other subscales. Even though SOC101 had a weak factor loading and $R^2$ value, this item was retained for a number of reasons. First, as identified above, this item was retained to maintain more than three items per subscale (Marsh et al., 1999). Despite the number of studies that opt for a cut off level of .5 for factor loadings, researchers have accepted cut off levels for factor loadings as low as .3 to allow for sufficient numbers of items to be retained (Billings & Wroten, 1987; Cohen, 1969; Geuens & DePelsmacker, 2002). Some researchers have published studies showing models that provide a good fit to the data but report factor loadings as low and lower than .3 (see for example Kim, Cramond, &
Second, SOC101 held an a priori expectation of the theory concerning the factor structure of social goals (see for example Dowson & McInerney, 2004) and although this item had a factor loading of .42 its removal would falsify theoretical expectations of social goals if it were deleted. For instance, parallel social goal items in Dowson and McInerney’s (2004) Goal Orientation and Learning Strategies Survey (GOALS-S) which also related to helping others, had factor loadings ranging from .77 to .88. Removal of this item would be contrary to expectations of theory on social goals.

The ASDQII instrument has been well established in the literature and demonstrated sound psychometric properties when combined with the GAGOS. All 5 English self-concept items and 5 mathematics self-concept items were retained. These items demonstrated high reliability, good factor loadings, low uniquenesses and small modification indices.

### 9.3.2 Confirmatory factor analysis for the refined instrument

Having removed relatively inferior or empirically-redundant items, a CFA was performed on the 23-item, 5 subscale model. All latent constructs comprised at least four items. The resulting model (M2aT1) was tested with the same constraints as M1aT1, that is, the remaining items loading on their “target” factors, with no cross-loadings allowed. This analysis yielded a chi square of 538.08 (df = 220), a TLI of .96, a CFI of .96 and RMSEA of .05. These fit indices demonstrate that the combined GAGOS-ASDQII provided a good fit to the data for the focus sample. The factor loadings and squared multiple correlations ($R^2$) are reported in Table 9.4.

The correlations between the variables are presented in Table 9.5. The same pattern of correlations from the initial a priori hypothesised model appeared in the refined a priori model. Specifically, mastery and performance goals were modestly correlated as were performance goals and social goals. These findings suggest that students pursue multiple goals. Mastery goals were more highly correlated to English self-concept than mathematics self-concept, while performance goals were more highly
correlated with mathematics self-concept than English self-concept. Social goals correlated weakly with mathematics self-concept and even more weakly with English self-concept, although the correlation with English self-concept was nonsignificant. These findings are parallel to the correlations from the initial a priori model (M1aT1).

Table 9.4

*Factor Structure of the M1aT1 and M2aT1 for the 5-Factors*

<table>
<thead>
<tr>
<th>Item</th>
<th>M1aT1 Factor</th>
<th>M1aT1 R²</th>
<th>M2aT1 Factor</th>
<th>M2aT1 R²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>loading</td>
<td></td>
<td>loading</td>
<td></td>
</tr>
<tr>
<td>28 items</td>
<td></td>
<td></td>
<td>23-items</td>
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</tr>
<tr>
<td>MAS27</td>
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<td>.46</td>
</tr>
<tr>
<td>MAS32</td>
<td>.48</td>
<td>.39</td>
<td>.49</td>
<td>.41</td>
</tr>
<tr>
<td>MAS37</td>
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</tr>
<tr>
<td>MAS42</td>
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<td>.45</td>
<td>.54</td>
<td>.45</td>
</tr>
<tr>
<td>MAS50</td>
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<td>.33</td>
<td>.46</td>
<td>.35</td>
</tr>
<tr>
<td>PER58</td>
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<tr>
<td>PER62</td>
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<td>.26</td>
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<td>.74</td>
<td>.41</td>
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<td>.28</td>
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<td>PER83</td>
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<td>MSC5</td>
<td>.87</td>
<td>.60</td>
<td>.87</td>
<td>.60</td>
</tr>
</tbody>
</table>
9.4 Model Comparison

Model M2aT1 has different measurement specifications from M1aT1 and therefore a model comparison is challenging, because there is no direct statistical comparison available (Maruyama, 1998). For such models, it is feasible to compare absolute fit indices, for example the Goodness-of-Fit Index (GFI), Chi square statistic, Normed Chi square ($\chi^2$/df), and Root Mean Square Error of Approximation (RMSEA), as well as comparing incremental fit indices such as the Tucker Lewis Index (TLI) and Comparative Fit Index (CFI; Kaplan, 2000). Maruyama (1998) and Kaplan (2000) both acknowledge additional fit indexes that are useful for gauging the rank order for which one model fits better than another. These recommended indexes do not have an ideal value but are used to provide relative ordering for different models that utilise the same data set. These statistics comprise the Akaike Information Criterion (AIC), Consistent Akaike Information Criterion (CAIC), and the Effective Cross Validation Index (ECVI). The model with the lowest AIC, CAIC, and EVCI is deemed to fit the data best because from a predictive viewpoint, the selected model will cross-validate better than the model with higher AIC, CAIC, and EVCI values (Kaplan, 2000).

M2aT1 appears to be a better representation of the data compared with M1aT1. The GFI for M1aT1 did not reach the criterion value .90 (GFI = .86), the RMSEA was larger than .05 (RMSEA = .69) and the normed chi square was greater than 3 ($\chi^2$/df = 3.5) but the remaining values (TLI = .92, CFI = .93) provided an acceptable fit to the data. M2aT1 reached the criterion value for the GFI (GFI = .92) and provided a very good fit to the remaining indices (RMSEA = .05, $\chi^2$/df = 2.5, TLI = .96, CFI = .96). The measures assessing adequacy of the competing models were all smaller for M2aT1 (AIC = 650.08, CAIC = .945.89, and EVCI = 1.22) compared with M1aT1 (AIC = 1331.64, CAIC = 1680.27, and EVCI = 2.49). These indices also favoured M2aT1 as a better representation of the data. In sum, M2aT1 provides a better representation of the data and this was supported by all of the indices referenced above.
Table 9.5

*Correlations Among the 5-factors for M2aT1*

<table>
<thead>
<tr>
<th></th>
<th>Mastery goals</th>
<th>Performance goals</th>
<th>Social goals</th>
<th>English self-concept</th>
<th>Mathematics self-concept</th>
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<td>Mastery goals</td>
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<td>Performance goals</td>
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<td></td>
<td></td>
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<td>.22***</td>
<td>.36***</td>
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<td></td>
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<tr>
<td>English self-concept</td>
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<td>.22***</td>
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<tr>
<td>Mathematics self-concept</td>
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<td>.24***</td>
<td>.14**</td>
<td>.19***</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*Note. Coefficients are significant at *p < .05. **p < .01. ***p < .001.*

9.5 Cross Validation of the Refined Model

9.5.1 Sample

The 4 schools that were unable to provide achievement ranks for the three waves of data were combined to generate an independent sample. The independent sample comprised 466 secondary students in Years 7 (n = 182, 39.1%), 8 (n = 167, 35.8%) and 9 (n = 117, 25.1%). Respondents were from three high schools in rural NSW (Schools 7, 8, and 9) and one high school in urban NSW (School 5). More than half of the respondents (n = 323, 69.3%) were female, 143 were male (3.7%). The mean age of respondents was 12.98 years (SD = 0.89). Table 9.1 presents the composition of the independent sample.

9.5.2 Model cross-validation

A strength of the present study is the use of model cross-validation. This involves collecting data from two samples and using one sample set for model refinement and the other for model testing or confirmation. Cross-validation provides a stringent procedure for preventing the possibility that a solution based on a given sample capitalises on chance relationships (Dimitrov, 2006; Kelloway, 1998).

9.5.3 Confirmatory factor analyses for the independent sample

The CFA conducted involved assessment of the refined model for an independent sample. An identical 23-item, 5-factor structure tested for the focus group was examined using CFA (M3aT1). A chi square of 446.15 (df = 220) was obtained, with a TLI of .96, CFI of .97, and RMSEA of .05. The factor loadings and $R^2$ are
presented in Table 9.6. Comparative fit indices for all models tested are presented in Table 9.7. These fit indices demonstrate a good fit to the data and substantiate the refined 23-item 5-factor structure.

Correlations between the variables are presented in Table 9.8. Most of the correlations for the independent sample replicate the pattern of correlations for the focus sample. Specifically, mastery goals and performance goals were modestly correlated \( (r = .42) \), as were performance goals and social goals \( (r = .48) \). Social goals were weakly correlated with English self-concept \( (r = .10) \) and mathematics self-concept \( (r = .03) \). Mastery goals correlated more highly with English self-concept \( (r = .43) \). The only inconsistent relationship for the independent sample compared with the focus group was that performance goals were more highly correlated with English self-concept rather than mathematics self-concept.
Table 9.6
Factor Loadings and $R^2$ for M3aT1: Independent Sample

<table>
<thead>
<tr>
<th>Item</th>
<th>M3aT1 Factor loading 23-items</th>
<th>M3aT1 $R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>T1 $\alpha = .76$</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAS27</td>
<td>.52</td>
<td>.48</td>
</tr>
<tr>
<td>MAS32</td>
<td>.40</td>
<td>.27</td>
</tr>
<tr>
<td>MAS42</td>
<td>.64</td>
<td>.56</td>
</tr>
<tr>
<td>MAS50</td>
<td>.54</td>
<td>.47</td>
</tr>
<tr>
<td><strong>T1 $\alpha = .77$</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PER72</td>
<td>.82</td>
<td>.44</td>
</tr>
<tr>
<td>PER78</td>
<td>.76</td>
<td>.37</td>
</tr>
<tr>
<td>PER90</td>
<td>.80</td>
<td>.41</td>
</tr>
<tr>
<td>PER95</td>
<td>.88</td>
<td>.50</td>
</tr>
<tr>
<td>PER98</td>
<td>.68</td>
<td>.30</td>
</tr>
<tr>
<td><strong>T1 $\alpha = .77$</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOC35</td>
<td>.71</td>
<td>.45</td>
</tr>
<tr>
<td>SOC55</td>
<td>.94</td>
<td>.69</td>
</tr>
<tr>
<td>SOC67</td>
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<td>.66</td>
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<tr>
<td>SOC101</td>
<td>.45</td>
<td>.18</td>
</tr>
<tr>
<td><strong>T1 $\alpha = .85$</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESC1</td>
<td>.71</td>
<td>.60</td>
</tr>
<tr>
<td>ESC2</td>
<td>.75</td>
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</tr>
<tr>
<td>ESC3</td>
<td>.71</td>
<td>.45</td>
</tr>
<tr>
<td>ESC4</td>
<td>.75</td>
<td>.61</td>
</tr>
<tr>
<td>ESC5</td>
<td>.72</td>
<td>.50</td>
</tr>
<tr>
<td><strong>T1 $\alpha = .89$</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSC1</td>
<td>.81</td>
<td>.64</td>
</tr>
<tr>
<td>MSC2</td>
<td>.89</td>
<td>.59</td>
</tr>
<tr>
<td>MSC3</td>
<td>.93</td>
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<td>MSC4</td>
<td>.79</td>
<td>.60</td>
</tr>
<tr>
<td>MSC5</td>
<td>.91</td>
<td>.64</td>
</tr>
</tbody>
</table>
Table 9.7

*Model Fit Statistics*

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\chi^2$/df</th>
<th>TLI</th>
<th>CFI</th>
<th>RMSEA</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1aT1</td>
<td>1199.64</td>
<td>340</td>
<td>3.53</td>
<td>.92</td>
<td>.93</td>
<td>.69</td>
<td>Hypothesised model T1 (28 items) focus sample</td>
</tr>
<tr>
<td>M1bT1</td>
<td>11083.05</td>
<td>378</td>
<td>29.32</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>Null model T1 (28 items) focus sample</td>
</tr>
<tr>
<td>M2aT1</td>
<td>538.08</td>
<td>220</td>
<td>2.45</td>
<td>.96</td>
<td>.96</td>
<td>.05</td>
<td>Hypothesised model T1 (23-items)</td>
</tr>
<tr>
<td>M2bT1</td>
<td>8093.05</td>
<td>253</td>
<td>31.99</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>Null model T1 (23-items) focus sample</td>
</tr>
<tr>
<td>M3aT1</td>
<td>446.15</td>
<td>220</td>
<td>2.03</td>
<td>.96</td>
<td>.97</td>
<td>.05</td>
<td>Hypothesised model T1 (23-items) independent sample</td>
</tr>
<tr>
<td>M3bT1</td>
<td>7065.55</td>
<td>253</td>
<td>27.93</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>Null model T1 (23-items) independent sample</td>
</tr>
</tbody>
</table>

*Note.* n.a. = not available. TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error Approximation. A null model is a model that specifies no relationship between the variables composing the model. The null model is used as a baseline to compare the hypothesised model (a model in which the relationship between variables has been specified) in the TLI.

\[
\text{TLI} = \frac{\text{Chi-square/degrees of freedom (null model)}}{\text{Chi-square/degrees of freedom (hypothesised model)}}
\]

\[
\text{RMSEA} = \text{Square Root} \left[ \frac{\text{Chi-square – degrees of freedom}}{(n – 1) \text{ degrees of freedom}} \right]
\]
Table 9.8

*Correlations Among the 5-factors for M3aT1*

<table>
<thead>
<tr>
<th></th>
<th>Mastery goals</th>
<th>Performance goals</th>
<th>Social goals</th>
<th>English self-concept</th>
<th>Mathematics self-concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastery goals</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance goals</td>
<td>.48***</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social goals</td>
<td>.26***</td>
<td>.42***</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>English self-concept</td>
<td>.43***</td>
<td>.26***</td>
<td>.10</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Mathematics self-concept</td>
<td>.21***</td>
<td>.13*</td>
<td>.03</td>
<td>.16**</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*Note.* Coefficients are significant at *p < .05. **p < .01. ***p < .001.

### 9.6 Testing for Factor Invariance Across Sex

Despite contemporary research on sex differences of students’ goal orientations and academic self-concepts, the literature remains ambiguous regarding whether, or how, sex differences may influence students in these areas. Compounding the ambiguity of sex differences is whether researchers’ findings reflect a difference of *degree* on these dimensions or difference of *kind* (Martin, 2004). The vast majority of studies exploring effects of sex on multiple dimensions of motivation usually are based around mean levels (Green et al., 2006). Differences of degree distinguish whether males are higher or lower than females on various motivational constructs. However, inadequate attention has been paid to sex differences of kind which attempt to examine the factor structure to determine whether a given instrument measures the same components of motivation with equal validity for males and females. Research that exclusively attends to differences of degree and overlooks differences of kind may mistakenly form unfounded judgements about sex differences. It may not be justifiable to compare motivation responses between males and females unless there is adequate support for invariance of factor structure across sex. For these reasons, it is important to determine whether the combined GAGOS-ASDQII instrument measures students’ goals and academic self-concepts equally validly for both males and females.
To determine whether the measurement model is applicable across sex, a test of invariance was conducted. It is necessary to determine whether negligible variance arises in the measurement model; otherwise, variation may incorrectly be attributed to the structural model (Marsh et al., 1999). Testing for invariance essentially involves assessing measurement invariance between the unconstrained model (hypothesised model for the focus group) and a model where various parameters are systematically constrained to be equal (across sex groups). If the chi square difference test reveals a nonsignificant difference between the unconstrained model and the constrained-equal model, then the conclusion is that the unconstrained model has measurement invariance (that is, males and females respond uniformly to the instrument).

Before conducting a true test of invariance, it is worthwhile testing one-sample models. For instance, when testing for invariance across sex, it is desirable to test a separate male sample and then test a female sample. The primary purpose of this procedure is to provide an overview of how consistent the results are between males and females (Byrne, 1998; Marsh, 1993c). If the separate analyses reveal minimal differences between males and females, then it is likely that the multi-group test, where parameters are constrained to be equal between males and females, will be invariant. In the case that the separate analyses reveal vastly different models between males and females then it is unlikely the measurement model will be invariant. For this reason, the focus sample was split by sex and a CFA for males ($n = 315$) and then females ($n = 220$) was conducted. Table 9.9 presents the findings from the separate CFAs for males and females. Results indicate both separate analyses provide a good fit to the data and suggest potential consistency across sex.
Table 9.9

CFAs for Males and Females

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\chi^2$/df</th>
<th>TLI</th>
<th>CFI</th>
<th>RMSEA</th>
<th>Model Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M4aT1</td>
<td>408.45</td>
<td>220</td>
<td>1.86</td>
<td>.96</td>
<td>.96</td>
<td>.05</td>
<td>Hypothesised model T1 Males</td>
</tr>
<tr>
<td>M4bT1</td>
<td>5161.09</td>
<td>253</td>
<td>2.40</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>Null model T1 Males</td>
</tr>
<tr>
<td>M4cT1</td>
<td>339.97</td>
<td>220</td>
<td>1.55</td>
<td>.95</td>
<td>.96</td>
<td>.05</td>
<td>Hypothesised model T1 Females</td>
</tr>
<tr>
<td>M4dT1</td>
<td>3063.80</td>
<td>253</td>
<td>12.11</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>Null model T1 Females</td>
</tr>
</tbody>
</table>

Given that the one-sample models between males and females demonstrated consistency since the chi square and degrees of freedom ratio for both males and females are less than 2 and the RMSEAs, TLI s and CFIs are almost identical, it was worthwhile proceeding to multi-group testing. Measurement invariance may be assessed with different levels of stringency, depending on which parameters are constrained to be equal. The three levels of variation for measurement models are: item factor loadings, factor correlations, and item uniquenesses. Byrne (2001) believes that invariance can be deemed acceptable at the factor loading level since undertaking tests of “equality constraints bearing on error variances and covariances is now considered to be excessively stringent” (p.202).

Factor loadings are considered to be the most crucial parameter to assess for invariance because of the necessity for measurement stability within latent variables (Byrne, 1998; Marsh, 1993a). Initially all of these three levels of variation were constrained for Model 5 (M5T1). That is, the factor loadings, factor correlations, and item uniquenesses were constrained to be equal across sex. In order to assess the model’s variation, two processes were employed. The first process entailed examining the goodness-of-fit indices to assess whether the model provided a good fit to the data. The second process entailed comparing the baseline model (M2aT1) with the invariant model (M5T1) using the chi square difference test.
The invariant model M5T1 yielded a chi-square of 538.08 (df = 220), a TLI of .95, a CFI of .96 and RMSEA of .05. These fit indices demonstrate that the invariant model provides a good fit to the data because all indices reached criterion values.

The next process in assessing a model’s invariance involves comparing a baseline model (M2aT1) with the invariant model (M5T1) using the chi square difference test. The baseline model for this comparison was M2aT1. Specifically, this model comprised the pooled male and female sample (focus sample n = 535). The baseline model (M2aT1) was specified to be unconstrained; that is, the factor loadings, factor correlations, and uniquenesses were freely estimated. A comparison between the unconstrained model (M2aT1) and the invariant model (M5T1) is presented in Table 9.10. If the difference between these two models is nonsignificant then it can be concluded that the constrained-equal (invariant–M5T1) model is the same as the unconstrained across sex model (M2aT1). A chi square difference test was then applied to determine whether the difference was significant. Chi square for this comparison was 30.41 with 276 degrees of freedom. This difference is nonsignificant, indicating M2aT1 and M5T1 display measurement invariance across sex groups.

Table 9.10
Comparative Fit Indicators for the Unconstrained and Invariant Models

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\chi^2$/df</th>
<th>TLI</th>
<th>CFI</th>
<th>RMSEA</th>
<th>Model Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M2aT1</td>
<td>538.08</td>
<td>220</td>
<td>2.45</td>
<td>.96</td>
<td>.96</td>
<td>.05</td>
<td>Unconstrained model</td>
</tr>
<tr>
<td>M5T1</td>
<td>838.49</td>
<td>496</td>
<td>1.70</td>
<td>.95</td>
<td>.96</td>
<td>.05</td>
<td>Invariant</td>
</tr>
</tbody>
</table>

9.7 Summary of Chapter

Three important findings emerged from the analyses in the first wave of data. Section 9.1 demonstrated that the combined GAGOS–ASDQII provided a marginal fit to the data but once the five poorly fitting items were removed, M2aT1 was a significantly better fit to the data. Section 9.2 presented cross-validation results which demonstrated that the refined model provided a good fit to both the focus sample and
the independent sample, thereby substantiating the fact that chance played no role in fitting the data to the model. Section 9.3 showed the GAGOS–ASDQII instrument yields data independently of the sex of the students. Consequently, inferences concerning differences in motivation and self-concept between males and females can be validly drawn.

Marsh et al. (1999) recommend researchers commence with simple CFA models in order to address potential measurement problems before proceeding to more complicated structural equation models. Notably, this chapter resolved measurement concerns by refining the initial hypothesised model: by removing the five poorly fitting items. This refined model is tested further in the following chapter to ensure measurement issues have been evaluated and rectified appropriately.
CHAPTER 10
CONFIRMATORY FACTOR ANALYSES TIME 2 AND TIME 3

1. Section 10.1 presents results derived from the first-order CFA for the focus sample at Time 2 (T2) and Time 3 (T3). The key objective explored in this section was:
Examining the multi-dimensionality of students’ goals and academic self-concept. Multi-dimensionality would be demonstrated if multiple goals could be represented by three distinct goals (mastery, performance and social) and if academic self-concept could be represented in two specific domains (English and mathematics).

2. The key objective of Section 10.2 was to examine the stability of the factor structure of the measurement model across T2 and T3. Stability would be demonstrated if factor correlations between the goals and between academic self-concepts replicated a similar pattern across T2 and T3. If this was the case, relations between goal orientations and domain-specific self-concepts would not change over time.

3. The key objective of Section 10.3 was to cross-validate the model to avoid the possibility of capitalising on chance variation within a given sample. Analyses replicate the first-order CFA with an independent sample at T2 and T3.

4. The purpose of Section 10.4 was to determine whether males and females uniformly interpret the items from the combined GAGOS–ASDQII across time waves T2 and T3. It presents a test for factor invariance across sex for these two waves.
10.1 Method

10.1.1 Focus sample across Time 2 and Time 3
The focus sample was selected from the schools that provided complete data across three waves (Schools 1, 2, 3, 4, and 6). Students who participated at Time 1 of the investigation were surveyed for a second (November, 2003) and third (November, 2004) time, with an interval of one year between each data collection point. The focus sample comprised 535 respondents, more than half ($n = 315, 59\%$) of whom were male, 220 being female (41%). Table 9.1 from the previous chapter presents details of the composition for the focus sample.

10.1.2 Materials and procedures
The same survey from Time 1 was delivered to the respondents at both Time 2 and Time 3. The standardised explanation of the purpose of the survey that was provided at Time 1 was also given at T2 and T3 at each school. The term “motivated” was defined for all respondents, to ensure their understanding of the term. The survey was then read aloud to the students to (a) ensure that most participants completed the survey within the time allotted (b) overcome reading and language difficulties of some students (c) ensure consistency with the procedure from school to school and year to year and (d) assist students with learning difficulties. At each session there were at least two research assistants present to assist the respondents completing the surveys. School teachers were not involved in the administration of the survey. Surveys were collected from the respondents before leaving the room.

10.1.3 Overview of analyses across Time 2 and Time 3
CFAs using LISREL (Jöreskog & Sörbom, 1989a; 2003) and Reliability Analyses (Pedhazur & Pedhazur-Schmelkin, 1991) using SPSS were used to determine the psychometric properties of the combined GAGOS-ASDQII scales for the focus sample at T2 and T3. To begin, four nested models were tested in a structural approach to determining the properties of the combined scales at T2 and T3. These models were:

Model 2a (M2aT2): the hypothesised (5-factor) model with the revised set of 23-items at Time 2.
Model 2b (M2bT2): the null model with the revised set of 23-items at Time 2.

Model 2a (M2aT3): the hypothesised (5-factor) model with the revised set of 23-items at Time 3.

Model 2b (M2bT3): the null model with the revised set of 23-items at Time 3.

Once a valid and reliable measurement model is substantiated at T2 and T3, the next step would be to cross-validate the measurement model for the independent sample at both time waves. This analysis involved:

Model 3a (M3aT2): the hypothesised (5-factor) model with the revised set of 23-items at Time 2 for the independent sample.

Model 3b (M3bT2): the null model with the revised set of 23-items at Time 2 for the independent sample.

Model 3a (M3aT3): the hypothesised (5-factor) model with the revised set of 23-items at Time 3 for the independent sample.

Model 3b (M3bT3): the null model with the revised set of 23-items at Time 3 for the independent sample.

When the measurement models M3aT2 and M3aT3 demonstrated good fits to the independent sample it was integral to this study to examine whether the refined measurement model (M2aT1) was invariant across sex. This process entailed two steps. The first step was to examine the measurement model in two separate tests, firstly for the male sample and secondly for the female sample at T2 and then at T3. This step involved examining how consistent these two models were for males compared with females. These analyses were:

Model 4a (M4aT2): the hypothesised (5-factor) model with the revised set of 23-items at Time 2 for males.

Model 4b (M4bT2): the null model with the revised set of 23-items at Time 2 for males.

Model 4c (M4cT2): the hypothesised (5-factor) model with the revised set of 23-items at Time 2 for females.

Model 4d (M4dT2): the null model with the revised set of 23-items at Time 2 for females.
Model 4a (M4aT3): the hypothesised (5-factor) model with the revised set of 23-items at Time 3 for males.

Model 4b (M4bT3): the null model with the revised set of 23-items at Time 3 for males.

Model 4c (M4cT3): the hypothesised (5-factor) model with the revised set of 23-items at Time 3 for females.

Model 4d (M4dT3): the null model with the revised set of 23-items at Time 3 for females.

After establishing that the sample for males and females was consistent at both time waves, the final step was a true test of invariance. These analyses were:

Model 5: (M5T2): test of invariance for the hypothesised (5-factor) model with 23-items from Time 2 for males and females.

Model 5: (M5T3): test of invariance for the hypothesised (5-factor) model with 23-items from Time 3 for males and females.

10.2 Results

10.2.1 Confirmatory factor analyses for the refined instrument

The first CFA analysis for Time 2 and Time 3 is parallel to the first-order CFA conducted on the refined instrument at Time 1. The hypothesised model tested 23-items loaded on 5-factors at T2 (M2aT2) and T3 (M2aT3). All latent constructs comprised four or five items. Models M2aT2 and M2aT3 provided a good fit to the data. M2aT2 yields a chi square of 527.06 (df = 220), a TLI of .95, a CFI .96, and .05 RMSEA. M2aT3 yields a chi square of 585.67 (df = 220), a TLI of .96, a CFI .96, and .06 RMSEA. These results support the convergent and discriminant validity of the measures, and indicate support for the multidimensionality of both students’ goals and academic self-concepts at T2 and T3. Table 10.1 presents the factor loadings, Cronbach’s alpha for the scales and $R^2$ for Model M2a at T2 and T3.

The correlations between the variables for T2 and T3 are presented in Table 10.2. The positive correlations at T2 and T3 between (a) mastery and performance goals and (b) performance goals and social goals replicate the pattern of findings for the first wave of data for both the focus sample and the independent sample. Also
parallel to the focus sample at T1 was the positive correlations at T2 and T3 between mastery goals and English self-concept and weaker yet positive correlations between mastery goals and mathematics self-concept. Conversely, performance goals at T2 and T3 correlated more highly with mathematics self-concept than with English self-concept. Relations between social goals and English self-concept and mathematics self-concept change over time. It appears that social goals for the focus sample are negatively correlated with English self-concept at T2 and at T3 are negatively correlated with both English self-concept and mathematics self-concept.
Table 10.1

Factor Loadings, Cronbach’s Alpha, and $R^2$ for M2aT2 and M2aT3

<table>
<thead>
<tr>
<th>Item</th>
<th>M2aT2 Factor Loadings</th>
<th>M2aT2 $R^2$</th>
<th>M2aT3 Factor Loadings</th>
<th>M2aT3 $R^2$</th>
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<tr>
<td>MAS27</td>
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<tr>
<td>MAS50</td>
<td>.62</td>
<td>.39</td>
<td>.55</td>
<td>.52</td>
</tr>
<tr>
<td>T2 $\alpha = .75$</td>
<td>T3 $\alpha = .78$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PER72</td>
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<td>.39</td>
<td>.76</td>
<td>.45</td>
</tr>
<tr>
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Table 10.2

*Correlations Among the 5-factors for M2aT2 and M2aT3*

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*Note.* Coefficients are significant at *p < .05. **p < .01. ***p < .001.*
10.3 Cross Validation Across Time 2 and Time 3

The refined model demonstrated a good fit to the data for the focus sample at both time waves. The following procedure was to determine whether an independent sample would also demonstrate a good fit to the data at T2 and T3. This procedure is a strong feature of this study as it provides a robust test for the validity and reliability of the measurement model.

10.3.1 Independent sample

Respondents from the independent sample at Time 1 were also surveyed approximately one year later (November, 2003) and then the following year (November, 2004). Respondents with complete data, except for achievement ranks, at Time 3 were traced back at Time 2 and Time 1. The matched cases for the independent sample comprised 466 secondary students. Table 9.1 from the previous chapter presents details of the composition for the independent sample across the three data collection points.

10.3.2 Confirmatory factor analyses for the independent sample at Time 2 and Time 3

Parallel to the CFA conducted on the refined instrument at Time 1 (M2aT1 and M3aT1), these analyses involved two identical CFAs with the independent sample across two distinct time waves, T2 (M3aT2) and T3 (M3aT3). At T2 a chi square of 496.39 (df = 220) was obtained, with a TLI of .96, CFI of .97, and RMSEA of .05. At T3 a chi square of 488.39 (df = 220) was obtained, with a TLI of .95, CFI of .96, and RMSEA of .05. The model fit at T3 was comparable with T2. The factor loadings and $R^2$ are presented in Table 10.3. These fit indices demonstrate that the measurement model at T2 and T3 for the independent sample indicates a good fit to the data and further substantiates the refined measurement model.

The correlations between the variables at T2 and T3 are presented in Table 10.4. Interesting to note is the reasonably consistent pattern of results across all three time waves. Although correlations between mathematics self-concept and mastery and performance goals varied, consistent relations were evident between (a) mastery goals and performance goals and (b) performance goals and social goals for both the
independent sample and focus sample. These consistent factor correlations indicated that relations between the goal orientation and domain-specific self-concept scales are reasonably stable overtime. Also consistent across time waves and the samples are the positive correlations among mastery goals and English self-concept.

Factor stability of goals and domain-specific self-concept was demonstrated because the items loaded on their factors consistently over the survey waves, indicating factor structure stability. These findings are consistent with results from two studies which both describe goal orientations as relatively stable (Attenweiler & Moore, 2006; Colquitt & Simmering, 1998).
Table 10.3

Factor Loadings, Cronbach’s Alpha, and $R^2$ for M3aT2 and M3aT3

<table>
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<th>Item</th>
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<th>M3aT3 Factor Loadings</th>
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Table 10.4

*Correlations Among the 5-factors for M3aT2 and M3aT3*

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<td>0.43***</td>
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<td>0.21*** -0.04</td>
</tr>
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<td>0.10 -0.07</td>
</tr>
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<td>0.23***</td>
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<td>0.23*** -0.11*</td>
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<td>0.09 -0.01</td>
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*Note. Coefficients are significant at *p < .05. **p < .01. ***p < .001.*
10.4 Factor Invariance Across Sex

Before testing for sex invariance in the structural model, it is necessary to ascertain that there is negligible invariance in the measurement model. Otherwise, variation may be attributed to the structural model when in fact the variation may be in the measurement model. Separate analyses for males (M4aT2 and M4aT3) and females (M4cT2 and M4cT3) indicate the models are comparable (see Table 10.5 for the fit statistics).

Table 10.5

CFA for Males and Females

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\chi^2$/df</th>
<th>TLI</th>
<th>CFI</th>
<th>RMSEA</th>
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<td>.96</td>
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<td>n.a.</td>
<td>n.a.</td>
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Consequently, a true test of invariance was conducted. When the factor loadings, factor correlations, and uniquenesses were constrained to be equal across sex groups, the results indicated that M5aT2 and M5aT3 provided a good fit to the data. Table 10.6 presents the fit statistics for these models. A comparison between the invariant model at T2 and T3 with the unconstrained model (M2aT2 and M2aT3) using a chi
square difference test was then conducted. The chi square difference test between
M5aT2 and the hypothesised model (M2aT2) revealed a chi square of 391.63 with
276 degrees of freedom. The chi square difference test between M5aT3 and M2aT3
revealed a chi square of 276.25 with 276 degrees of freedom. These results
demonstrate that the invariant M5aT2 and M5aT3 were not significantly different
from their respective unconstrained model. Importantly these findings demonstrate
that males and females responded uniformly in the measurement model.

Table 10.6
Comparative Fit Indicators For the Unconstrained and Invariant Models

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\chi^2$/df</th>
<th>TLI</th>
<th>CFI</th>
<th>RMSEA</th>
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<td>.05</td>
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<td>.95</td>
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<td>2.66</td>
<td>.96</td>
<td>.96</td>
<td>.06</td>
<td>Unconstrained model</td>
</tr>
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<td>1.74</td>
<td>.95</td>
<td>.96</td>
<td>.05</td>
<td>Invariant</td>
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</table>

10.5 Summary of Chapter

This chapter has demonstrated that:

- The combined GAGOS–ASDQII reliably and validly measured students’
multiple mastery, performance and social goals, and English and mathematics
self-concepts in the context of one instrument at T2 and T3 (Section 10.1).
- The multi-dimensional model provided a good representation of the data for
both time waves (Section 10.1).
- The factor structure of goals and academic self-concept remained stable across
T2 and T3, therefore providing support for the stability of the measurement model (Section 10.2)
• The model at T2 and T3 for an independent sample also provided a good fit to the data. These results confirm that chance played no role in fitting the data to the model (Section 10.3).

• Males and females respond equally to the GAGOS–ASDQII items (Section 10.4).

The next process, which is addressed in the following chapter, according to Marsh et al.’s (1999) recommended procedures for analysing LSEM is to conduct more complicated CFA models where all variables across all time waves are simultaneously examined.
CHAPTER 11  
CONFIRMATORY FACTOR ANALYSES OF THE COMBINED THREE WAVES

For research addressing longitudinal causal ordering, Marsh et al. (1999) recommend a necessary sequence of four distinct phases of analysis.

1. straightforward CFA models to address measurement issues.
2. pursuing more complicated CFA models that involve all variables across time waves.
3. a full-forward structural equation model and
4. developing alternative causal models with the purpose of providing a point of comparison, exploring general issues, and idiosyncrasies of the specific study.

Thus far, this research has addressed the first phase by testing a number of simple single wave a priori CFA models with the purpose of identifying measurement problems and resolving them accordingly. The conclusion is that the combined GAGOS–ASDQII instrument yields robust psychometric properties, hence demonstrating that students’ multi-dimensional goals and academic self-concepts are stable over time and invariant across sex.

This chapter addresses the second phase. Two complicated models are tested in this chapter:

I. a model that simultaneously tests five first-order variables (mastery goals, performance goals, social goals, English self-concept, and mathematics self-concept) across all three waves (Time 1 = 2002, Time 2 = 2003, and Time 3 = 2004). This model is referred to as the 5-variable 3-wave model (5V3W).

II. a model that simultaneously tests seven first-order variables (same five variables above in addition to English achievement and mathematics achievement) across all three waves. This model is referred to as the 7-variable 3-wave model (7V3W).
11.1 Correlated Uniquenesses With Longitudinal Data

A priori CFAs usually assume that errors of measurement associated with each observed variable (more frequently referred to as uniquenesses and hereafter referred to as such) are distinct from the errors of measurement associated with other observed variables. Due to this distinction, CFA models hypothesise that error uniquenesses associated with each measure are uncorrelated. In the case of longitudinal data, however, parallel items are administered on multiple occasions to the same sample; hence, the uniqueness associated with identically measured variables is likely to be correlated (more frequently referred to as correlated uniquenesses and hereafter referred to as such). If these correlated uniquenesses are not stipulated in the a priori model, then the estimated correlations between the parallel latent constructs will be positively biased and can result in a poorly fitting model and lead to improper solutions (Marsh et al., 2005). Consequently, Marsh and Hau (1996) proposed as a guideline for longitudinal data that: it is crucial to posit an a priori model that specifies correlated uniquenesses between parallel measures collected across different points in time. Importantly, this guideline applies to latent constructs inferred on the basis of multiple indicators such that one factor is inferred by at least three indicators (Marsh, Hau, Balla, & Grayson, 1998). Correlating uniquenesses does not apply, however, when only a single indicator is available for a latent construct. This exception to following the guidelines is relevant to subsequent analyses involving achievement ranks and is addressed in subsequent analyses.

11.2 Overview of Analyses

There is a requirement in longitudinal studies to consider correlated uniquenesses, that is, parallel measures collected on multiple occasions to avoid positively biased estimates of stability. It is essential to specify a priori models that contain correlated uniquenesses when a latent construct is inferred on the basis of multiple indicators (Marsh et al., 2005). Marsh et al. (1999) add that it is desirable to evaluate the size and nature of these effects by comparing both a model with and a model without uniquenesses, but they also highlight the inappropriateness of evaluating only models with no correlated uniquenesses. Subsequently, the first section of analyses includes
two a priori models comprising 5V3Ws for comparison and a test of invariance for
the best fitting 5V3W model. In this study both an a priori model with correlated
uniquenesses specified (Model 7) and an a priori model with no correlated
uniquenesses (Model 6) were proposed and compared with each other. The
importance of specifying correlated uniquenesses is demonstrated through this
comparison. (The LISREL syntax generated to test the model with correlated
uniquenesses (M7) is included in Appendix D).

In addition to testing two a priori models, the better fitting model of M6 and M7 will
be assessed to determine that the measurement model is applicable across sex. Past
analyses involved separate CFAs of the same a priori model, one for males and one
for females. These separate analyses provide the opportunity for preliminary
analysis because if the models are vastly different, it is unlikely that the measurement
model will be invariant. In the case that there are five variables across three waves, it
is impossible to conduct these separate analyses since the sample size (males n = 315
and females n = 220) is smaller than the number of parameters to be estimated.
Subsequently, only a true test of invariance will be conducted for these more
complicated CFA models.

A true test of measurement invariance involves comparing an unconstrained model
with a model whose parameters are constrained to be equal among factor loadings,
factor correlations, and uniquenesses. Initially the fit indices of the constrained-
equal model are examined to assess whether the data provide an adequate fit, and
then a chi square difference test is conducted between the unconstrained model and
the constrained-equal model. If the chi square difference test reveals a nonsignificant
difference between the two, then the conclusion drawn is that the model has
measurement invariance (that is, males and females respond uniformly to the
measurement model). (The LISREL syntax generated to test the 5V3W model is
included in Appendix E). Below is a summary of the models tested:

Section one’s analyses in this chapter include:

Model 6 (M6): the hypothesised (5-factor 3-wave) model with no correlated
uniquenesses

Model 7 (M7): the hypothesised (5-factor 3-wave) model with correlated
uniquenesses
Model 8 (M8): test of invariance across sex for the better fitting model between M6 and M7

Parallel analyses as those described above for the 5V3W model are followed for the model which includes achievement data (i.e., 7V3W model). Specifically, an a priori model is proposed to comprise seven variables. These seven variables include the same five variables as those referred to above, with the addition to English ranks and mathematics ranks. Before pursuing longitudinal structural equation models (LSEM), a prerequisite proposed by Guay et al. (2003) is to perform a large CFA where all variables from all time waves are simultaneously tested. The opportunity was taken to include English and mathematics ranks in Model 9. Essentially, this CFA is mathematically equivalent to the most general SEM model, referred to as a “full-forward” model. A full-forward model estimates all paths among all variables and is equivalent to the corresponding CFA where the chi square and degrees of freedom are the same, and the parameter estimates are either the same or reparameterizations of each other (Marsh et al., 1999). By performing the 7V3W CFA, it is possible to verify the appropriateness of a full-forward model and assess potential problems and possible solutions, since these are more readily pursued for CFA models than for SEM models.

Unlike the variables from M7, which all have multiple indicators, the achievement data are inferred by a single indicator for English ranks and a single indicator for mathematics ranks. Importantly, Marsh et al. (1999) affirm that their guideline for correlating uniquenesses is inapplicable to variables denoted by a single indicator. Marsh (1987) suggested that when only a single indicator is available it is necessary to analyse results based on a range of plausible values of reliability and correlated uniquenesses. This means that the latent correlation may be smaller or larger than the observed correlation and consequently, conclusions based on this approach must be tentative.

Parallel to the first section of analyses in this chapter, the second section also involves a true test of measurement invariance across sex. The a priori model comprising 7V3W will be constrained so that factor loadings, uniquenesses and error variances are constrained to be equal across sex. To assess the model, the fit indices
will be examined and then a chi square difference test will be completed between the constrained and unconstrained model. If the chi square difference test results in a nonsignificant difference between the two, then the measurement model is invariant across sex. (The LISREL syntax generated to test the 7V3W model is included in Appendix F and the syntax generated to test whether this model remained invariant across sex is included in Appendix G). The models tested were:

Model 9a (M9a): the hypothesised (seven factor) model which includes achievement ranks with correlated uniquenesses among variables with multiple indicators and no correlated uniquenesses among the achievement ranks.

Model 9b (M9b): M9a test of invariance across sex

11.3 Results

Following recommendations from Marsh and Hau (1996) the analyses for the first section commenced with an a priori model with correlated uniquenesses between parallel measures collected at T1, T2 and T3 for all five variables (Model 7). However, to demonstrate the significance of this consideration an a priori model with no correlated uniquenesses was also tested (Model 6). M6 represented an exceptionally poor fit to the data (TLI = .56) and provided an improper solution because the correlation matrix was specified to be “not positive definite”. A common criterion for improper solutions is when the output specifies that the correlation matrix was “not positive definite”. (Marsh et al., 1998). In Model 7, 69 correlated uniquenesses (relating uniquenesses with parallel T1, T2 and T3 measures) were included. Here the fit was substantially improved (TLI = .97). Hence, the a priori model (M7) that included the correlated uniquenesses fits the data better than the corresponding model that did not. Consistently with expectations, the correlated uniquenesses were predominantly positive, although not all were significantly positive and none was significantly negative. Comparative fit statistics of M6 and M7 are provided in Table 11.1. On the basis of the guidelines recommended by Marsh and Hau (1996), as well as from the results of the preliminary analyses, and in order to facilitate substantive interpretations of the results, subsequent models including three waves of data will focus on a priori models with correlated uniquenesses (Marsh et al., 2005).
Table 11.1

*Comparative Fit Indices for the 5V3W Model*

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\chi^2$/df</th>
<th>TLI</th>
<th>CFI</th>
<th>RMSEA</th>
<th>Model Description</th>
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<tbody>
<tr>
<td>M6</td>
<td>44451.66</td>
<td>2277</td>
<td>19.5</td>
<td>.56</td>
<td>.57</td>
<td>.19</td>
<td>5V3W model with no correlated uniquenesses</td>
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<tr>
<td>M7</td>
<td>3791.20</td>
<td>2104</td>
<td>1.8</td>
<td>.97</td>
<td>.96</td>
<td>.04</td>
<td>5V3W with correlated uniquenesses</td>
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<tr>
<td>M8</td>
<td>6478.40</td>
<td>4519</td>
<td>1.4</td>
<td>.94</td>
<td>.94</td>
<td>.04</td>
<td>M7 that tests for invariance across sex</td>
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11.4 Invariance Across Sex

Model 7, the best fitting a priori model, was then used to test whether it remained invariant across sex. When the factor loadings, uniquenesses, and error variances were constrained to be equal across sex groups, the results indicated that M8 provided a good fit to the data. Table 11.1 presents the fit statistics for this model. A comparison between the invariant Model M8 with the unconstrained Model M7 using a chi square difference test was then conducted. The chi square difference test for M7d revealed a chi square of 2687.4 with 2415 degrees of freedom. These results demonstrate that the invariant M8 was not significantly different from its respective unconstrained model. Importantly, these findings demonstrate that males and females responded uniformly in the measurement model.

The second section of analyses commenced with an a priori model with correlated uniquenesses between parallel measures collected at T1, T2, and T3 for the five variables with multiple indicators while the achievement data with single indicators were not correlated across the three waves of data (Model 9a). Results demonstrate that the a priori model with 7V3W provided an excellent fit to the data, with all fit indices exceeding criterion values. Table 11.2 presents the fit statistics for Model 8. This model provides a good basis for pursuing SEM models, which are the substantive emphasis of this research.
The next analysis in the second section was a test of invariance across sex. When the factor loadings, uniquenesses and error variances were constrained to be equal across sex groups, the results indicated that M9b provided a good fit to the data. Table 11.2 presents the fit statistics for this model. A comparison between the invariant model M9b with the unconstrained model M9a using a chi square difference test was then conducted. The chi square difference test for M9b revealed a chi square of 3308.4 with 2855 degrees of freedom. These results demonstrate that the invariant M9b was not significantly different from its respective unconstrained model. It can be concluded that males and females responded equally to the measurement items at all three time waves for all seven variables, thus demonstrating that the measurement model was invariant across sex.

Table 11.2

<table>
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<tr>
<th>Model</th>
<th>$\chi^2$</th>
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<th>Model Description</th>
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<tr>
<td>M9a</td>
<td>3489.92</td>
<td>2423</td>
<td>1.4</td>
<td>.97</td>
<td>.98</td>
<td>.03</td>
<td>7V3W model with Correlated uniquenesses</td>
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<tr>
<td>M9b</td>
<td>6798.32</td>
<td>5278</td>
<td>1.3</td>
<td>.95</td>
<td>.95</td>
<td>.03</td>
<td>M8a that tests for invariance across sex</td>
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11.5 Correlations Among the Factors

Correlations among the seven factors across three waves are presented in Table 11.3. Most notable are the stability correlations which are the test-retest correlations for the seven latent constructs across three waves of data. As expected, variables collected on multiple occasions were highly and positively correlated with each other; for example, the correlation between performance goals at T1 and T2 is .62 and at T2 and T3 is .51. This pattern of results between parallel variables collected on multiple occasions was replicated for mastery goals, social goals, English self-concept, mathematics self-concept, English ranks, and mathematics ranks (boldfaced correlations).
As hypothesised in Chapter 6, English self-concept is more highly correlated with achievement ranks from the corresponding domain ($r$s vary from .16 to .36 across three waves) and this was also true for mathematics self-concept and mathematics achievement ($r$s vary from .13 to .36 across three waves). Consistently with predictions, correlations among the two achievement ranks (T1 = .51 T2 = .54 T3 = .58) were substantially larger than correlations among the two academic self-concept scales (T1 = .19 T2 = .17 T3 = .20).

A similar pattern of correlations that emerged in the earlier first-order CFAs, were evident in the results for Model 8. In particular, mastery and performance goals were positively correlated at all three time waves. Performance goals and social goals were positively correlated at all three time waves. Similarly to performance goals, social goals related more strongly with mathematics self-concept and mathematics ranks than with English self-concept and English ranks. Specifically, social goals related negatively with English self-concept at T2 and T3 and negatively to English ranks at all three time points. Social goals related positively with mathematics self-concept but related negatively with math ranks, and this pattern was replicated across all three time points. It appears that socially oriented individuals may be preoccupied with helping others and that this preoccupation with others negatively affects their achievement in both domains and self-concept in English. These results are discussed in more detail in Chapter 12.
### Table 11.3

**Correlations Among 7V3W a Priori Model**

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*Note. Decimals omitted. Coefficients are significant at *p < .05. ** p < .01. ***p < .001.*
11.6 Summary of Chapter

This chapter demonstrated that:

- The 5V3W model (M7) provided a good fit to the data when correlated uniquenesses were specified in the model.
- The 7V3W model (M9a) also provided a good fit to the data and the fit indices of this model were essentially comparable with the 5V3W model.
- M9a provided an exceptionally good fit, with indices exceeding recommended criterion values. Consequently, both the 5V3W (M7) and 7V3W (M9a) models supported the convergent and discriminant validity of the measures.
- Both the 5V3W (M8) and 7V3W (M9b) models proved to be invariant across sex.
- The factor structure for both the 5V3W and 7V3W model remained stable across all three waves, providing support for the stability of mastery and performance goals and English and mathematics self-concepts.
- The factor structure for social goals varied, providing evidence that social goals may be unstable across time.
- The above findings continue to demonstrate that students’ goals and academic self-concepts can be represented as multi-dimensional.

Based on Marsh et al.’s (1999) recommended guidelines for analysing longitudinal structural equation models (LSEM) the pivotal findings from the first two phases from their fourth guideline are discussed in the following chapter.
CHAPTER 12
DISCUSSION OF CONFIRMATORY FACTOR ANALYSES RESULTS

One of the challenges of examining student motivation is the various “ways of conceptualising it which help teachers to understand children’s progress and behaviour, thereby helping them to evaluate their classroom practice and teaching methods” (Galloway et al., 1998, p.42). In order to address the complex nature of student motivation, this study endeavours to unify two significant bodies of research in an attempt to provide a more comprehensive and meaningful model to explain student motivation. Stringent and advanced validation processes are employed to establish reliable and valid measures that concisely operationalise student motivation. Central to this study is the widely accepted and useful employment of a test-retest design (Rayko & Penev, 2005). Not only are models cross-validated with an independent sample, the models are also examined on multiple occasions, providing a rigorous means by which the models can be assessed.

Chapter 9 tested an a priori model of students’ goals and academic self-concept by determining the best fitting items and subsequently making some post hoc adjustments. This refined model was then tested for the remaining two waves of data with both the focus sample and independent sample. Next, the model for both samples was tested for invariance across sex. Chapter 11 presented more complicated CFAs, where the three waves of data were simultaneously examined in a large CFA. The initial 5V3W model was extended to include English ranks and mathematics ranks, thereby hypothesising an a priori model with seven variables across three time points. Key findings from the first-order CFAs are discussed below.
12.1 Hypothesised and Refined Model

Model 2 (M1At1) tested the hypothesis that the 28 initial items loaded on 5-factors. The fit for this model did not reach criterion values. As a result, five poorly fitting items (i.e., items with low factor loadings, high uniquenesses, and relatively high modification indices) were removed from Model 1 (M1At1). These items were A37MAS, A58PER, A62PER, A83PER, and A108SOC.

The resulting model (Model 2a) was tested with the same constraints as M1aT1, that is, the remaining items loading on their same “target” factors, with no cross-loadings allowed. M2aT1 showed a better fit to the data than M1aT1. M2aT1’s RMSEA is substantially less than M1aT1’s. The TLI for M2aT1 is above .95, and substantially higher than that for M1aT1. Thus, removing the five poorly fitting items from the original hypothesised model led to an improved overall model fit. In order to assess whether M2aT1 was a significantly improved overall fit to the data than M1aT1, a chi square difference test was computed. The difference proved significant, indicating that M2aT1 represents a significantly improved fit over M1aT1.

A strength of this study is the robust procedure of model cross validation. Byrne (1998) acknowledges the need for model respecification but criticises researchers for atheoretical fiddling with models to make them fit. She highlights an approach that addresses concerns with post hoc model fitting, and this method has been employed in this study. First, Byrne (1998) recommends testing the final model derived from post hoc analyses with an independent sample. This method of cross validation can highlight whether a solution based on a given sample capitalised on chance relationships (Kelloway, 1998). Since post hoc analyses may be driven by distinct characteristics from the particular sample from which the model was tested, it is necessary to test the respecifications on an independent sample. The final model, or as it is referred to in this study, the refined model (M2aT1) for the focus sample, was tested with the independent sample (M3aT1). Furthermore, the refined model was tested across an additional two waves for both the focus sample and the independent sample. Fit indices for the focus sample (M2aT1, M2aT2, & M2aT3) and independent sample (M3aT1, M3aT2, & M3aT3) across all three waves were essentially comparable, demonstrating the replicability of paths, hence validating the
refined hypothesised model. Test–retest design is a feature of this study and directly addresses Byrne’s (1998) concern with educational psychology research that rarely retests models.

The refined model for the focus group at all three time waves was also assessed for invariance across sex. Results show there is no significant amount of variation to the factor loadings, factor correlations, and item uniquenesses due to sex in the measurement model at all three time waves (M5T1, M5T2 and M5T3). This demonstrates that males and females interpret the items for the combined GAGOS-ASDQ II homogeneously.

The above findings support the convergent and discriminant validity as well as the reliability of the combined GAGOS-ASDQ II. This demonstrates that students’ goals can be conceptualized as comprising multiple mastery, performance, and social goals and that students’ academic self-concept can be conceptualized as comprising students’ English and mathematics self-concept. Results from the CFAs provide strong evidence that these motivational forces can be measured in the context of one instrument at Time 1, Time 2, and Time 3. Factor correlations across the CFA models in T1 through to T3 indicate that both the goal orientation and academic self-concept scales are stable.

Findings from both the first phase and second phase lend support to the theoretical argument that goals and self-concept should be viewed as multi- rather than unidimensional constructs. Results of this study are, thus, congruent with other theoretical (e.g., Urdan & Maehr, 1995), qualitative (e.g., Dowson & McInerney, 2001, 2003) and quantitative studies (e.g., Marsh et al., 2002; McInerney et al., 2003; McInerney et al., 1997), which also support the multidimensionality of students’ goals and academic self-concept. Furthermore, this clear conceptualisation of student’s multiple goals and self-concepts can facilitate teachers’ understanding of what contributes to student motivation. By clearly conceptualising motivation in terms of students’ goals and self-concept, an unambiguous explanation of student motivation is provided to teachers which can facilitate them to understand children’s progress and behaviour.
Pursuit of multiple goals has recently been proposed by a number of researchers (DeShon & Gillespie, 2005; Giota, 2002; Harackiewicz & Linnenbrink, 2005; Linnenbrink, 2005; Smith & Sinclair, 2003). Rather than adopting one goal exclusively, individuals may pursue more than one goal at a time which interact simultaneously and vary in salience depending on task structure, the school environment, and the broader social and educational context (McInerney et al., 1997; Meece et al., 2006; Lemos & Goncalves, 2004). Notable is the proposed inclusion of social goals, interacting alongside academic goals. This revised framework can enrich our understanding of motivation and achievement. In particular, the models in this study work well with the inclusion of social goals as a first-order construct. This, consistently with other studies (for example, Dowson & McInerney, 2003; Giota, 2002), suggests that social goals in addition to academic (mastery and performance) goals are important for students in educational settings. Hence, this study provides a measurement framework within which the interaction of multiple goal orientations and academic self-concept variables may justifiably be examined further.

12.2 Relations Among Goals and Domain-specific Self-Concept

Correlations between mastery goals and performance goals were positively related (T1 = .44, T2 = .43 and T3 = .50) at all three time waves. There are mixed findings in the literature regarding the relations between mastery and performance goals (Shih & Alexander, 2000). For instance, some researchers have found negligible positive correlations between the two goals (see for example Midgley et al., 1995; Roeser et al., 1996) while many others report positive correlations (Barker et al., 2006a; 2006b; Hagen, 1994; Nolen & Haladyna, 1990). The correlations found in this study contribute further to current literature on students’ goals as, not only were the correlations between the goals significantly positive, but they also demonstrated that the relationship between mastery goals and performance goals remained stable across three years. Elliot and Harackiewicz (1996) have argued that both mastery and performance goals pertain to self-regulatory strategies which contribute to positive outcomes, including attainment of competence or task mastery. This study concurs
with numerous achievement goal theory researchers, who postulate that mastery goals serve an adaptive motivational function and positively influence performance goals (Dweck, 1986; Urdan, 1997; Pajares et al., 2000). Urdan (1997) substantiates that mastery goals are affiliated with a range of adaptive outcomes and suggests positive correlations between mastery goals and performance goals, demonstrating that performance goals have adaptive qualities also.

The positive correlation between mastery goals and performance goals suggests that, rather than focusing on one goal to the exclusion of the other, respondents who adopted a mastery goal were also likely to adopt performance goals and that this relationship proved stable over three waves of data. Barron and Harackiewicz (2001) found consistently positive correlations between mastery goals and performance goals, but this was only one point in time. This study extends previous work to provide a longitudinal investigation on how goals relate. Harackiewicz et al. (1998) provided a review of a number of correlational studies on students’ goal pursuits. Instead of the traditional dichotomy in which one goal is pursued exclusively (which would be the case if these two goals were negatively correlated), they revealed correlational studies that consistently found that measures of students’ mastery goals and performance goals were uncorrelated or even positively correlated. Given the possibility that individuals can adopt multiple goals, it is critical to test the interaction of mastery and performance goals and their combined effect on important outcomes such as students’ academic self-concept and academic achievement.

How students coordinate the pursuing of multiple goals is beginning to be investigated (Lemos, 2004). Interesting to note is whether particular goal combinations facilitate or impede each other. Argyle et al. (1981) believes that the simultaneous pursuit of certain goals can positively relate such that the particular combination of multiple goals facilitate each other or that the certain goals could negatively relate such that they impede each other. When particular combinations of goals facilitate each other they are referred to as “goal independence” but when certain combinations impede or interfere with each other they are referred to as “goal interference” (Argyle et al., 1981). To date, most research supports goal instrumentality when mastery and performance goals are combined. Specifically, both goals work in a complementary manner, such that mastery goals predict interest
and performance goals predict academic performance; hence, this combination of goals produces optimal motivation and performance (Barron & Harackiewicz, 2000). The next strongest positive correlation across the three waves of data was between performance goals and socials goals (T1 = .36, T2 = .39 and T3 = .30) followed by mastery goals and social goals (T1 = .22, T2 = .19 and T3 = .17). It appears that over three years students who adopt a social goal also pursue performance goals and mastery goals. According to research, social goals that focus on cooperation and assisting peers align well with mastery goals (Anderman & Anderman, 1999; Covington, 2000; Feshbach & Feshbach, 1987). This explanation appears to be relevant to the present study, as the social goals relate to the desire to work with and assist peers and therefore correlate positively with mastery goals.

Social goals that focus on maintaining a positive outward view relate particularly well with performance goals (Ryan et al., 1997). A focus on maintaining favourable judgements from others is important to both social goals and performance goals (Anderman & Anderman, 1999). A number of studies have included components of social goals when operationalising performance goals (see for example, Nicholls et al., 1988). This similarity between social goals and performance goals denotes the common underlying processes reported between academic goals and social goals (Hinkley et al., 2001). It appears that contending with others to preserve a positive public image is a common process pursued amid performance oriented individuals and social goal oriented individuals.

Although relations between mastery and performance goals have previously been examined by others, there is a need for research to explore multiple goal pursuits with the inclusion of social goals. In this study, social goals promote cooperation and facilitating peers with their work as well as focusing the individual’s attention on maintaining positive judgements from others. Vital questions relating to how academic goals relate with social goals and how the various combinations influence important educational outcomes such as students’ academic self-concept and academic achievement remain largely unanswered.
Of the limited research on the relations between students’ goals and self-perceived abilities, mastery goals and performance goals have been found to be uncorrelated with self-perceived abilities, or weakly correlated (Ames & Archer, 1988; Nicholls, 1989; Nicholls et al., 1985). Of the significant correlations found in the literature between mastery goals and self-perceived abilities, most are positive. Findings from this study surmise that students’ mastery goals positively relate to English and mathematics self-concepts. Inconsistent relations have been found between performance goals and self-perceived abilities. Results from this study maintain that performance goals, as operationalised in this study, positively relate to English and mathematics self-concepts. These findings are congruent with an understanding that performance goals are not always adverse, or at least not for all students, all of the time (Dowson & McInerney, 2003; Urdan, 1997). Importantly, these positive correlations between mastery and performance goals with English and mathematics self-concept could be evidence that goals and self-concept are mutually reinforcing.

Specifically, mastery goals were more positively correlated with English self-concept (T1 = .39, T2 = .25, T3 = .20) and not so strongly correlated with mathematics self-concept (T1 = .17, T2 = .21, T3 = .15). Congruent with these findings, performance goals were more positively related to mathematics self-concept (T1 = .24, T2 = .22, T3 = .30) than with English self-concept (T1 = .22, T2 = .07, T3 = .12). Mathematics as a subject usually focuses on evaluation and competition (Aunola et al., 2006) because there is an objectively correct or incorrect result, whereas there is an element of subjectivity in English. Classroom structures in these two distinct subject domains can harvest the pursuit of a particular goal. Mathematics classroom structures are more likely to encourage performance goals due to the focus on accuracy and the evaluative and competitive nature of the subject (Dowson, 1999). In contrast, classroom structures in English are more likely to encourage mastery goals due to the element of subjectivity and emphasis on opinions and feelings. However, given the apparently small differences found in the correlations, this contention need to be further investigated.

Social goals also replicated the pattern demonstrated by performance goals as both were more often highly correlated with mathematics self-concept, compared with English self-concept. Perhaps a common quality of both social goals and
performance goals is that each is externally referenced. Anderman and Anderman (1999) hypothesised that students’ social goals that relate to peer relationships may in fact link to performance goals. In this study, social goals are broadly related to individuals who are concerned with helping others and showing empathy and interest for their peers in academic situations. Similarly, performance goals are externally referenced, such that individuals are concerned with competing and doing well relative to others. It is feasible to hypothesise that since both performance goals and social goals are externally referenced, these students are more likely to judge their competence relative to others more regularly, and these continual external comparisons may be more salient in mathematics, due to the evaluative and competitive nature of the subject.

A notable difference between students in this study and high school students from previous research (for example Frances, Yeung, Putai, & Low, 1997; Tay et al., 1995) is the correlation between mathematics and English self-concept, which has frequently been found to be near zero (Marsh, 1986a) or even negative (Yeung & Lee, 1999). To account for the near-zero and negative correlations found between self-concepts in different domains, Marsh proposed the Internal/External frame of reference model (Marsh, 1986a; 1990a). Congruently with this research, this study hypothesised (refer to Hypothesis 5) a weak or near zero correlation between mathematics and English self-concepts. In contrast however, this study found correlations between mathematics and English self-concepts to be moderately and positively correlated across all three time waves for both the focus sample and independent sample.

Despite the majority of research studies reporting weak correlations between mathematics and English self-concepts, there have been some methodologically sound studies that report the same positive correlations between the two self-concepts revealed in this study. For instance, the findings of this study are consistent with Yeung et al., (2000) who also demonstrated moderate correlations between mathematics and English self-concepts. These findings indicate that students with a positive English self-concept are likely to hold a positive mathematics self-concept. Skaalvik and Rankin (1992) attest that positive correlations between mathematics and English self-concept are evidence that not all students make internal comparisons
where they perceive themselves to be more competent at one subject at the expense of another, because students could rate their mathematics and English ability as equally good or bad.

There were some ambiguities among the correlations, that need to be addressed. One of these inconsistencies was the relationship between performance goals and mathematics self-concept for the independent sample at T1. Specifically, performance goals at T2 and T3 were more highly correlated with English self-concept than mathematics self-concept, but this was not the case at T1. Another ambiguous finding was for social goals. Initially, social goals were positively correlated with all variables, but at T2 and T3 for both the focus sample and independent sample, they were negatively related to English and mathematics self-concept. These findings provide evidence that students’ social goals change over time. This can be expected, since research on high school students’ motivation shows change over time (Martin, 2005; Watt, 2004). It appears that social goals become negatively related to English and mathematics self-concepts over time. One interpretation of these findings could be that students with a high or low English and mathematics self-concepts have little concern for working cooperatively with others.

There exists an absence of consensus regarding whether goal orientations should be treated as a stable trait or whether goal orientations are a state that changes as a function of personal characteristics and situational cues (Button et al., 1996). Research remains indecisive about whether goals are fostered across a range of various learning contexts (a trait—Pervin 1994) or whether goals are a short term state induced by salient features of the context (a state—Fridhandler 1986; Nesselroade 1988). In their review of goals, DeShon and Gillespie (2005) reveal that there is substantial conceptual argument regarding the stability of goals across contexts, domains, and time. Unsurprisingly, researchers aligned with goals as a trait more commonly identified goals as being stable. In fact, 47% of the 89 studies examined by DeShon and Gillespie (2005) advocate the stability of goals. The pattern of correlations from this study across three waves suggest that goals are fairly stable over time, but they seem to change somewhat; so at most there is support for the trait hypothesis. In particular, mastery and performance goals showed a consistent pattern over the three time waves, while social goals only varied in pattern
for the first wave. These results partially support Hypothesis 3, which specifies goal orientations will remain stable over time, and appear to be consistent with Attenweiler and Moore’s (2006) and Colquitt and Simmering’s (1998) descriptions of goal orientations as relatively stable.

12.3 Inclusion of Achievement Data

The first-order modelling process for the sample as a whole demonstrated that the refined 23-item model was a good fit for the data at Time 1, Time 2 and Time 3 (M2a). Achievement data in terms of English and mathematics ranks were then added to the best 23-items from the GAGOS-ASDQII instrument to determine the model’s fit over the combined three waves. Specifically, this large CFA involved examining the simultaneous interaction of students’ goals, academic self-concept, and achievement across the combined three points in time. The 7V3W model presented an excellent fit to the data (M9a). This demonstrated that the achievement data, along with the combined GAGOS-ASDQII instrument, reliably and validly measured students’ multiple mastery, performance & social goals, English & mathematics self-concept, and English and mathematics achievement (i.e. 7V3W) in the context of the one instrument for Time 1, Time 2 and Time 3, thereby providing support for stability.

In summary, the results suggest that the multidimensional model was a good representation of the data at all three waves. This integrative model of student motivation represents the data well and substantiates the definition of goals and self-concept proposed by the combined GAGOS-ASDQII instrument. The present study directly addresses Bong’s (1996) concern that social cognitive models are inept, due to vague construct definitions, as this study lucidly defines three approach goals (as well as domain-specific self-concepts) and rigorously tests the definition using single wave and multiple wave confirmatory factor analysis. This study has developed and tested a more unified model of students’ motivation by acknowledging the academic self-concept–goal theory linkage.
This useful integrative framework was tested for sex differences of kind using a test of sex invariance. This test of differences of kind determines whether the factor structure for a given instrument actually measures the same components for males as for females. If this difference of kind remains untested it is possible to overlook the possibility that males and females respond fundamentally differently to the facets of motivation measured in this study. Analyses of the 7V3W model demonstrated no qualitative differences between males and females, which demonstrates that the combined GAGOS-ASDQII instrument has the same underlying meaning for both males and females. The practical significance of these findings is that programs aimed at modifying and enhancing students’ goals and academic self-concept need not be qualitatively and fundamentally distinct for males and females, but similar approaches will work equally well for both sexes.

12.4 Relations Among Goals, Domain-specific Self-concept, and Academic Achievement

Inclusion of the achievement data in the model allowed for the examination of how students’ goals and academic self-concepts relate to achievement in English and mathematics. Mastery goals related positively at all three time waves with English achievement; however, this relationship was nonsignificant at T1. These results are consistent with research that shows the positive effects of mastery goals on academic achievement (Aunola et al., 2006). Since mastery goals are associated with deep levels of processing (Barker et al., 2002), it is more likely that these students will experience success due to their ability to self-regulate by selecting effective and appropriate learning strategies (Harackiewicz et al., 2002).

A different pattern of correlations between mastery goals and achievement emerged for the subject domain of mathematics. All of the correlations between mastery goals and mathematics were nonsignificant and at T1 and T3 the relationship was negative. These results are consistent with the remaining research on mastery goals and academic achievement, which reports the lack of a strong relationship between mastery goals and academic achievement (Meece et al., 2006).
Correlations between social goals and academic achievement in English and mathematics were more substantial than either mastery or performance goals. Social goals, across all three time points, related negatively to both English and mathematics achievement but interestingly, the negative correlation between social goals and English ranks was far greater than for mathematics ranks. Learning experiences in mathematics in Australian high schools tend to be structured, and emphasis is on individual accomplishment; that is, fewer opportunities are provided to work in groups in mathematics since emphasis is on solving problems for oneself so as to learn concepts (Archer, 2000; Martin, 2005). Students who espouse social goals in a mathematics classroom are, therefore, availed few opportunities to work cooperatively. This could explain why social goals were more negatively related to mathematics achievement than to English achievement.

The negative relationship between social goals and academic achievement is interesting, as few studies have directly explored relations between social goals and English and mathematics achievement. The negative correlation appears to demonstrate that the preoccupation with helping others is associated with poor academic achievement. Specifically, students who perform poorly are more likely to be socially oriented, whereas students who perform well academically are less likely to be preoccupied with helping friends. Hence, those who are more likely to pursue social goals perform more poorly than students who are less likely to pursue social goals.

Relations among achievement and academic self-concept yield some interesting findings that can be explained using Marsh’s (1986a; 1990a) Internal/External (I/E) frame of reference model. A component of Marsh’s I/E model assumes that individuals judge their own achievements in one subject with their achievements in other subjects. This process of internal comparison should result in negative relations in achievement in one subject (e.g., English) against self-concept in a different subject (e.g., mathematics domain; Moller et al., 2006). Although only one pattern of relations in the 7V3W model replicated the proposed negative correlation assumed by the I/E model, all remaining paths between both domains of achievement with the other (non-matching) self-concept were close to zero. Notably, mathematics achievement was less correlated with English self-concept than with mathematics
self-concept, and English achievement was less correlated with mathematics self-concept than with English self-concept. Furthermore, and as predicted by the I/E model, correlations between matching domains of achievement and self-concept were statistically significant (Moller et al., 2006).

One finding that was inconsistent with the literature was the near-zero correlations found between achievement in English and achievement in mathematics. Past research reports positive correlations between mathematics and English achievement because students who perform well in one subject domain are likely to perform well in other subject domains (Marsh and Craven, 2006). This finding appears to be an anomaly and requires further investigation.

The stability correlations, which are the test-retest correlations among the seven variables, were substantially larger than any other correlations in the a priori model. These findings are consistent with expectations, since variables collected on multiple occasions correlate highly with the corresponding measure at a different time point. Also consistently with expectations, English self-concept was more highly correlated with English ranks, and this pattern was replicated for mathematics self-concept and mathematics ranks. Shavelson et al.’s (1976) model specifies that academic achievement is correlated more positively with academic self-concept than with non-academic or general self-concept, and that English and mathematics achievement indicators are correlated more highly with self-concepts in parallel domains than with other self-concept facets.

Correlations discussed in this chapter provide important implications for understanding the nature of students’ goals, domain-specific self-concepts and academic achievement in English and mathematics. Although the 7V3W model, which specifies correlations among all seven variables across three waves, has important implications for how these variables relate across time, it is not particularly useful in disentangling the causal ordering of these constructs. Chapter 14 pursues the ambitious task of disentangling the causal ordering of goals and self-concept and their effect on academic achievement.
12.5 Summary of Chapter

The main findings highlight that the combined GAGOS-ASDQII reliably and validly measured students’ multiple mastery, performance, and social goals, as well as students’ English self-concept and mathematics self-concept, and English and mathematics achievement in the context of one instrument for T1, T2, and T3, therefore providing support for stability. In general, this model was an excellent representation of the data at all three time waves.

The results discussed above address Bong’s (1996) concern that social cognitive models are inept, due to vague construct definitions. A rigorous procedure has been applied to the construct validation processes for this study in an attempt to further define students’ multiple goal pursuits in achievement-related situations. The results from earlier chapters consistently illustrate that students’ goals can be conceptualised as comprising multiple mastery goals, performance goals and social goals. Findings substantiate that students pursuing mastery goals are also likely to pursue performance goals and students pursuing performance goals are also likely to pursue social goals. Importantly, the inclusion of social goals within the framework demonstrates that students also pursue a goal that is directly related to individuals or groups associated with an academic task. Social goals prove to be important to students in achievement-related situations and influence student achievement behaviour. Whether this behaviour is adaptive or maladaptive remains unclear, as the results from the first-order CFAs suggest that social goals relate positively to mathematics self-concept but are more often negatively related to English self-concept and consistently negatively correlated to both English ranks and mathematics ranks. Although they are not as extensively examined as academic goals, it appears that social goals are another important class of goals that influence student achievement behaviour and require further examination.

A key goal of this study is to unify competing motivational constructs to provide a more comprehensive and meaningful model of student motivation. Although not as complete as the proposed comprehensive model, this study does unite two distinct fields, specifically, goal theory and self-concept. Combining the GAGOS-ASDQ II allowed for relations to be explored among students’ goals and academic self-
concept in the domains of English and mathematics. Correlations among these two independent motivational dimensions and academic achievement indicate that they are not mutually exclusive but are in fact interconnected. By unifying these two fields of motivation, it is possible to seek valuable insight into how students’ goals and academic self-concepts both relate to influence student achievement.
CHAPTER 13
HIGHER-ORDER ANALYSES ACROSS THREE WAVES OF DATA

13.1 Hierarchical Structure of Goals and Domain-specific Self-concepts

As discussed in the review of the literature, the three variables measuring goals are conceptually akin, as are the two variables measuring domain-specific self-concepts. For instance, the three goal orientations (mastery, performance, and social goals) all represent purposes for achievement. However, the reasons for achieving differ for each of the goals. The two domain-specific self-concepts (English and mathematics self-concept) represent self-perceptions of ability, but differ according to the subject domain. Due to the conceptual comparability between the first-order variables for the three goals and comparability between the domain-specific self-concepts at the first-order level, it was considered that analyses may be rendered more parsimonious if performed on the basis of conceptual comparability.

Furthermore, whenever first-order factors are correlated, it is logical to test models positing one or more higher-order factors (Marsh et al., 2002). Exploring correlations between the multiple first-order factors provides the opportunity to demonstrate a hierarchical representation of goals and academic self-concept. Consequently, this chapter tests whether students’ goals and domain specific self-concepts can be conceptualised as two singular latent constructs labelled “Purposes for achievement” and “Academic self-concept” respectively, represented within a hierarchical factorial structure that consists of three first-order goals (mastery, performance, and social goals) and two first-order domain-specific self-concepts (English and mathematics self-concept).
13.2 Method

13.2.1 Focus sample

The focus sample for the higher-order analysis was identical to the focus sample from the first-order CFA analyses. Respondents were the same 535 students that were surveyed across three waves of data. More than half of the respondents ($n = 315, 59\%$) were male, 220 were female (41%). The mean age of respondents at T1 was 13.0 (SD = 1.03), T2 was 14.27 years (SD = 0.96) and at T3 was 15.09 years (SD = 0.89).

13.2.2 Procedures

There was a number of purposes for conducting the higher-order analyses. These were:

1. evaluating an a priori hierarchical CFA model positing one HO factor (academic self-concept) that was consistent with the design of the ASDQII instrument and the Shavelson et al (1976) model on which these instruments were based;
2. evaluating an a priori hierarchical CFA model positing one HO factor (Purposes for achievement) that was hypothesised to relate to the underlying premise of the items in the GAGOS Instrument with particular attention to the inclusion of a social goal to the academic goals framework;
3. evaluating whether the a priori HO model remains stable across three waves of data;
4. comparing this a priori model with the corresponding first-order CFA model across all three waves;
5. evaluating whether the HO model remains invariant across sex for all three waves;
6. evaluating the fit of the a priori HO model when all three data waves are combined in the one analysis, in order to assess the simultaneous interplay among the variables;
7. evaluating whether the large HO model remains invariant across sex; and finally
8. comparing this large a priori HO model with the corresponding large first-order CFA model (M9a) when all three waves were simultaneously combined.
Investigating higher-order models involves examining the size of correlations among the first-order factors. If correlations among the first-order factors are small, then the hierarchy will be unavoidably weak. If this is the case, most of the reliable variance in the first-order factors cannot be explained in terms of a higher-order factor. Conversely, if the correlations are strong among the first-order factors, then a higher-order factor is plausible, at least empirically.

The size of first-order correlations is directly related to the size of the second-order factor loadings but is not directly related to the overall fit of the model. For instance, a model with uniformly weak correlations may still fit the data well. Essentially, evaluating higher-order models involves examining the overall model fit and making judgements as to whether the model counterbalances the loss of fit from constraining additional paths with the increase in the degrees of freedom.

A higher-order model is a model that has one or more latent constructs whose indicators are themselves latent constructs. In higher-order models, correlations between first-order factors are constrained to be zero and relations among the first-order factors are explained in terms of higher-order factors. Thus, the higher-order structure in this study is the component of the model that connects the second-order latent variables (e.g., Purposes for achievement and academic self-concept) with the five first-order latent variables (mastery goal, performance goal, social goal, English self-concept, and mathematics self-concept). This hypothesised hierarchical model is proposed in Figure 13.1.
Higher-order models are usually more parsimonious than first-order models since the number of higher-order factor loadings is typically smaller than the number of correlations among first-order factors. Higher-order models are usually nested under first-order models, and chi square difference values (and fit indices congruent with

Figure 13.1 Representation of the Higher-order Factor Structure
chi square) will favour the first-order model. When the fit of a higher-order model approaches that of the first-order model (or exceeds it) in terms of fit indices that adjust for lack of parsimony, then the higher-order model is arguably a better fit on the basis of greater parsimony. However, this argument may be invalidated if the theoretical integrity of both the first-order and higher-order structures is not critically evaluated.

13.3 Representing Students’ Goals and Academic Self-concept as Multidimensional and Hierarchical

13.3.1 Goal Orientations

Three first-order factors comprise the achievement goals in this study: mastery goals, performance goals and social goals. As conceptualised in this study, these three goals are appetitive, or approach forms of motivation (Elliot & Church, 1997) since they relate to purposes for achievement. Although the purposes for achievement are different for these specific goals (mastery-oriented individuals engage to seek competence, performance-oriented individuals engage to demonstrate ability relative to others, and social-oriented individuals engage to collaborate with peers), there is a universal disposition among the three specific goals, however, such that they are posited to direct, select and energise behaviour (McClelland, Koestner, & Weinberger, 1989). Correlations among the three distinct goals presented in Chapter 11 (Table 11.3, for instance) also support the hypothesis that there may be a common quality underlying these constructs. For example, strong to moderate correlations are apparent between mastery goals and performance goals, between social goals and performance goals, and between mastery goals and social goals. Consequently, a higher-order factor labelled Purposes for achievement is posited to represent the higher-order structure of the three distinct yet related goals.

13.3.2 Domain-specific Self-concepts

Historically, researchers conceptualised self-concept as unidimensional and hence, instruments designed on this model provided limited insight into self-concept. Not until relatively recently have researchers developed instruments designed to measure the specific facets of academic self-concept. Marsh devised the ASDQ instrument
based on Shavelson’s model and firmly believes “theory and instrument construction are inexorably intertwined, and that each will suffer if the two are separated” (Marsh, 1990d, p.19). Inadequacies from previous self-concept research methodology and theory can be addressed with a more reliable instrument that accounts for the multidimensional and hierarchical structure of self-concept and provides the opportunity to test hypotheses using a sound theoretical model as the basis.

Typically the hierarchy of academic self-concept has been weak, especially for high school students’ self-concept in specific school subjects (El-Hassan, 2004; Marsh & Yeung, 1998a). It appears that the school subjects studied by high school students are so distinct that attempting to capture the various self-concepts in each of these areas has proven problematic. That is, a higher-order factor of academic self-concept has proved more complicated than anticipated. One of the few studies that found convincing evidence for a hierarchy in high school students’ academic self-concept was that of Yeung et al. (2000). They reported moderate correlations (.26) between mathematics and English self-concept which demonstrates that students’ self-concepts in these two domains are related, even though the subjects themselves are distinct.

It is speculated that since both English and mathematics subjects are prioritised highly (a) in Australian high schools, (b) as prerequisites to apply for university entrance, and (c) valued in the workforce, that this commercial focus may explain why, what would appear to be two distinct subjects, may actually be related. Furthermore, similarities between the subjects also extend to the significant number of lessons scheduled in a week relative to other school subjects, and both these subjects are usually programmed to be taught at the beginning of the day. Based on these speculations, previous research, and correlations between mathematics and English self-concepts reported in earlier chapters, it is hypothesised that a higher-order factor of Academic self-concept represents two distinct yet related self-concepts: mathematics self-concept and English self-concept.
13.4 Overview of Analyses for the Second-order CFA Model

Nine second-order models were tested to determine the multi-dimensional and hierarchical structure of goals and self-concepts, and to assess the stability of the solutions over the three waves of data collection. The multiple goals construct was related to the higher-order factor Purposes for achievement, while English and mathematics self-concept were related to the higher-order factor Academic self-concept. (The LISREL syntax generated to test the T1 higher-order model is included in Appendix H and the syntax generated to test whether this model remained invariant across sex is included in Appendix I). The models tested were:

- **Model 10aT1 (M10aT1):** the hypothesised second-order model with 23-items for the focus sample at Time 1.
- **Model 10bT1 (M10bbT1):** the second-order null model with 23-items for the focus sample at Time 1.
- **Model 10cT1 (M10cT1):** test of invariance across sex for the hypothesised second-order model with 23-items for the focus sample at Time 1.
- **Model 10aT2 (M10aT2):** the second-order hypothesised model at Time 2 for the focus sample.
- **Model 10bT2 (M10bT2):** the second-order null model at Time 2 for the focus sample.
- **Model 10cT2 (M10cT2):** test of invariance across sex for the hypothesised second-order model at Time 2 for the focus sample.
- **Model 10aT3 (M10aT3):** the second-order hypothesised model at Time 3 for the focus sample.
- **Model 10bt3 (M10bT3):** the second-order null model at Time 3 for the focus sample.
- **Model 10cT3 (M10cT3):** test of invariance across sex for the hypothesised second-order model at Time 3 for the focus sample.
The a priori model hypothesises that the three first-order academic and social goals could be represented by one second-order factor referred to as Purposes for achievement and that the two first-order English and mathematics self-concepts could be represented by one second-order factor referred to as Academic self-concept. This hypothesis is represented diagrammatically in the above Figure, Figure 13.1.

13.5 Results

Table 13.1 shows the hypothesised second-order model results at Time 1, Time 2, and Time 3, all of which represent a good fit to the data. That is, students’ multiple mastery, performance and social goals can be represented by a higher-order factor Purposes for achievement, and students’ English and mathematics self-concepts can be represented by a higher-order factor Academic self-concept. All indices for the models reached acceptable criterion values.
Table 13.1

*Model Fit Statistics for the Higher-order Models Across All Time Waves*

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\chi^2$/df</th>
<th>TLI</th>
<th>CFI</th>
<th>RMSEA</th>
<th>Model Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M10aT1</td>
<td>567.33</td>
<td>224</td>
<td>2.5</td>
<td>.95</td>
<td>.96</td>
<td>.05</td>
<td>Hypothesised second-order model T1</td>
</tr>
<tr>
<td>M10bT1</td>
<td>8093.45</td>
<td>253</td>
<td>32.0</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>Null second-order model T1</td>
</tr>
<tr>
<td>M10cT1</td>
<td>863.36</td>
<td>495</td>
<td>1.7</td>
<td>.95</td>
<td>.95</td>
<td>.05</td>
<td>Invariance across sex T1</td>
</tr>
<tr>
<td>M10aT2</td>
<td>471.38</td>
<td>224</td>
<td>2.1</td>
<td>.96</td>
<td>.96</td>
<td>.05</td>
<td>Hypothesised second-order model T2</td>
</tr>
<tr>
<td>M10bT2</td>
<td>7065.55</td>
<td>253</td>
<td>27.9</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>Null second-order model T2</td>
</tr>
<tr>
<td>M10cT2</td>
<td>954.38</td>
<td>495</td>
<td>1.9</td>
<td>.94</td>
<td>.95</td>
<td>.05</td>
<td>Invariance across sex T2</td>
</tr>
<tr>
<td>M10aT3</td>
<td>60.37</td>
<td>224</td>
<td>2.7</td>
<td>.96</td>
<td>.96</td>
<td>.06</td>
<td>Hypothesised second-order model T3</td>
</tr>
<tr>
<td>M10bT3</td>
<td>9401.08</td>
<td>253</td>
<td>37.2</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>Null second-order model T3</td>
</tr>
<tr>
<td>M10cT3</td>
<td>872.91</td>
<td>495</td>
<td>1.8</td>
<td>.95</td>
<td>.95</td>
<td>.05</td>
<td>Invariance across sex T3</td>
</tr>
</tbody>
</table>

In addition to examining the overall model fit, it is also important to assess the structural regression coefficients and correlations among factors in the higher-order model. Structural regression coefficients and correlations for the hypothesised second-order model at T1, T2 and T3 are presented in Table 13.2. Significant and substantial structural regression coefficient paths are evident for mastery, performance and social goals to the higher-order factor (Purposes for achievement). Results for the structural regression coefficients demonstrate that the higher-order factor Purposes for achievement is most influenced by performance goals (T1 = .69; T2 = .83; T3 = .84) then mastery goals (T1 = .68; T2 = .54; T3 = .49), and least influenced by social goals (T1 = .39; T2 = .43; T3 = .29).
Structural regression coefficient paths from the Completely Standardised Solution in LISREL were similar for English self-concept and mathematics self-concept at Time 1, Time 2 and Time 3 to the higher-order factor (Academic self-concept), but these coefficients tend to be smaller in comparison to each of the structural regression coefficients for goals. This indicates that the hierarchy for academic self-concept is weaker than the proposed hierarchy for students’ goals. Overall it appears that the first-order factors load substantially on their respective second-order factors. These results, the overall model fit, as well as the relatively small increase of the chi square and degrees of freedom ratio all indicate that the second-order model provides a good approximation of the data. The results demonstrate that the higher-order model remains stable across all three waves.
Table 13.2
*Structural Regression Coefficients and Correlations Based on a Two Factor Higher-order CFA*

<table>
<thead>
<tr>
<th>Structural regression coefficients</th>
<th>Goals T1</th>
<th>Self T1</th>
<th>Goals T2</th>
<th>Self T2</th>
<th>Goals T3</th>
<th>Self T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mastery T1</td>
<td>.68***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance T1</td>
<td>.69***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social T1</td>
<td>.39***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>English self-concept T1</td>
<td></td>
<td>.49***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathematics self-concept T1</td>
<td></td>
<td>.38***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mastery T2</td>
<td></td>
<td></td>
<td>.54***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance T2</td>
<td></td>
<td></td>
<td>.83***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social T2</td>
<td></td>
<td></td>
<td>.43***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>English self-concept T2</td>
<td></td>
<td></td>
<td></td>
<td>.30***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathematics self-concept T2</td>
<td></td>
<td></td>
<td></td>
<td>.56***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mastery T3</td>
<td></td>
<td></td>
<td></td>
<td>.49***</td>
<td></td>
<td>.31***</td>
</tr>
<tr>
<td>Performance T3</td>
<td></td>
<td></td>
<td></td>
<td>.94***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social T3</td>
<td></td>
<td></td>
<td></td>
<td>.29***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>English self-concept T3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.31***</td>
<td></td>
</tr>
<tr>
<td>Mathematics self-concept T3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.66***</td>
</tr>
</tbody>
</table>

Correlations

<table>
<thead>
<tr>
<th>Goals T1</th>
<th>Self T1</th>
<th>Goals T2</th>
<th>Self T2</th>
<th>Goals T3</th>
<th>Self T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goals T1</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self T1</td>
<td>.80***</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goals T2</td>
<td></td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self T2</td>
<td>.49***</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goals T3</td>
<td></td>
<td></td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self T3</td>
<td>.41***</td>
<td>-</td>
<td></td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Coefficients > .* are significant at $p < .05$* $ p < .01$** $p < .001$***

The chi square difference tests between the second-order model and the corresponding first-order model are presented in Table 13.3. Specifically, the chi square test was conducted between the second-order model and the refined first-order model at all three time points (e.g., Time 1 second-order M10aT1 versus Time 1 first-order M2aT1). Results from all three chi square difference tests revealed significant differences between the two models. As predicted, the chi square difference values favoured the first-order model. However, the fit indices for higher-order were in some cases identical to or at least comparable with the first-order. In the case that higher-order models approached that of the first-order model, then the
A higher-order model is usually considered a better fit on the basis of greater parsimony. In sum, the first-order model provides a better representation of the data and there is only weak support for the higher-order model.

Table 13.3

*Chi Square Difference Tests*

<table>
<thead>
<tr>
<th>Models</th>
<th>Chi square difference</th>
<th>Degrees of freedom</th>
</tr>
</thead>
<tbody>
<tr>
<td>M10at1</td>
<td>29.3</td>
<td>4***</td>
</tr>
<tr>
<td>M2at1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M10at2</td>
<td>131.5</td>
<td>4***</td>
</tr>
<tr>
<td>M2at2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M10at3</td>
<td>14.7</td>
<td>4**</td>
</tr>
<tr>
<td>M2at3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Difference test between invariant and unconstrained model

<table>
<thead>
<tr>
<th>Models</th>
<th>Chi square difference</th>
<th>Degrees of freedom</th>
</tr>
</thead>
<tbody>
<tr>
<td>M10Ct1</td>
<td>296.03</td>
<td>271</td>
</tr>
<tr>
<td>M10At1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M10Ct2</td>
<td>438</td>
<td>271</td>
</tr>
<tr>
<td>M10At2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M10Ct3</td>
<td>272.54</td>
<td>271</td>
</tr>
<tr>
<td>M10At3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**13.6 Invariance Across Sex**

A substantive issue for this study is the extent to which the structure of students’ goals and academic self-concept is the same for males and females. Having established that the second-order model provides an equivalent fit to the data, it was important to assess whether this model would remain invariant across sex. A true test of invariance was conducted. To test this, the structural regression coefficients, factor loadings, and uniquenesses were simultaneously constrained to be equal across sex groups. To determine whether the second-order model was invariant across sex the overall fit statistics were examined and then a chi square difference test between the invariant model and unconstrained model was conducted.
The TLI penalises model complexity, so the introduction of invariance constraints provides for a more parsimonious model and should result in an improved (larger) TLI. Parallel to the TLI, the chi square and degrees of freedom ratio also imposes a penalty for model complexity, so it is feasible for this index to improve (decrease in size) when invariance constraints are specified, but the significant issue in relation to improvement in the chi square/degrees of freedom ratio is whether the chi-square value increases relatively little in comparison with the increased degrees of freedom. Consequently, if the introduction of equality constraints results in an improved TLI and relative increases to the chi square/degrees of freedom ratio, then it can be concluded that there is strong support for the equality constraints. However, constrained models usually fit the data worse than unconstrained models so it is important to determine how much worse the constrained invariant model fits, relative to the hypothesised model.

In this study there was a relative improvement at all three time waves for the chi square/degrees of freedom ratio and there was a modest reduction of the TLI at T2 and T3. A comparison between the invariant model at all three time points with the corresponding unconstrained model (M10aT1, M10aT2 and M10aT3) using a chi square difference test was then conducted. Results for these chi square tests are reported in Table 13.3. The chi-square difference statistic demonstrates that the invariant model at all three time points is not significantly different from the unconstrained model, which attests to the model being invariant across sex.

13.7 Discussion

13.7.1 Hierarchical structure of goals

Literature reviewed in Chapter 2 demonstrates that mastery goals, performance goals and social goals are adaptive and positively oriented goals because they all express purposes for achievement rather than addressing why individuals choose not to achieve. Examining how these three approach goals relate with each other in a hierarchical structure contributes to a deeper and fuller understanding of the various purposes for achievement and this can help inform theory. Gorsuch (1983) believes that analysing data across different levels provides different perspectives on the constructs under investigation. An exclusive focus on goals at the base (first-order)
jeopardises the investigation of possible interaction for the full scope (i.e., first- and second-order) (McInerney et al., 2003). For this reason, studies that limit their examination of individual goals and their effect on achievement may provide fragmented and superficial assumptions.

Although purposes for achievement vary for each of these specific goals—for instance, mastery oriented individuals achieve to seek competence, performance oriented individuals achieve to demonstrate ability relative to others, and social oriented individuals achieve to collaborate with peers—there is a universal disposition among the three specific approach goals such that they are posited to direct, select and energise behaviour (McClelland et al., 1989). Correlations between the three distinct goals presented in Chapter 11 (see for example Table 11.3) support the hypothesis that there is a common quality underlying these constructs. Besides demonstrating a common quality underlying the constructs, these correlations also indicate that individuals pursue multiple goals. Lemos and Goncalves (2004) believe that a higher-order factor structure may help explain how students coordinate multiple goals. Consequently, a higher-order factor labelled Purposes for achievement is posited to represent the three distinct yet related goals.

Examining the hierarchy of approach goals provides the opportunity to validate the theoretical structure of Goal Theory and in particular, approach forms of goals. As a result of testing the hierarchy of approach goals, this study contributes to the theory by providing a lucid and differentiated definition of three approach goals. Furthermore, this study contributes to Goal Theory by demonstrating that all three goals represent Purposes for achievement. The higher-order factor “Purposes for achievement” reflects purposefulness with respect to achievement such that the first-order factors identify the three distinct but related purposes.

This study conceptualised students’ Purposes for achievement as a singular latent construct, within a hierarchical factorial structure that consists of three first-order factors—mastery goals, performance goals and social goals. Support for the hierarchy of goals is evident from the model fit, given that all models (10aT1, 10aT2, and 10aT3) reached criterion values. Among the three goals, strong correlations to their higher-order factor provide further evidence of the strong hierarchy.
Importantly, the hierarchy remained invariant across sex, demonstrating that the model provides an equally good fit for males and females. Demonstrating the equivalence of males and females is a particularly important finding, since it adds weight to future studies that explore mean sex differences.

A number of practical implications arise as a result of these findings and warrant further investigation. For instance, the hierarchy of approach goals demonstrates that all three goals relate positively with each other. It provides further evidence for social goals to be included alongside academic goals when examining the various purposes for achievement. This study would encourage future research to investigate the effects of social goals on academic goals, since they have been shown to be an important goal pursuit for adolescent students.

### 13.7.2 Hierarchical Structure of Self-concept

In addition to proposing a hierarchical structure of approach goals, this study also conceptualised students’ academic self-concept as a singular latent construct, within a hierarchical factorial structure that comprised two first-order factors—English self-concept and mathematics self-concept. This structure was supported for both males and females through a test of sex invariance. Results attest that the ASDQII reliably and validly measures students’ specific facets of academic self-concept, and these can be represented hierarchically. These results are consistent with the design of the ASDQII instrument, which was based on the Shavelson et al. (1976) model.

Typically the hierarchy of self-concept has been shown to be weak. Weakness of this hierarchy can be indexed by the size of the correlations between the first-order factors. Previous research has found near zero and negative correlations between domain-specific self-concepts, particularly for adolescents. This is partially a result of subjects studied in high schools being so varied and distinct, that encapsulating different self-concepts across the different domains is intricate and more complex than anticipated. To account for relatively uncorrelated results between domain-specific self-concepts Marsh proposed the Internal/External frame of reference model (Marsh, 1986a; 1990a). According to the I/E model, academic mathematics and English self-concepts are formed as a result of two comparison processes or frames.
of reference (Hau et al., 2000). These external and internal frames of reference are detailed in the review of the literature in Chapter 2.

In contrast with research reporting relatively uncorrelated results between mathematics and English self-concepts this study found, along with El-Hassan (2004), support for a hierarchical structure for adolescence which posits academic self-concept to be represented by English and mathematics self-concepts. Correlations between mathematics and English self-concepts were found to be moderate and positively correlated across all three time waves. These findings are consistent with Yeung et al. (2000), who also demonstrated moderate correlations between mathematics and English self-concept. These results indicate that students with a positive English self-concept are likely to hold a positive mathematics self-concept and conversely, students who hold a positive mathematics self-concept are likely to hold a positive English self-concept. Skaalvik and Rankin (1992) attest that positive correlations between mathematics and English self-concept are evidence that not all students make internal comparisons where they perceive themselves to be more competent at one subject at the expense of another, but in fact students could rate their mathematics and English ability as equally good or bad.

Self-concept can be both multidimensional and hierarchical, and these two features are not necessarily mutually exclusive (Lau et al., 1999). One of the theoretical contributions of this study is evidence of a self-concept hierarchy, whereby a higher-order construct is capable of explaining the covariance of its subordinate first-order self-concept measures (in this case, English self-concept and mathematics self-concept). The strength of this hierarchy can be indexed by the size of the correlations between the first-order factors. The modest and highly significant correlations between English and mathematics self-concepts at the first-order showed that although the self-concept domains were distinct enough to be perceived as multidimensional, their relationship was close enough to form a higher-order construct that represented the two domains.
A number of practical implications are raised as a result of these findings and warrant further investigation. For instance, a multidimensional structure of self-concept assumes that self-concept enhancement and intervention should be more effective if it targets specific domains. However, evidence of an academic self-concept hierarchy in this study, which encapsulates both Mathematics and English self-concept, suggests that enrichment and development of self-concept could also be effective if it is targeted at a more general level (academic self-concept). In terms of classroom practices, these findings support self-concept enhancement programs that encourage increased self-perceptions through more general approaches. Some examples of approaches that teachers could adopt for the purpose of increasing students’ academic self-concept include reducing social comparisons and competitive learning environments, encouraging self-regulation and positive self-talk, encouraging students to reflect on feedback as corrective rather than criticism, and providing learning experiences in which students are likely to achieve their goals (Snowman & Biehler, 2006; Zimmerman, 1998, 2004).

Confirmatory factor analyses of the first-order factors supported the possibility of a hierarchical structure. Correlations between the two second-order factors (Purposes for achievement and Academic Self-concept) related strongly at Time 1 ($r = .80$) and moderate to weakly at Time 2 ($r = .49$), and Time 3 ($r = .41$). This pattern of results shows that adolescent students’ approach goals and academic self-concept are related and that this relationship is positively oriented. These findings substantiate the theoretical argument in the review of the literature (Chapter 5) that approach goals and domain-specific self-concepts are related in achievement situations. It appears that increases in academic self-concept contribute to increases in approach goals and increases in approach goals contribute to increases in academic self-concept. Although these correlations are informative and heuristic, they do not show how these two constructs are causally related. The following chapter extends on reporting correlations between the two constructs and investigates how goals and domain-specific self-concepts are causally related over time.
13.8 Summary of Chapter

A number of key findings have been disclosed and discussed in this Chapter 13.

- support for an a priori hierarchical CFA model positing one HO factor (academic self-concept) that is consistent with the design of the ASDQII instrument and the Shavelson et al. (1976) model, on which this instrument was based;
- support for an a priori hierarchical CFA model positing one HO factor (Purposes for achievement) that is hypothesised to relate to the underlying premise of the items in the GAGOS instrument, which includes social goals to the academic goals framework;
- evidence that the a priori HO model remains stable across three waves of data;
- some indication that the higher-order model represented the data better than the corresponding first-order model;
- clear evidence that the HO model remains invariant across sex for all three waves; and
- confirmation that approach goals and academic self-concept are related, that this relationship is positive and remained stable across three years.
Analyses from Chapters 9, 10, and 11 provided opportunities to evaluate measurement issues for the confirmatory factor analysis models and make necessary modifications before pursuing the full-forward SEM model (like that in Figure 7.3 in Chapter 7). Earlier chapters also focused on how goals, self-concept, and academic achievement were related. Specifically, correlations reported in Table 11.3 (Chapter 11) between goals and domain-specific self-concept, tended to be positive. Although correlations are informative and heuristic, they do not reveal the underlying mechanisms that cause the positive correlations. This chapter pursues the more complicated and central aim of the study concerning the causal ordering of goals and academic self-concept and their combined effect on academic achievement. Since correlations reported in the earlier CFA chapters were based on single waves of data, they provide no clear basis for concluding that either goals influence subsequent academic self-concept or that academic self-concept influences subsequent goal adoption or that perhaps the two constructs are mutually reinforcing. This chapter intends to disentangle the causal ordering of these constructs utilising structural equation modelling and applying Marsh et al.’s (1999) recommended guidelines for analysing longitudinal causal ordering.

In Chapter 14, the central aim is to proceed with a full-forward model and then test alternative models to evaluate various aspects of the solution and find the model that affords the best explanation of the data. The full-forward model will be used as a starting point for analysing causal relations and to assess the reciprocal effects model. The full-forward model will also be utilised as a point of comparison for the two subsequent competing models: (a) goal orientations cause academic self-concepts, which in turn affect subsequent academic achievement and; (b) academic
self-concepts cause goal orientations, which in turn affect subsequent academic achievement.

14.1 Method

14.1.1 Sample

A total of 9 high schools were initially involved in this study. However, over the three years of data collection four schools were unable to provide complete data across the time span of this study; consequently, five schools (School 1, School 2, School 3, School 4, and School 6) were utilised for the Longitudinal Structural Equation Modelling (LSEM) analyses. This focus sample was used in earlier chapters to test the CFAs at T1, T2, and T3 and for the more complicated CFAs (5V3W and 7V3W CFAs). Table 14.1 presents composition details of the focus sample.

Table 14.1
Sample Composition

<table>
<thead>
<tr>
<th>Year</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>195</td>
<td>179</td>
<td>161</td>
</tr>
<tr>
<td>2003</td>
<td>195</td>
<td>179</td>
<td>179</td>
</tr>
<tr>
<td>2004</td>
<td>195</td>
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<td>195</td>
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Focus Sample

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<td>2004</td>
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Number: 535 535 535
Ratio male/female: 59/41 59/41 59/41
Age–mean: 13.0 14.3 15.1
Age–std dev: 1.0 1.0 0.9
Achievement data provided included school ranks for English and school ranks for mathematics. Students were assigned ranks based on performance in class tests and exams. Ranks ranged from 1 through 5, with 5 representing top performers and 1 representing the poorest performers. Too few schools provided achievement scores in English and mathematics to permit analyses using multiple measures of academic achievement.

14.1.2 Procedures
Marsh et al. (1999) recommend ten guidelines for examining causal relations between self-concept and academic achievement. These ten guidelines and affiliated phases for examining self-concept and academic achievement were discussed in the review of the literature. Although this study includes academic and social goals in its examination of relations between self-concept and academic achievement, the fourth guideline detailing procedures for analyses of longitudinal causal ordering remains applicable. In particular, their fourth guideline recommends four distinct phases by which to proceed when conducting longitudinal causal ordering analyses.

A part of Chapter 7’s brief orientation and overview of analyses for this study was a synopsis of this fourth guideline, the four distinct phases and links to affiliated Chapters. For instance, Chapters 9 and 10 correspond with Phase 1 of this guideline, with analyses of straightforward CFAs. Chapter 11 corresponds with Phase 2, with analyses of more complicated CFAs. This Chapter continues with the remaining two phases, Phases 3 and 4. Each of Marsh et al.’s (1999) four phases affiliated with Guideline 4 are briefly recalled below, with particular attention to the last two phases as they directly apply to analyses to be conducted in this chapter.

Initially, straightforward CFA models should be conducted to address measurement issues (refer to Chapters 9 and 10). Secondly, more complicated CFAs should be pursued that comprise all variables across all waves, so as to examine simultaneous interactions among the variables and to again, address any measurement issues before moving on to structural models (refer to Chapter 11). This is because potential problems and their solutions are typically more easily resolved for CFA models than SEM models (Marsh et al., 1999). The third phase involves a full-forward SEM where all paths in the model are estimated. Consistent with Marsh et al.’s (1999)
guidelines, this chapter commences with a full-forward SEM in which correlations among factors within the same wave, as well as paths from all constructs in each wave to all constructs in subsequent waves are freely estimated. The final phase entails testing alternative causal models by constraining certain paths in the full-forward model. Alternative models are nested within the full-forward model, because paths in the nested model are constrained such that they are a subset of the model with additional parameters (full-forward model). Consequently, nested models can be used as a point of comparison with the purpose of determining, using available evidence, which model explains the data best. Nested models usually fit the data more poorly than additional parameter models (i.e., full-forward model) because they place supplementary (error laden) restrictions on the data.

This chapter presents analyses in two sections which correspond to the last two phases of Marsh et al.’s (1999) fourth guideline. The first section of analyses corresponds with Phase 3 and involves examining the full-forward model. The second section corresponds with Phase 4 and involves examining two competing models that are nested under the full-forward model. An overview of these sections is reviewed below.

### 14.2 Overview of Analyses

Data were analysed using LISREL 8.54 (Jöreskog & Sörbom, 1989a; 2003). Models were estimated using Maximum Likelihood estimation (MLE). The benefits associated with MLE are described in Chapter 7. In order to test the potential causal ordering of goals and self-concept with respect to achievement, the final two phases of Marsh et al.’s (1999) guidelines were applied. Specifically, Phase 3 entails testing a full-forward model. The full-forward model proposes that goal orientations (mastery, performance and social goals) and self-concepts (English and mathematics self-concept) are reciprocally related to affect academic achievement (English and mathematics achievement). Phase 4 entails testing two nested models under the full-forward model. The nested models propose two causal orderings. The first causal ordering hypothesises that goals at Time 1 affect self-concepts at Time 2, which influence academic achievement at Time 3. The second causal ordering hypothesises that self-concepts at Time 1 (T1), affect goals at Time 2 (T2), which influence academic
achievement at Time 3 (T3). These competing models were examined across English and mathematics domains. (The LISREL syntax generated to test the full-forward model is included in Appendix I and the syntax generated for the two competing models is included in Appendix J).

In sum, Phase 3 tests the full-forward model while Phase 4 tests the two nested models:

**Phase 3**

- **Model 11 (M11):** the full-forward model with all parameters estimated.

**Phase 4**

- **Model 12 (M12):** the constrained full-forward model with paths from goals T1, self-concept T2 and ranks T3
- **Model 13 (M13):** the constrained full-forward model with paths from self-concept T1, goals T2 and ranks T3

### 14.2.1 Analyses for phase 3: Full-forward model

Phase 3 is designed to test hypotheses bearing on the issue of causal predominance between goal orientations (mastery, performance, and social goals), and domain-specific self-concepts (English and mathematics), and their combined effect on domain-specific academic achievement (English and mathematics ranks). It is a longitudinal model involving the measurement of these constructs at three points in time (November, 2002, November 2003, and November 2004), with each data collection point taking place one academic year apart. The central relationships in the hypothesised model are presented in Figure 14.1.
Figure 14.1 Basic structure of the hypothesised full-forward model showing reciprocal effects. MAS = Mastery goal, PER = Performance goal, SOC = Social goal, ESC = English self-concept, MSC = Mathematics self-concept, EACH = English achievement, MACH = Mathematics achievement, T1 = Time 1, T2 = Time 2, T3 = Time 3.

Specifically the full-forward model specifies correlations among observed variables within parallel waves, in addition to all paths from all latent variables (e.g., mastery goals, English self-concept) in each wave to all latent variables in subsequent waves. The central aim is to investigate the causal ordering of goals and domain-specific self-concept and their combined effect on academic achievement. It was necessary to control for prior levels of achievement and effects of prior levels of achievement on all variables, therefore all paths from English and mathematics achievement were specified to be freely estimated. A schematic portrayal of the hypothesised full-forward model is shown in Figure 14.2.
Figure 14.2 shows that each latent construct is measured by the same number of observed variables at each of the three time points. Consistent with Marsh and Byrne’s first guideline, each latent construct is inferred by at least four items, except for the two latent constructs for academic achievement (English achievement and mathematics achievement) which are inferred by one each. Furthermore, to avoid method-halo effects, multiple observed variables which were collected on multiple occasions are specified in the model to be correlated. To facilitate reading of Figure 14.2 these paths are not schematically represented, but were included in the model’s specifications. Specifying method-halo effects demonstrates application of Marsh and Byrne’s guideline number two.

The three columns in Figure 14.2 represent the three waves of data collected. Instead of the recommended two data collection points, this study includes three, with the desirable data span of one academic year between each collection point. Therefore this study exceeds the requirements of Marsh and Byrne’s third guideline which recommends at least two collection points. The seven rows in Figure 13 represent the number of latent constructs. Marsh and Byrne’s sixth guideline for examining relations between self-concept and academic achievement recommends extending existing research by including more than one academic domain. This study comprises both English and mathematics self-concept and English and mathematics achievement.

Following analyses of the full-forward model are analyses of two competing causal ordering models. These competing models fulfil Marsh and Byrne’s fourth phase of guideline four. Model restrictions for these two competing models are described in the following section.
Figure 14.2  Schematic portrayal of the full-forward model. *Note.* MAS = Mastery goal, PER = Performance goal, SOC = Social goal, ESC = English self-concept, MSC = Mathematics self-concept, EACH = English achievement, MACH = Mathematics achievement, T1 = Time 1, T2 = Time 2, T3 = Time 3.
14.2.2 Analyses for phase 4: Competing models

After testing the full-forward model, two competing causal orderings are analysed. To obtain these competing models, specific paths or parameters from the full-forward model are constrained to be equal to 0. Since parameters in the full-forward model are being constrained to obtain the competing models, these competing models are said to be nested models, because they are a subset of the model with additional parameters (full-forward model).

Nested models have a greater number of degrees of freedom compared with the model with additional parameters. Furthermore, nested models impose additional restrictions on model parameters, which results in higher chi square values than the model with additional parameters. Differences between chi squares of a nested model and full-forward model, compared to differences in degrees of freedom, can be used as a test of significance. The chi square difference test demonstrates whether restrictions imposed on one or more parameters resulted in a significant decrement in model fit (Raykov & Marcoulides, 2000). This chi square difference test will be conducted between the full-forward model and the two competing models.

The first competing longitudinal causal model to be tested in Phase 4 hypothesises that mastery, performance and social goals affect English and mathematics self-concepts, which in turn influence subsequent academic achievement in mathematics and English. The central relationships in this hypothesised longitudinal causal model are presented in Figure 14.3.
Figure 14.3 Basic structure of the first hypothesised nested model with goals causally predominant. MAS = Mastery goal, PER = Performance goal, SOC = Social goal, ESC = English self-concept, MSC = Mathematics self-concept, EACH = English achievement, MACH = Mathematics achievement, T1 = Time 1, T2 = Time 2, T3 = Time 3.

Constraints are placed on the self-concept latent constructs as this model examines causal predominance of goals and their subsequent effect on English and mathematics self-concept. Specifically, paths from English and mathematics self-concept at Time 1 (T1) to mastery, performance and social goals at Time 2 (T2) are constrained (see Figure 14.4). Likewise paths from English and mathematics self-concept T2 to mastery, performance and social goals T3 are constrained (see Figure 14.4). A total of 12 paths in the beta matrix are constrained to be equal to 0. Freely estimated in this model are paths for mastery, performance, and social goals, as well as English and mathematics achievement at all three time waves. The achievement latent constructs in this model are freely estimated with the purpose of controlling for prior levels of achievement and the effects of this on all variables in the model. Specifically, paths for these five latent constructs for each time wave, to all latent variables in subsequent waves are freely estimated. A modified schematic portrayal of the hypothesised competing model is shown in Figure 14.4.
Modifications to the schematic portrayal attempt to facilitate interpretation of the model. This model has been modified as it only depicts paths for: (a) one goal orientation construct, (b) one self-concept construct, and (c) one academic achievement construct. This is because the patterns of paths are replicated for each of these three constructs with their counterpart constructs. Moreover, identical patterns of paths represented by mastery goals in Figure 14.4 apply to performance goals and social goals; however, these paths have not been visually represented in the model. Patterns of paths represented by English self-concept apply to mathematics self-concept and patterns of paths represented by English achievement apply to mathematics achievement. Modifications to the schematic portrayal allow for method-halo effects to be visually represented. Unlike Figure 14.2, this schematic representation depicts correlations between observed variables collected on multiple occasions to address method-halo effects.
Figure 14.4 Nested model with goal orientations causally predominant. Note. MAS = Mastery goal, PER = Performance goal, SOC = Social goal, ESC = English self-concept, MSC = Mathematics self-concept, EACH = English achievement, MACH = Mathematics achievement, T1 = Time 1, T2 = Time 2, T3 = Time 3.
The second competing longitudinal causal model to be tested in Phase 4 hypothesises that English and mathematics self-concepts affect mastery, performance and social goals, which in turn influence subsequent academic achievement in mathematics and English. The central relationships in the hypothesised longitudinal causal model are presented in Figure 14.5.

Figure 14.5 Basic structure of the second hypothesised nested model with self-concept causally predominant. MAS = Mastery goal, PER = Performance goal, SOC = Social goal, ESC = English self-concept, MSC = Mathematics self-concept, EACH = English achievement, MACH = Mathematics achievement, T1 = Time 1, T2 = Time 2, T3 = Time 3.

Constraints are placed on the goal orientation latent constructs as this model examines causal predominance of self-concepts and their subsequent effect on mastery, performance and social goals. Specifically, paths from mastery, performance, and social goals at Time 1 to English and mathematics self-concept at T2 are constrained. Likewise, paths from mastery, performance, and social goals at T2 to English and mathematics self-concept at T3 are constrained. Identical to the first nested model, the achievement latent constructs in this model are freely estimated, with the purpose of controlling prior levels of achievement and the effects of this on all variables in the model.
Parallel to the first competing model, a total of 12 paths in the beta matrix were constrained to be equal to 0. This resulted in the equivalent number of degrees of freedom for each nested model, since both models will have applied an identical number of restrictions to parameter estimates. Freely estimated in this model are paths for English and mathematics self-concept, as well as English and mathematics achievement (see Figure 14.6). Specifically, paths for these four latent constructs at each wave to all latent variables in subsequent waves are freely estimated. A modified schematic portrayal of the hypothesised competing model is shown in Figure 14.6.

Modifications to the schematic portrayal attempt to facilitate interpretation of the model. This model has been modified as it only depicts paths for: (a) one goal orientation construct, (b) one self-concept construct, and (c) one academic achievement construct. This is because the patterns of paths are replicated for each of these three constructs with their counterpart constructs. Moreover, identical patterns of paths represented by mastery goals in Figure 14.6 apply to performance goals and social goals, although these paths have not been visually represented in the model. Patterns of paths represented by English self-concept apply to mathematics self-concept and patterns of paths represented by English achievement apply to mathematics achievement. Similarly to Figure 14.4, this schematic representation depicts correlations between observed variables collected on multiple occasions, to address method-halo effects.
Figure 14.6 Nested model with domain-specific self-concepts causally predominant.

Note. MAS = Mastery goal, PER = Performance goal, SOC = Social goal, ESC = English self-concept, MSC = Mathematics self-concept, EACH = English achievement, MACH = Mathematics achievement, T1 = Time 1, T2 = Time 2, T3 = Time 3.
14.3 Results

14.3.1 Full-forward Model

Phase 3 involved testing the full-forward model (Model 11). Model 11 (M11) assumes that the latent constructs are reciprocally related and therefore the model’s specifications comprised correlations among observed variables within parallel waves, in addition to all paths from all latent variables in each wave, to all latent variables in subsequent waves. This complex model converged to a proper solution. M11 was well defined in that factor loadings were substantial and the fit statistics were very good. Table 14.2 presents the overall goodness-of-fit indices. Table 14.3 presents the factor loadings, Table 14.4 presents factor correlations, and Table 14.5 presents the path coefficients and total effects. Figure 14.7 depicts only the significant path coefficients.

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Table 14.3
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Note. Decimals omitted. Coefficients are significant at *p < .05, **p < .01, ***p < .001. FL = Factor loading, MAS = Mastery goal items, PER = Performance goal items, SOC = Social goal items, ESC = English self-concept items, MSC = Mathematics self-concept items, EACH = English achievement, MACH = Mathematics achievement.
Table 14.4

*Factor Correlations for the Full-forward Model*

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*Note.* Decimals omitted. Coefficients are significant at *p < .05. **p < .01. ***p < .001. FC = Factor correlations, MAS = Mastery goal items, PER = Performance goal items, SOC = Social goal items, ESC = English self-concept items, MSC = Mathematics self-concept items, EACH = English achievement, MACH = Mathematics achievement, EA = English achievement, MA = Mathematics achievement, T1 = Time 1, T2 = Time 2, T3 = Time 3.
Table 14.5  
Path Coefficients and Total Effects for the Full-forward Model

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**Note.** Decimals omitted. Coefficients are significant at *p<0.05. **p<0.01. ***p<0.001. PC = Path Coefficients, MAS = Mastery goal items, PER = Performance goal items, SOC = Social goal items, ESC = English self-concept items, MSC = Mathematics self-concept items, EACH = English achievement, MACH = Mathematics achievement, T1 = Time 1, T2 = Time 2, T3 = Time 3.
Figure 14.7 Significant path coefficients for the full-forward model. Note. MAS = Mastery goal, PER = Performance goal, SOC = Social goal, ESC = English self-concept, MSC = Mathematics self-concept, EACH = English achievement, MACH = Mathematics achievement, T1 = Time 1, T2 = Time 2, T3 = Time 3.
Subsumed in the full-forward model were the two competing or nested models. Therefore, the full-forward model is particularly useful for examining relationships between the variables, since all possible paths are represented in M11. (Appendix L presents a complete table of direct, indirect, and total effects for M11). Path coefficients and total effects were particularly important (see Figure 14.12; Marsh, Prada, Craven, & Finger, 2004). In causal ordering models, path coefficients are the direct effects which relate earlier variables with subsequent variables (e.g., T1 scores to T2 and T3 scores; see Figure 14.2). Total effects are the sum of direct and indirect (mediated) effects. Since there are no variables between T1 and T2 or between T2 and T3, in the causal ordering, there are no mediated effects. Therefore, total and direct effects are the same. However, for the effects of T1 variables on T3 variables, there are both direct and mediated effects (e.g., the direct effect of T1 variables on T3 variables and the effects of T1 variables mediated by T2 variables). Consequently, total effects and direct effects typically differ, since a proportion of the effects of T1 variables on T3 variables are likely to be mediated by T2 variables. Reporting of results will therefore focus primarily on total effects and path coefficients.

The largest effect for each T2 and T3 outcome was the parallel variable from the preceding wave. For instance, Table 14.5 showed the total effects for mastery goals at T1 to T2, T2 to T3, and T1 to T3 were highly significant and positive (.28, .36, and .28 respectively). However, the crucial effects in relation to the a priori reciprocal effects model which was hypothesised in Chapter 6 are the effects of goal orientations on domain-specific self-concepts and the effects from domain-specific self-concepts on subsequent goal orientations. Importantly, the total effects of T1 goals on T2 English self-concept are positive, although not for social goals, and this effect was significant for mastery goals. T1 goals negatively affect T2 mathematics self-concept, although not for social goals, and this effect was significant for performance goals. A different pattern of effect from T1 goals to T2 English self-concept appeared for T2 goals and T3 English self-concept but these effects were close to 0. Instead of being positive, performance and social goals negatively affect T3 English self-concept. T2 goals positively affect T3 mathematics self-concept except for mastery goals, which negatively affect T3 mathematics self-concept.
The total effects of T1 English self-concept on T2 goals were mixed. There was a nonsignificant effect on both social and performance goals but a significant positive effect on mastery goals (.15). The total effect for T1 mastery goals on T2 English self-concept was significantly positive (.24). This pattern of results indicates that there is a pattern of reciprocal effects in which mastery goals and English self-concept are both positive causes and effects of each other (i.e., prior pursuit of mastery goals can cause changes to English self-concept and English self-concept can lead students to adopt mastery goals). This reciprocal effect, however, is only evident between T1 and T2. The same variables at T2 and T3 are nonsignificant and near 0. An unexpected result was the significant negative effects of both T1 English and mathematics achievement on T2 mastery goals (-.22, -.16). The inconsistent and nonsignificant effects between mathematics self-concept and goals indicate no clear cut causal ordering.

As expected, T1 mathematics achievement had a significant positive effect on T2 mathematics self-concept (.26) and this pattern of effect was repeated between T2 mathematics achievement and T3 mathematics self-concept (.15). This pattern of effect also emerged for T1 English achievement and T2 English self-concept; however, this effect was nonsignificant. The effect between T1 English self-concept and T3 English achievement was positive and significant but these variables at T2 and T3 were nonsignificant.

T1 performance goals significantly affect a number of T2 variables. In particular, performance goals have a significant negative effect on mathematics self-concept (-.20) and a substantially negative effect on English achievement (-.51). The effect on mathematics achievement however was significantly positive (.39). T2 performance goals have no significant effect on these variables at T3. However, the relationship changes such that performance goals no longer negatively affect mathematics self-concept. Additionally, the negative effect of T2 performance goals on English achievement (-.51) becomes positive at T3 (.11) while the opposite is the case for T2 performance goals and T3 mathematics achievement (T1 and T2 = .39, T2 and T3 = -.15).
Only two significant crosslagged effects emerged, for social goals. The first is between T1 mastery goals and T2 social goals (-.15). Results show a negative effect between these two variables. The second significant effect occurs between T1 social goals and T3 performance goals (-.14). In particular, T1 social goals have a significant negative effect on T3 performance goals. Other interesting effects emerge between T1 and T3 variables. T1 English achievement has a significant negative effect on T3 mathematics self-concept (-.22) but a significant positive effect on mathematics achievement T3 (.33).

The full-forward model provided a good representation of the data according to the goodness-of-fit indices but the inconsistent and large number of nonsignificant crosslagged effects provided only tentative judgements at best concerning the causal ordering of these variables. Examination of the total effects provided little evidence to support a reciprocal effects model. The full-forward model was useful for exploring how each of the variables related across three waves of data and will be used as a baseline comparison for the competing models of causation.

14.3.2 Competing Models Results

Since few significant effects between goals and domain-specific self-concepts were reported in the full-forward model, disentangling the causal predominance was challenging. Analysing results from the nested models in relation to the two a priori hypotheses presented in Chapter 6 will provide further insight into the possible causal orderings.

Phase 4 tested the two competing models which are nested under the full-forward model. Overall results of these two models and the full-forward model are presented in Table 14.2. In order to compare the full-forward model with the two competing nested models, it is necessary to conduct a chi square difference test. If the chi square difference test reveals a significant difference between the full-forward model and a nested model, then the conclusion drawn is that the full-forward model provides a significantly better fit to the data. It is common for the model with additional parameters (full-forward model) to fit the data better than nested models. This was the case for the full-forward model with the first nested Model (Model 12), which hypothesised the causal flow of goals T1, domain-specific self-concept T2,
and achievement T3. Table 14.6 presents the results of the chi square difference tests. Interestingly, the second nested Model (Model 13) with the causal ordering of domain-specific self-concept T1, goals T2, and achievement T3 provided a nonsignificant difference chi square test and therefore the full-forward model does not necessarily explain the data best. This nested model with domain-specific self-concept T1, goals T2, and achievement T3 was assessed for the relative strength of relationships to make judgements about causality.

Table 14.6

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Most of the patterns of relationships apparent in M11 were replicated in M13. This is because the full-forward model represents all possible paths and M13 is nested under the full-forward model. The patterns of effect for M13 are included in the Appendix since the pattern of effects was almost identical to M11’s. (Appendix M presents a table of the direct, indirect, and total effects for M13 model). Notably, the strength of relationships in M13 is comparable with M11. Given that: (a) the form of effects and strength of these effects are near equivalent between M11 and M13, (b) the chi square difference test reveals that M11 does not explain the data any better than M13, and (c) M13 is more parsimonious than M11, it is proposed that M13 provides the best explanation for the causal ordering of domain-specific self-concept, goals, and academic achievement. Model 13, which specifies domain-specific self-concept as causally predominant over goals and academic achievement, provides the best explanation of the data.
14.4 Discussion

This chapter applied Phases 3 and 4 from Marsh et al.’s (1999) fourth guideline. Pivotal to this study is the examination of the causal ordering of goal orientations, domain-specific self-concepts, and their effect on academic achievement. Examining causal ordering of these variables helps to elucidate the nature of student motivation. Results led to the judgement whereby self-concept is causally predominant over students’ goal orientations and academic achievement. Given that this model facilitates the interpretation of the results pertaining to the present investigation, a discussion of interpreting the results and the implications of this model is presented below.

Disentangling the causal relations between goals and self-concept in the full-forward model proved problematic because of the large number of nonsignificant effects, and because the pattern of these effects were inconsistent across data waves as well as between variables. Furthermore, relatively high levels of stability for each of these factors (discussed in Chapter 12 in relations to the 7V3W model) and the large number of paths to be estimated, resulted in changes in relations between the constructs being insubstantial. There were however, subsequent analyses of two competing nested models which provided further insight and the opportunity to explicate the causal ordering of goals and self-concept and their effect on academic achievement.

All paths in the full-forward model were freely estimated but to obtain the nested models a number of paths were fixed in the full-forward model. An identical number of restrictions were imposed on the two nested models. Distinguishing between M12 and M13 were the differential time waves and latent constructs for which these 12 paths were removed. These imposed restrictions resulted in equivalent increases to the degrees of freedom for M12 and M13. The restrictions also resulted in increases to the chi square values. However, the positioning of the restricted paths differentially affected increases in the chi squares, which influenced subsequent results of the chi square difference test between M11 and the nested models (M12 and M13).
Results from the chi square difference test revealed a significant difference between M11 and M12. This indicates that M12 provides a significantly worse representation of the data than M11, although interesting to note is that this difference was only marginally significant. More interesting was the fact that the same chi square difference test between M11 and M13 provided no significant difference. This indicates that M11 does not explain the data any better than M13 and that it may therefore be considered an equivalent representation of the data. This latter result was surprising, given that nested models typically fit data more poorly than additional parameter models because they place supplementary restrictions on the data. Furthermore, since M13 is more parsimonious than M11 and the model parameters were comparable with M11, it is proposed that M13 could be a better representation of the causal ordering of goal orientations, domain-specific self-concepts, and academic achievement. Thus it is plausible to suggest that domain-specific self-concepts may be causally predominant over goals and academic achievement.

Results emanating from this chapter suggest that how competent an individual perceives themselves to be in a subject domain (English or mathematics) governs their purpose for achievement in subsequent academic situations and that these purposes or goals adopted by individuals affect subsequent academic achievement. Self-perceptions of ability that focus on “Can I do this?” lead to differential preferences for purposes for achievement such that individuals question themselves according to “what are the reasons for achieving in this achievement situation?” The reasons identified lead to goal adoption, which can influence academic achievement. Thus the purpose of engaging in academic related situations depends on an individual’s sense of self, and achievement results depend on goal adoption.

The substantive significance of the causal findings in this study is that both self-perceptions and perceptions of tasks are key variables in achievement-related situations. Both self-concept and goal orientations are fundamental psychological drivers of performance and achievement arising from associated tasks. If future research only considers goals or self-concept constructs when examining achievement-related behaviours and achievement itself, then either key perceptions concerning the task, or key perceptions concerning self will be absent from the
respective analyses, to the extent that if this is the case, then a holistic account of both fundamental constructs in achievement-related tasks will be missing.

Consistent with Skaalvik et al. (1994) who found perceptions of self predicted students’ goal orientations, this study demonstrated that domain-specific self-concepts affect subsequent goal pursuits. Consensus in contemporary motivation research is that poor self-perceptions have dire consequences for motivation such that these detrimental beliefs influence task engagement, effort expenditure, and persistence in the face of difficulty (Skaalvik, 1997a). This study provides further empirical evidence that self-perceptions of ability do indeed affect future purposes for achievement and contends that the relative salience of self-concept and goal orientations affects future academic achievement. In sum, self-perceptions of ability trigger the initiation of goals which affect subsequent achievement.

Results from this study showing self-concept as causally predominant provide significant evidence of the importance of self-perceptions in facilitating goal adoption. Academic self-concept has motivational properties such that changes to either English or mathematics self-concept lead to changes in subsequent goal adoption. It appears that domain-specific self-concepts and goal orientations fuel each other over time to affect subsequent achievement. A number of research studies report the effects of classroom structures on influencing goal pursuits (Ames, 1990). This study maintains that a classroom structure that fosters and builds positive senses of self will result in students adopting approach goals and that these goals will affect subsequent achievement. In sum, this study highlights the fundamental importance of self-perceptions in facilitating student goal adoption, and that this process influences academic achievement.

Consistent with Marsh and Craven’s (2006) prototype procedure for assessing causal ordering, this study found that paths of each T1 variable on the parallel T2 and T3 variable were substantially positive. Only 4 of 21 test-retest paths were nonsignificant (T1 to T2 mathematics achievement and performance goals, T1 to T3 English achievement and mathematics self-concept). Significant positive effects between both T1 English self-concept and T1 mathematics self-concept with T2 mastery goals is further evidence of self-concept causing goal orientations. The
nature of one’s academic self-concept is a crucial determinant of purposes for achieving in academic situations.

Of the studies examining perceptions of self and goal orientations, most have used correlational methods to explore relations. Notwithstanding the significance of this research, studies of this nature generally base their findings on a single wave of data. Hence the findings, although informative and heuristic, provide minimal insight into the underlying mechanisms that determine the positive or negative correlations. To address this void, this research tested structural equation models utilising longitudinal data to extrapolate the causal relations of self-perceptions and goal orientations. Despite the frequency with which these models have been used in previous research, particularly for examining the causal ordering of self-concept and achievement (e.g., Marsh & Craven, 2006; Marsh et al., 2005), the researcher is aware of no study that has employed this approach with goal orientations which include social goals and domain-specific self-concepts, in addition to academic achievement.

Although a sparse number of studies demonstrate that perceptions of self predict students’ goal orientations, fewer studies have been able to predict the direction of this relationship (Skaalvik et al., 1994). M13 provides a significant contribution to the extant literature examining student motivation. It offers a theoretical basis for explaining more fully the complex nature of students’ motivation and achievement. It challenges previous research that exclusively examines self-concept and achievement or exclusively examines goals and achievement by demonstrating that both self-concept and goals relate across time to influence subsequent academic achievement and therefore both constructs should be included in respective analyses of achievement. Furthermore, it has the potential to inform and underpin a deeper understanding of the causal relations between academic self-concept, goal orientations, and academic achievement. Depth and breadth is achieved in this study by including social goals with academic goals and examining domain-specific self-concepts as well as domain-specific achievement. Additionally, this study employs recent methodological advances to longitudinal structural equation modelling that exceed a number of previous causal ordering studies. Consequently, the model with
T1 self-concept, T2 goals, and T3 achievement (M13) offers a basis from which to broaden and inform theory, research, and practice.

14.5 Summary of Chapter

This thesis set out to answer the provocative question concerning the causal ordering of goal orientations and domain-specific self-concepts and their effect on academic achievement. Earlier chapters investigated the integrative model of student motivation and examined relations between students’ goals and domain-specific self-concepts as well as their effect on academic achievement in English and mathematics. Correlations reported in earlier chapters reveal strong links between goals and self-concept but do not reveal which construct causes the other, or whether goals and self-concept are mutually reinforcing. This chapter specifically explored the underlying mechanisms between these motivational constructs utilising longitudinal structural equation modeling. A tentative answer to the provocative causal ordering question based on this research attests that the model with self-concept causally predominant provides the best representation of the data.

The results contribute to a deeper understanding of the nature of student motivation and its effect on academic achievement. Students’ self-perceptions in various subject domains influence goal adoption and these goals affect subsequent academic achievement. The complex nature of motivational goals will be more adequately understood when the impact of self-concept is considered as an antecedent to goal adoption. These findings have important implications for future theory, research, and practice and are addressed in the following chapter.

The intent of the following chapter is to discuss pivotal findings emanating from the present investigation such that the model with self-concept causally predominant can serve to explain complex relations, and offer a theoretical basis for providing insights into the nature of student motivation and its effect on academic achievement.
CHAPTER 15
GENERAL DISCUSSION

15.1 Purpose

The purpose of this chapter is to briefly review key findings stemming from hypotheses posed in Chapter 6. Results for the provocative research question posed in Chapter 6 are also briefly reviewed. These pivotal findings from both the hypotheses and the research question are then discussed and implications for future research and educational practice are examined.

15.2 Review of Findings

To facilitate the review of the key findings, printed below in italics are the seven hypotheses and the central research question from Chapter 6, and a brief orientation to the results of each. Following the review of key findings for each of the hypotheses and the research question is a general discussion which addresses implications for research and educational practice.

_Hypothesis 1a: despite being combined in the one measurement instrument, the General Achievement Goal Orientation Scale (GAGOS) and the Academic Self Description Questionnaire II (ASDQII), will maintain scale independence._

The General Achievement Goal Orientation Scale and Academic Self-Description Questionnaire II instruments were combined to form an integrative measurement instrument. Consistently with Hypothesis 1a, this integrative measurement instrument provided a good fit to the data across all three data waves for the focus and independent samples. Despite combining the two related yet independent instruments, the GAGOS and ASDQII maintained scale independence. Rigorous procedures were employed when testing this measurement model. For instance,
testing involved multiple waves of data and multiple samples. Comparable fit statistics across these analyses provide strong support for the proposed integrative measurement model of student motivation.

**Hypothesis 1b:** students’ multiple approach goals, as operationalised in the GAGOS, are represented by mastery goals, performance approach goals, and social goals thereby demonstrating their multidimensionality and;

**Hypothesis 1c:** academic self-concept can be represented by two distinct subject domains, English and mathematics, thereby demonstrating the multidimensional nature of students’ academic self-concept.

Confirmatory factor analysis revealed robust support for Hypotheses 1b and 1c. CFAs reported in Chapters 9, 10, and 11 identified three distinct goal orientations and two domain-specific academic self-concepts, thereby demonstrating the multidimensionality of both goals and academic self-concept. Distinct domain-specific academic self-concepts in this study comprised English self-concept and mathematics self-concept. Distinct goal orientations in this study comprised mastery goals, performance goals and social goals. These findings expand upon current conceptualisations of goal pursuits, since social goals are included within the goal theory framework. It appears that in addition to the approach forms of mastery and performance goals, social goals also facilitate individuals to organise and direct behaviour in achievement-related situations (Covington, 2000; Urdan & Maehr, 1995).

**Hypothesis 2:** (a) students pursuing performance approach goals will also pursue mastery goals, (b) students pursuing mastery goals will also pursue social goals, and (c) students pursuing performance goals will pursue social goals.

Relations hypothesised in 2a, 2b, and 2c were evident from positive correlations between each of the goals. Rather than focusing on one goal to the exclusion of the other, which would be the case if negative correlations occurred, adolescent students in this study adopted multiple goals. The strongest correlation was between mastery and performance goals and the next strongest was between performance goals and social goals. Since social goals have rarely been included in the goal theory framework, little is known of the effects this goal pursuit has on academic goals.
(Hinkley et al., 2001). The strong relation between performance goals and social goals denotes similar underlying processes.

**Hypothesis 3:** In testing the stability of high school students’ goals and academic self-concept, two hypotheses are considered: (a) students’ goals remain stable across the three waves of data and (b) students’ English self-concept and maths self-concept remain stable across the three waves of data.

Consistent with Hypothesis 3, students’ goals and academic self-concept remained stable across the three waves of data. Only a handful of studies have examined stability of students’ goals and even fewer have investigated the stability of social goals (DeShon & Gallespie, 2005). Notably, domain-specific self-concepts, mastery, and performance goals demonstrated a consistent pattern, whereas social goals varied for the first wave but remained stable for the following two waves. It appears that as children develop and age their motivation becomes more stable.

**Hypothesis 4:** students’ goals are hierarchically structured such that the higher-order factor represents purposes for engagement and the first order represents the three varying purposes for engagement.

Higher-order confirmatory factor analysis in Chapter 13 found support for Hypothesis 4. Specifically, the proposed higher-order factor labelled Purposes for Approach Goals subsumed three distinct goal orientations. Each of these goal orientations espouse different reasons for engaging in academic tasks. A universal disposition among these three positively orientated goals is their ability to direct, select and energise behaviour.

**Hypothesis 5:** correlations between English and mathematics self-concept will be weak and may even be negatively correlated and therefore it is further hypothesised that there will be minimal evidence for a hierarchy of academic self-concept that encapsulates both English self-concept and maths self-concept.

Contrary to Hypothesis 5, higher-order confirmatory factor analysis found support for a hierarchical structure of academic self-concept. Examining correlations between English and mathematics self-concept provides an index of the strength of the hierarchy. In this study, correlations between English and mathematics self-concept were moderate and positive (ranging from .17 to .20), demonstrating a
weaker hierarchy relative to the hierarchy proposed for students’ goals. Although the self-concept domains were distinct, providing evidence of their multidimensionality, their relationship was close enough to form a higher-order construct labelled academic self-concept which represents self-concept in the domains of English and mathematics, but this hierarchy was weak.

*Hypothesis 6:* In testing for invariance of students’ goals and academic self-concept across sex, two hypotheses are considered: (a) that the number of underlying factors is equivalent and (b) that the pattern of factor loadings is equivalent.

Hypothesis 6 was supported for the first-order and higher-order confirmatory factor analysis models. These findings demonstrate that the instrument designed to measure students’ goals and academic self-concept measures the same components of motivation with equal validity for males and females. Males and females respond fundamentally the same to the facets of motivation examined in this study.

*Hypothesis 7:* (a) English self-concept will correlate positively with English achievement and negatively correlate with maths achievement; conversely, (b) Maths self-concept will correlate positively with maths achievement and negatively with English achievement.

Partial support for Hypothesis 7 was evident in the 7V3W model. Paths between English and maths achievement with non-corresponding domains of self-concept were close to zero, with only one path depicting the hypothesised negative pattern (T3 maths self-concept T3 English rank). Interestingly, paths between domains of achievement with corresponding domains of self-concept were positive and statistically significant. These results attest to the domain-specificity of self-concept.

*Research question:* What is the causal ordering of students’ goals, domain-specific self-concepts and academic achievement in English and mathematics?

Three models were hypothesised to explain relations between goals, domain-specific self-concept, and academic achievement. The model providing the best representation of the data was the model specifying self-concept as causally predominant. These results suggest that self-perceptions of ability in a subject domain influence subsequent goal adoption and that these various goals affect subsequent academic achievement.
15.3 Discussion of Key Findings

The intent of this section is to discuss pivotal findings emanating from the present investigation. Specifically, results overviewed in the above section are related and applied to theory and practice. Findings from this research study can serve to explain the complex relations between goal orientations and academic self-concept and offer a theoretical basis for providing insights into the nature of student motivation and its effect on academic achievement.

Students’ goal orientations and domain-specific self-concepts have been meaningfully linked, to provide a more thorough and integrative model of student motivation that attempts to explain student learning and achievement. Pintrich (1994) highlighted the need for studies to move beyond separate analyses of processes involved in learning and develop more comprehensive models that examine relations between cognitive, motivational, and affective components of learning. This research endeavours to fill this void by presenting an integrated model that incorporates motivational components (goal theory) and descriptive components (self-concept) and relates these to cognitive dimensions (academic achievement). Specifically, this model has been used to look at relations between motivational and affective processes and how they relate to influence academic achievement. Significantly, this model is examined across time to address the complex nature of student motivation and its effect on academic achievement.

Exclusive to this integrative model is the inclusion of social goals within the goal theory framework. Despite recent developments of a multiple goal perspective, reviewed in Chapter 2, this demonstrates that an additional goal relates with both mastery and performance goals. Comparable with academic goals, social goals organise and direct cognitions, effect and behaviour. However, unlike academic goals, these goals are directly referenced to individuals or groups associated with a task, in addition to being referenced to the task themselves (Bouffard et al., 1998; Pintrich et al., 1993). Schools are commonly considered to be a social place, particularly for adolescents. However, researchers and teachers need to reconsider the importance of peer relationships in motivating students to engage in academic achievement-related situations.
Mastery goals and social goals were positively related, demonstrating that social goals must have adaptive qualities in common with mastery goals. Perhaps the focus on understanding and improving is a common process for both goals, but mastery oriented individuals use this understanding for the purpose of attaining competence, whereas social oriented individuals use their understanding to assist their peers in completing tasks. Social goals and performance goals related very strongly, providing evidence that perhaps peer relationships and external references are some of the common qualities underlying both goal pursuits. Conceivably, preoccupation with others is a common process for performance and social goals. Anderman and Anderman (1999) contend that social goals focusing on cooperation more readily associate with mastery goals, whereas social goals focusing on external judgements associate best with performance goals. In this study, the latter appears to be the best explanation, because the stronger correlation was between social goals and performance goals.

Inclusion of social goals can enrich our understanding of student motivation and achievement. The longitudinal nature of this study allowed for the stability of these goals to be investigated. Factor correlations indicated that mastery and performance goals remained stable across the three years, although social goals were unstable for the first year and increased in stability for the last two years. Consistently with Mangos and Steele-Johnson (2001), goals become increasingly stable as children age and develop. This certainly appears to be the case for social goals.

This study has demonstrated that social goals are an important goal pursuit for adolescent students. Furthermore, they have common underlying processes with mastery and performance goals. Classroom goal structures that support social goals could provide opportunities for peers to work cooperatively to complete tasks. Students could be encouraged to understand material in order to assist their peers who are less capable, or those experiencing difficulties. Future research should include social goals in the examination of goal theory as for adolescents, they prove to be a particularly salient purpose for engagement in academic tasks.
To date, research supports no conclusive findings on the effects of social goals on important educational outcomes (Dowson, 1999; Dowson & McInerney, 2003). To contribute to our understanding of social goals, this study examined relations between social goals and important educational outcomes comprising academic self-concept and academic achievement in two subject domains. The effects of social goals on self-concept and achievement were interesting. Social goals had minimal influence on English self-concept but had a significant positive influence on mathematics self-concept. Social goals in this study related to individuals concerned with working with others and assisting their peers to complete work. Parallel with previous research on social goals, it appears that students who pursue social goals reference themselves to others (Ryan et al., 1997). A focus on maintaining favourable judgements from others seems to be important to students pursuing social goals in this study. It is feasible to hypothesise that since social oriented individuals externally reference themselves, they continually judge their competence relative to others and that these continual external comparisons may be more salient in mathematics, due to the evaluative and competitive nature of the subject.

Despite the goal correlating positively with academic goals and academic self-concept, social goals related negatively with academic achievement. The negative correlation between social goals and English and mathematics achievement could indicate that socially oriented individuals are preoccupied with working with their peers and that this preoccupation is costly for their own academic achievement. It may also indicate that students who perform well academically are less likely to pursue social goals.

All three goals conceptualised in this study are forms of approach goals. Typically, approach goals lead to positive outcomes, whereas avoidance forms lead to negative outcomes (Elliot et al., 2006). The three approach goals are posited to have differential predictive utility, given that each goal varies in content focus. For instance, research studies show that mastery goals are better predictors of interest because the goal’s content focus is on seeking competence and task mastery, whereas performance goals are better predictors of academic achievement because the goal’s content focus is on performance relative to others and social comparison (Harackiewicz et al., 2000). Only a small amount of research has been conducted on
the predictive qualities of social goals and the content focus for social goals. Subsequently, this study directly sought to address this void.

The instrument used to measure the integrative model of student motivation demonstrated sound construct validity. In particular, the integrative measurement model worked well with the inclusion of social goals. As operationalised in this study, the content focus for social goals concerned working cooperatively, and this cooperation occurred when individuals worked in groups, worked with others, or worked with friends. Emphasis was on helping others achieve academically.

The differential content focus for mastery, performance, and social goals demonstrates their distinctiveness and multidimensionality. As discussed above and as predicted in Hypothesis 2, students in this study pursued multiple goals. For instance, mastery oriented individuals pursued performance goals as well as social goals. Lemos and Goncalves (2004) contend that positing a higher-order factor may assist in accounting for how students coordinate their multiple goals. Perhaps the adaptive nature common to the three goals in this study provides some explanation for how students coordinate multiple goals. Mastery, performance, and social goals represent regulation associated with positive outcomes and are thus approach orientations. It is possible that the underlying processes for these approach orientations are complementary and that this complementary pattern of processes is responsible for facilitating the coordination of multiple goals. All three goals encapsulate purposes for engaging which energise behaviour, but the direction of this energised behaviour varies as a function of the distinct goal content. In this study, the energy or purpose for engagement represents the higher-order factor referred to as purposes for approach goals, whereas the direction or distinct goal content represents the first-order factors.

Positing the hierarchical model of approach goals provides the opportunity to validate the theoretical structure of Goal Theory. The specific component of the theory being validated is the ability to discriminate and lucidly define forms of approach goals. Early research on achievement motivation focused on two motives, the need for achievement (approach) and the fear of failure (avoidance). This approach-avoidance dichotomy has been applied to performance goals, mastery goals
and very recently to social goals (Elliot, 2006; Elliot & Fryer, in press; Elliot et al., 2006; Gable, in press). The proposed hierarchy clearly identified a higher-order factor that represented approach goals and differentiated between the content of the three goals.

The hierarchical structure of goals was integrated with a hierarchical structure of academic self-concept. Initially, the integrative model of student motivation revealed much stronger correlations between English self-concept and mathematics self-concept in the first-order CFA than hypothesised (refer to Hypothesis 5). Positive correlations between English and mathematics self-concept appear contrary to Marsh’s (1989a; 1990a) proposed internal/external (I/E) frames of reference model. This positive correlation provides evidence that not all students perceive themselves to be better at one subject compared with another. For example, a student may perceive themselves as having equal ability in both English and mathematics. In this study, adolescents are just as likely to hold positive maths self-concepts as they are to hold positive English self-concepts. This explanation for positive correlations between maths and English self-concept was offered by Skaalvik and Rankin (1992).

The hierarchical structure of domain-specific self-concepts in this study has not typically been tested, primarily due to the difficulty of encapsulating the distinct self-concepts across vast domains. Although a small number of studies have concurred with this hierarchical structure (see for example El-Hassan, 2004; Yeung et al., 2000), it is important to recognise that students can have equivalently high or low self-concepts in various school subjects. For instance, an English teacher can not assume that a student in their class displaying a high self-concept in their subject necessarily evaluates themselves more poorly in another subject.

Further practical implications of this hierarchical structure concern the forms of intervention utilised to enhance self-concepts. This hierarchical model indicates that programs primarily targeting improvements to self-concept in specific subject domains are likely to be no more effective than those interventions that aim to enhance and improve self-concept utilising more general approaches which would apply to any subject domain. Reducing social comparisons, encouraging positive
self-talk, receiving feedback as corrective rather than as a criticism and setting learning tasks with achievable goals, are just a few general approaches that aim to enhance self-concept, and which could be utilised across subject domains.

Further empirical support for the proposed integrative model of student motivation is evident in that the two higher-order factors “Purposes for approach goals” and “Academic self-concept” were highly correlated, and this pattern was replicated across all three waves ($T1 = .80$, $T2 = .49$, $T3 = .41$). This finding is important because it confirms that approach goals and academic self-concept are inextricably linked. Thus, for example, individuals with high academic self-concepts adopt approach forms of goal orientations.

Correlations between approach goals, academic self-concept, and academic achievement were examined across single waves of data as well as examined simultaneously across three years (7V3W model of student motivation). Correlations across three waves reveal some of the long-term effects of goal adoption, which can be useful to inform learning and teaching practices (Schunk, 2000). Bong (1996) recommends studies to involve longitudinal data to examine the changing relations of student motivation. This study confirms the benefits of pursuing a mastery goal. Strong evidence supports the long-term positive effects of mastery goals on both English and mathematics self-concept, English achievement and to a smaller extent mathematics achievement.

The long-term effects for performance and social goals are not as clear cut. Performance and social goals were reasonably similar in their long-term pattern of effects on self-concept and achievement. Both were more often positively related to mathematics self-concept and negatively related to achievement in both English and mathematics. These findings contribute further to research that supports mastery goals and would lead to the recommendation that they be fostered over the long-term, due to the associated benefits to self-concept and academic achievement. Despite the salience of performance and social goals during adolescence, these goals seem to have both positive and negative long-term effects for students in this study.
Aside from the significant correlations reported above, which are informative and heuristic, a vital question remains unanswered concerning the underlying mechanisms responsible for the results. Consequently, an important contribution this study makes is the application of structural equation models utilising longitudinal data to disentangle the causal relations of goal orientations, domain-specific self-concept, and academic achievement. This study pursues a more challenging question which goes beyond considering the nature of relations between the constructs and attempts to extricate the causal ordering of goals and academic self-concept and whether they influence achievement across time.

Fundamental to exploring the provocative question on causal ordering was application of Marsh et al.’s (1999) guidelines for testing causal ordering models. Also deemed pivotal to this quest was the adoption of Marsh and Craven’s (2006) prototype for assessing causal models. Although application of Marsh and Craven’s (2006) prototype was problematic due to the smaller number of significant cross-paths between the constructs, the model providing the best representation of the data was the model with self-concept causally predominant. This judgement was based on the fact that the full-forward model provided an equivalent explanation of the data such that the chi square test resulted in no significant difference between the full-forward model and the self-concept predominant model, and the pattern and strength of paths between the two models were highly comparable. Finally, since the self-concept predominant model is more parsimonious than the full-forward model, it is deemed to be the best explanation for the causal pattern of relations between goal orientations, domain-specific self-concept, and academic achievement.

Interpretation of this model assumes that prior self-concept significantly affects the learning goals students adopt when engaging in subsequent academic tasks. Furthermore, these adopted goals affect subsequent academic achievement. Whether an individual has a high or low self-concept in English or mathematics will affect the type of goals pursued in subsequent tasks and depending on the goals adopted, subsequent academic achievement will be influenced. For an achievement-related situation in English or mathematics, according to the proposed causal model in this study, students will initially ask themselves how competent they think they are in English or mathematics and subsequently ask themselves what is the purpose for
achieving at the task. The questions “Can I do this and for what reason am I doing this” combine to influence future academic achievement.

The significance of these finding is grounded in the fact that self-perceptions play a vital role in predicting the goals students choose to adopt to engage in academic tasks. Self-perceptions of ability in English and mathematics facilitate future goal adoption. These results support experimental research studies which show the effect of classroom contexts and structures that influence goal pursuit (Ames, 1990). Taken together, the results from correlations across three waves simultaneously (7W3V) and longitudinal structural equation model (self-concept predominant), it appears that it might be best for teachers to enhance students’ self-concepts in both English and mathematics so as to influence their subsequent pursuit of mastery goals, especially since mastery goals positively influence subsequent academic achievement in both English and mathematics.

Substantively, the causal findings in this study contend that both self-perceptions and perceptions of tasks are key variables in achievement-related situations. Self-concept and goal orientations are fundamental psychological drivers of performance attainment. Since domain-specific self-concepts and goal orientations have been proven in this study to be interconnected and to combine to affect achievement, it is important to consider both constructs (self-concept and goals) when examining academic achievement. If one construct is examined to the exclusion of the other, then a holistic account of these two fundamental constructs causally combine to affect achievement will be absent and an insufficient explanation of academic achievement will be provided.

This study highlights the fundamental importance self-perceptions play in facilitating student goal adoption, and that this process influences subsequent academic achievement. Results from this investigation provide important contributions to the study of student motivation. Gaps in the research of student motivation have been directly addressed. These gaps include examining goals and their long-term effects on important educational outcomes. Goals were investigated across a three year time span and were integrated with domain-specific self-concept, which is an important outcome in its own right, and also associated with academic achievement in English
and mathematics. Furthermore, this study extended beyond showing that goals and self-concept are related but demonstrated how they relate in a causal manner to affect subsequent academic achievement.

15.4 Limitations of the Study

The tentative conclusions drawn above based on findings from this research must be viewed in relation to potential limitations of the present study. Notably, this study focused exclusively on approach forms of goals and should consider the implications of not including avoidance forms of goals when forming judgements relating to the multidimensionality and hierarchical structure of goals, as well as judgements on the causal ordering of goals. Additionally, implications arise concerning subject domain-specificity. For the construct of self-concept and for investigating academic achievement, two subject domains, English and mathematics, were examined. Measures used to examine approach goals were global; however, contemporary research suggests motivation varies as a function of the subject domain (Bong, 2001; Marsh et al., 2002) and therefore the results may vary due to the global level at which approach goal orientations were measured.

In order to assess causality, Marsh and Craven (2006) recommend examining the cross-paths between constructs. If these paths are substantial and positive then there is strong evidence of causal flow between the constructs. Only tentative findings of the causal links between goals and domain-specific self-concept were possible, due to the limited number of significant positive cross-paths between the constructs.

A potential weakness of this study is that two key theoretical constructs were examined using self-report measures. Consequently, shared method variance may exist between self-concept dimensions and achievement goals. Academic achievement in this study was measured by school ranks in English and mathematics. School based measures have been shown to relate more strongly with academic self-concept and were argued in the review of the literature to relate more strongly to achievement goals (Marsh, 1987). Instead of using ranks in English and mathematics as indicators of domain-specific achievement, this study could have been further improved if schools were able to provide achievement test scores in addition to achievement...
ranks, with the purpose of constructing multiple indicators to measure domain-specific achievement (Marsh et al., 1999).

Notwithstanding the size and diversity of the sample for this study, the number of paths to be estimated in the model could have increased in significance with an even larger sample size. Future research may consider larger sample sizes when estimating models with substantial number of paths. In this study the benefit of a larger sample size may result in stronger evidence for the causal flow.

15.5 Directions for Future Research

This research study and its results illuminate a number of directions in which future research could embark. In endeavouring to unravel the causal ordering of goal orientations, domain-specific self-concept, and academic achievement, it would be important to determine whether a similar pattern that surfaced from this study applies to other groups of individuals, thus demonstrating the preferred model’s generalisability. Moreover, future research could test whether the causal model for high school students pertains to younger and older students; whether the model applies equally to Western and non-Western, as well as cross cultural settings; whether results could vary as a function of school, to be tested using multilevel structural equation modelling; whether students’ individual characteristics may moderate the model; and whether the model can be generalised across additional subject domains.

Although correlations can be useful and informative, this study advanced to longitudinal structural equation models to examine the underlying mechanisms of the constructs under investigation and how they are causally related. Future research examining the relations between goals, self-concept, and academic achievement should also consider alternative methodologies that avoid oversimplifying results and simultaneously address the context in which these relations occur. Questions concerning the conditions under which self-concepts can be enhanced to facilitate healthy goal adoption, necessitate varied research methodologies such as experimental designs, qualitative research into the constructs, and utilising
sophisticated structural equation modelling such as testing multiple indicator and multiple causes models (MIMIC).

Developmental differences may also be a factor that could further explain causal relations between goal orientations, domain-specific self-concepts, and academic achievement. Given a larger sample size, it would be possible to conduct multicohort-multioccasion analyses. It would also be valuable to use age as a moderating variable, as suggested by Marsh and Craven (2006), to determine the effects of age on the causal flow. Other variables that may influence causal flow should also be tested. Examining the causal flow across multiple subject domains for each of the constructs could be a valuable contribution to explaining causality.

15.6 Implications for Practitioners

The pivotal finding emanating from this study is that students’ academic self-concepts determine the differential purposes students espouse in future academic learning situations and that these goals affect subsequent academic achievement. Practitioners need to be aware of the motivational properties associated with academic self-concept. Although previous research has highlighted self-concept as an important issue in a child’s development which can predict future interest and achievement (Helmke & Van Aken, 1995), few would be aware of the effect that self-concept has on students’ achievement goal adoption. Practitioners should therefore be alerted to the suggestion that instructional practices for enhancing self-concept should also be accompanied by appropriate motivational interventions and emphasis on appropriate classroom goal structures.

Practitioners would be well aware of students engaging in academic tasks for the sake of gaining in competence, or for the sake of demonstrating their ability relative to others. What might not be so obvious, however, is that students also achieve in academic tasks for social purposes. These social purposes may relate to working at academic tasks so as to assist a peer or to work with friends. Goal theory has been consumed almost exclusively with the investigation of mastery and performance goals and has tended to overlook the significance of other important goals students espouse for learning, and how these alternative goals may interact with mastery and
performance goals. This study puts forward a case for social goals, which have emerged as salient goals pursued by adolescent students, related positively to mastery and performance goals.

Although social goals emerged as an important goal adopted by adolescents, the effects of this goal on academic self-concept were positive, but negative for achievement. Consequently, practitioners should be aware that social goals are beneficial for enhancing self-concept but that those students who are socially oriented may have poorer achievement results. Recommendations stemming from this research are that mastery goals, consistently with most research studies, are most beneficial in terms of heightening self-concept and academic achievement (Meece et al., 2006; Skaalvik, 1997b). Consistent with other research studies were the negative effects of both performance goals and social goals on academic achievement, but both goals were more often positively associated with academic self-concept (Dowson, 1999; Skaalvik, 1997b). Thus, findings of performance goals are congruent with studies that report performance goals are not always detrimental (Ames, 1992).

The school and classroom environment are vital factors that can influence both the formation of academic self-concept and goal adoption (Meece, et al., 2006; Plucker & Stocking, 2001). A final recommendation would be for practitioners to consider how their classroom context can address student wellbeing through enhancing students’ academic self-concept and fostering classroom goal structures that encourage the pursuit of mastery goals. Achievement levels of students will be improved if practitioners address self-perceptions of ability and emphasise adaptive goal orientations. Mastery patterns of behaviour are driven by a strong sense of self (Seifert, 2004). Therefore, practitioners need to keep in mind the benefits of self-concept interventions, and programs can be expanded to include their significance for affecting future goal adoption.
15.7 Summary of Chapter

Chapter 15 has highlighted the key findings concerning relations between goals, domain-specific self-concepts, and academic achievement and addressed the likely causal ordering of these variables. It also considered conceptualisations of goals and domain-specific self-concepts as multidimensional and hierarchically structured. Limitations of the study and directions for future research were addressed. Implications of the key findings for theory and practitioners were acknowledged. The following chapter outlines the pivotal findings of this study.
CHAPTER 16
CONCLUSION

The present investigation has endeavoured to provide a more comprehensive and integrative model of student motivation. It proposes that students’ goal orientations and academic self-concept are inextricably linked. It further proposes that these constructs are causally related, and affect academic achievement. In the course of unifying the literature on student motivation, this study yields significant contributions to theory and practice:

- The study provided an integrative measurement model of student motivation which comprised approach goals and domain-specific self-concepts.
- A case for examining social goals within the goal theory framework was presented, since the model of student motivation worked well with the inclusion of social goals. Thus, social goals were proven to be salient goals adopted by adolescent students.
- The study confirms the multidimensionality of achievement goals and academic self-concept.
- The study enriches our understanding of goal structures and coordination of multiple goals by providing strong evidence for a hierarchy of goals by identifying three specific goals (mastery, performance, and social goals) that are argued to be indicants of approach goals.
- Contrary to Marsh’s (1986b) internal/external frames of reference model, the present investigation demonstrated that domain-specific self-concepts could be represented by one higher-order factor (academic self-concept), although this hierarchy was relatively weak compared with the hierarchy for approach goals.
• An important contribution from this study is the demonstration that not all students perceive themselves as lacking ability in one domain at the expense of another.

• Fundamental to this research was the contribution enriching our understanding of the long-term effects of goals and self-concepts, and how these constructs relate to academic achievement.

• The central aim and substantial finding of this research was the unravelling of the causal ordering of goal orientations, academic self-concept, and academic achievement.

The findings from the present investigation hold substantive and methodological implications for researchers investigating relations between goal orientations and academic self-concept but are also relevant to educational practitioners who aim to optimally motivate students in their classes and improve academic achievement.
REFERENCES


APPENDIX A

LISREL SYNTAX FOR THE STRAIGHTFORWARD FIRST-ORDER CONFIRMATORY FACTOR ANALYSIS (CFA) MODEL M1AT1 (28 ITEMS)

Straightforward hypothesised CFA 1st order T1 28 items
DA NI=103 NO= 535
LA
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12 YR
Q12 YR2 Q12 YR3 Q13 Q132 Q133
EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
CM FI=MERanks.cmm
SE
20 21 22 23 24
25 26 27 28 29 30 31 32
33 34 35 36 37
38 39 40 41 42
43 44 45 46 47 /
MO NX=28 NK=5 LX=FU,FI PH=ST TD=DI,FR
PA LX
5 (1 0 0 0 0)
8 (0 1 0 0 0)
5 (0 0 1 0 0)
5 (0 0 0 1 0)
5 (0 0 0 0 1)
LK
MAST1 PERT1 SOCT1 ESCT1 MASCT1
PD
OU TV EF SS MI SE SC RS ND=3
APPENDIX B

LISREL SYNTAX FOR THE STRAIGHTFORWARD FIRST-ORDER CFA MODEL M2AT1 (REFINED MODEL WITH 23 ITEMS)

Straightforward CFA 1st order T1 23 items- refined model
DA NI=103 NO= 535
LA
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
Q12YR2 Q12YR3 Q13 Q132 Q133
EACHT1 MACH1 EACHT2 MACH2 EACHT3 MACH3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
CM FI=MERanks.cmm
SE
20 21 23 24
27 28 30 31 32
33 34 35 36
38 39 40 41 42
43 44 45 46 47 /
MO NX=23 NK=5 LX=FU,FI PH=ST TD=DI,FR
PA LX
4 (1 0 0 0 0)
5 (0 1 0 0 0)
4 (0 0 1 0 0)
5 (0 0 0 1 0)
5 (0 0 0 0 1)
LK
MAST2 PERT2 SOCT2 ESCT2 MASCT2
PD
OU TV EF SS MI SE SC RS ND=3
APPENDIX C

LISREL SYNTAX FOR THE STRAIGHTFORWARD FIRST-ORDER CFA SEX INVARIANT MODEL M5T1

Straightforward CFA T1 sex invariance
Male Factor structure for T1 23items.
DA NI=103 NO=315 NG=2
CM FI=Male23items.cmm
LA/
  ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
  Q12YR2 Q12YR3 Q13 Q132 Q133
  EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
  MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
  PER58T1 PER62T1 PER72T1 PER78T1
  PER83T1 PER90T1 PER95T1 PER98T1
  SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
  ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
  MSCI1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
  MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
  PER58T2 PER62T2 PER72T2 PER78T2
  PER83T2 PER90T2 PER95T2 PER98T2
  SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
  ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
  MSCI1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
  MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
  PER58T3 PER62T3 PER72T3 PER78T3
  PER83T3 PER90T3 PER95T3 PER98T3
  SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
  ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
  MSCI1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
SE/
  MAS27T1 MAS32T1 MAS42T1 MAS50T1
  PER72T1 PER78T1 PER90T1 PER95T1 PER98T1
  SOC35T1 SOC55T1 SOC67T1 SOC101T1
  ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
  MSCI1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1 /
MO NX=23 NK=5 LX=FU,FI PH=FU, FR TD=DIFR
PA LX
  4 (1 0 0 0 0)
  5 (0 1 0 0 0)
  4 (0 0 1 0 0)
  5 (0 0 0 1 0)
  5 (0 0 0 0 1)
ST 1 LX 1 1 LX 5 2 LX 10 3 LX 14 4 LX 19 5
FI  LX 1 1 LX 5 2 LX 10 3 LX 14 4 LX 19 5

319
Female data structure for T1 23 item model.
DA NI=103 NO=220 NG=2
CM FI=Female23items.cmm
LA/
  ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
  Q12YR2 Q12YR3 Q13 Q132 Q133
  EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
  MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
  PER58T1 PER62T1 PER72T1 PER78T1
  PER83T1 PER90T1 PER95T1 PER98T1
  SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
  ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
  MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
  MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
  PER58T2 PER62T2 PER72T2 PER78T2
  PER83T2 PER90T2 PER95T2 PER98T2
  SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
  ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
  MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
  MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
  PER58T3 PER62T3 PER72T3 PER78T3
  PER83T3 PER90T3 PER95T3 PER98T3
  SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
  ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
  MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
SE/
  MAS27T1 MAS32T1 MAS42T1 MAS50T1
  PER72T1 PER78T1 PER90T1 PER95T1 PER98T1
  SOC35T1 SOC55T1 SOC67T1 SOC101T1
  ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
  MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1 /
MO LX=IN PH=IN TD=IN
st .7 all
LK
mast1 pert1 soct1 esct1 masct1 /
pd
OU tv sc AD=OFF
APPENDIX D

LISREL SYNTAX FOR THE COMPLICATED FIRST-ORDER CFA MODEL
M7A (5V3W)

Complicated CFA with 5V3W
DA NI=103 NO=535
LA
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
Q12YR2 Q12YR3 Q13 Q132 Q133
EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
CM FI=MERanks.cmm
SE
20 21 23 24
27 28 30 31 32
33 34 35 36
38 39 40 41 42
43 44 45 46 47
48 49 51 52
55 56 58 59 60
61 62 63 64
66 67 68 69 70
71 72 73 74 75
76 77 79 80
83 84 86 87 88
89 90 91 92
94 95 96 97 98
99 100 101 102 103 /
MO NY=69 NE=15 LY=FU,FI PS=FU,FR TE=FU,FI
PA LY
4 (1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0)
Complicated CFA sex invariance 5V3W model

Male Factor structure for 5V3W model.

DA NI=103 NO=315 NG=2
CM FI=Male23items.cmm

LA/
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
Q12YR2 Q12YR3 Q13 Q132 Q133
EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
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PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
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MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
SE/
MAS27T1 MAS32T1 MAS42T1 MAS50T1
PER72T1 PER78T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS42T2 MAS50T2
PER72T2 PER78T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS42T3 MAS50T3
PER72T3 PER78T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3

MO NX=69 NK=15 LX=FU,FI PH=FU,FR TD=D_I,FR
Female data structure for 5V3W model.
DA NI=103 NO=220 NG=2
CM FI=Female23items.cmm
LA/
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
Q12YR2 Q12YR3 Q13 Q132 Q133
EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
SE/
MAS27T1 MAS32T1 MAS42T1 MAS50T1
PER72T1 PER78T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS42T2 MAS50T2
PER72T2 PER78T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS42T3 MAS50T3
PER72T3 PER78T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
MO LX=IN PH=IN TD=IN
ST .7 all
LK
MAST1 PERT1 SOCT1 ESCT1 MASCT1
MAST2 PERT2 SOCT2 ESCT2 MASCT2
MAST3 PERT3 SOCT3 ESCT3 MASCT3
PD
OU tv sc AD=OFF
APPENDIX F

LISREL SYNTAX FOR THE COMPLICATED FIRST-ORDER CFA MODEL
M8A (7V3W)

Complicated CFA with 7V3W
DA NI=103 NO=535
LA
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
Q12YR2 Q12YR3 Q13 Q132 Q133
EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
CM FI=MERanks.cmm
SE
20 21 23 24
27 28 30 31 32
33 34 35 36
38 39 40 41 42
43 44 45 46 47
14 15
48 49 51 52
55 56 58 59 60
61 62 63 64
66 67 68 69 70
71 72 73 74 75
16 17
76 77 79 80
83 84 86 87 88
89 90 91 92
94 95 96 97 98
99 100 101 102 103
18 19/
MO NY=75 NE=21 LY=FU,FI PS=FU,FR TE=FU,FI
PA LY

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FR TE 55 5 TE 56 6 TE 57 7 TE 58 8 TE 59 9
FR TE 60 10 TE 61 11 TE 62 12 TE 63 13
FR TE 64 14 TE 65 15 TE 66 16 TE 67 17 TE 68 18
FR TE 69 19 TE 70 20 TE 71 21 TE 72 22 TE 73 23
FR TE 26 1 TE 27 2 TE 28 3 TE 29 4
FR TE 30 5 TE 31 6 TE 32 7 TE 33 8 TE 34 9
FR TE 35 10 TE 36 11 TE 37 12 TE 38 13
FR TE 39 14 TE 40 15 TE 41 16 TE 42 17 TE 43 18
FR TE 44 19 TE 45 20 TE 46 21 TE 47 22 TE 48 23
FR TE 51 26 TE 52 27 TE 53 28 TE 54 29
FR TE 55 30 TE 56 31 TE 57 32 TE 58 33 TE 59 34
FR TE 60 35 TE 61 36 TE 62 37 TE 63 38
FR TE 64 39 TE 65 40 TE 66 41 TE 67 42 TE 68 43
FR TE 69 44 TE 70 45 TE 71 46 TE 72 47 TE 73 48
FR TE 1 1 TE 2 2 TE 3 3 TE 4 4 TE 5 5 TE 6 6 TE 7 7
FR TE 8 8 TE 9 9 TE 10 10 TE 11 11 TE 12 12 TE 13 13
FR TE 14 14 TE 15 15 TE 16 16 TE 17 17 TE 18 18 TE 19 19
FR TE 20 20 TE 21 21 TE 22 22 TE 23 23 TE 24 24 TE 25 25
FR TE 26 26 TE 27 27 TE 28 28 TE 29 29 TE 30 30 TE 31 31
FR TE 32 32 TE 33 33 TE 34 34 TE 35 35 TE 36 36 TE 37 37
FR TE 38 38 TE 39 39 TE 40 40 TE 41 41 TE 42 42 TE 43 43
FR TE 44 44 TE 45 45 TE 46 46 TE 47 47 TE 48 48 TE 49 49
FR TE 50 50 TE 51 51 TE 52 52 TE 53 53 TE 54 54 TE 55 55
FR TE 56 56 TE 57 57 TE 58 58 TE 59 59 TE 60 60 TE 61 61
FR TE 62 62 TE 63 63 TE 64 64 TE 65 65 TE 66 66 TE 67 67
FR TE 68 68 TE 69 69 TE 70 70 TE 71 71 TE 72 72 TE 73 73
TE 74 74 TE 75 75

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FI TE 24 24 TE 25 25 TE 49 49 TE 50 50 TE 74 74 TE 75 75
VA 1 TE 24 24 TE 25 25 TE 49 49 TE 50 50 TE 74 74 TE 75 75
FI PS 21 19
VA .1 PS 21 19
LE
MAST1 PERT1 SOCT1 ESCT1 MASCT1 EACHT1 MACHT1
MAST2 PERT2 SOCT2 ESCT2 MASCT2 EACHT2 MACHT2
MAST3 PERT3 SOCT3 ESCT3 MASCT3 EACHT3 MACHT3
PD
OU TV EF SS MI SE SC RS ND=3 AD=500
APPENDIX G

LISREL SYNTAX FOR THE COMPLICATED FIRST-ORDER CFA SEX IN Variant MODEL M8B (SEX INVARIANT 7V3W)

Male Factor structure for 7V3W model.
DA NI=103 NO=315 NG=2
CM FI=Male23items.cmm
LA/
   ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
   Q12YR2 Q12YR3 Q13 Q132 Q133
   EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
   MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
   PER58T1 PER62T1 PER72T1 PER78T1
   PER83T1 PER90T1 PER95T1 PER98T1
   SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
   ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
   MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
   MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
   PER58T2 PER62T2 PER72T2 PER78T2
   PER83T2 PER90T2 PER95T2 PER98T2
   SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
   ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
   MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
   MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
   PER58T3 PER62T3 PER72T3 PER78T3
   PER83T3 PER90T3 PER95T3 PER98T3
   SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
   ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
   MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
SE
   20 21 23 24
   27 28 30 31 32
   33 34 35 36
   38 39 40 41 42
   43 44 45 46 47
   14 15
   48 49 51 52
   55 56 58 59 60
   61 62 63 64
   66 67 68 69 70
   71 72 73 74 75
   16 17
   76 77 79 80
   83 84 86 87 88
   89 90 91 92
   94 95 96 97 98
   99 100 101 102 103
   18 19/
MO NY=75 NE=21 LY=FU,FI PS=FU,FR TE=FU,FI

PA LY
4 (1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0)
5 (0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0)
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FR TE 51 1 TE 52 2 TE 53 3 TE 54 4
FR TE 55 5 TE 56 6 TE 57 7 TE 58 8 TE 59 9
FR TE 60 10 TE 61 11 TE 62 12 TE 63 13
FR TE 64 14 TE 65 15 TE 66 16 TE 67 17 TE 68 18
FR TE 69 19 TE 70 20 TE 71 21 TE 72 22 TE 73 23
FR TE 74 26 TE 75 27 TE 76 28 TE 77 29
FR TE 78 30 TE 79 31 TE 80 32 TE 81 33
FR TE 82 34 TE 83 35 TE 84 36 TE 85 37
FR TE 86 38 TE 87 39 TE 88 40 TE 89 41
FR TE 90 42 TE 91 43 TE 92 44 TE 93 45
FR TE 94 46 TE 95 47 TE 96 48 TE 97 49
FR TE 98 50 TE 99 51 TE 100 52 TE 101 53
FR TE 102 54 TE 103 55 TE 104 56 TE 105 57
FR TE 106 58 TE 107 59 TE 108 60 TE 109 61
FR TE 110 62 TE 111 63 TE 112 64 TE 113 65
FR TE 114 66 TE 115 67 TE 116 68 TE 117 69
FR TE 118 70 TE 119 71 TE 120 72 TE 121 73
FR TE 122 74 TE 123 75
Female data structure for 7V3W model.
DA NI=103 NO=220 NG=2
CM FI=Female23items.cmm
LA/
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR Q12YR2 Q12YR3 Q13 Q132 Q133 EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1 PER58T1 PER62T1 PER72T1 PER78T1 PER83T1 PER90T1 PER95T1 PER98T1 SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1 ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1 MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1 MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2 PER58T2 PER62T2 PER72T2 PER78T2 PER83T2 PER90T2 PER95T2 PER98T2 SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2 ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2 MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2 MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3 PER58T3 PER62T3 PER72T3 PER78T3 PER83T3 PER90T3 PER95T3 PER98T3 SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3 ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3 MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3 SE/
MAS27T1 MAS32T1 MAS42T1 MAS50T1 PER72T1 PER78T1 PER90T1 PER95T1 PER98T1 SOC35T1 SOC55T1 SOC67T1 SOC101T1 ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1 MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1 EACHT1 MACHT1
MAS27T2 MAS32T2 MAS42T2 MAS50T2
PER72T2 PER78T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
EACHT2 MACHT2
MAS27T3 MAS32T3 MAS42T3 MAS50T3
PER72T3 PER78T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
EACHT3 MACHT3
MO LY=IN PS=IN TE=IN
ST .7 all
LE
MAST1 PERT1 SOCT1 ESCT1 MASCT1 EACHT1 MACHT1
MAST2 PERT2 SOCT2 ESCT2 MASCT2 EACHT2 MACHT2
MAST3 PERT3 SOCT3 ESCT3 MASCT3 EACHT3 MACHT3
PD
OU tv sc AD=50
APPENDIX H

LISREL SYNTAX FOR THE HIGHER-ORDER CFA MODEL M9AT1

2nd order CFA T1
DA NI=103 NO=535
LA
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
Q12YR2 Q12YR3 Q13 Q132 Q133
EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
CM FI=MERanks.cmm
SE
20 21 23 24
27 28 30 31 32
33 34 35 36
38 39 40 41 42
43 44 45 46 47 /
MO NY=23 NE=5 NK=2 LY=FU,FI BE=FU,FI GA=FU,FI PH=ST E=DI,FR
PA LY
4 (1 0 0 0 0)
5 (0 1 0 0 0)
4 (0 0 1 0 0)
5 (0 0 0 1 0)
5 (0 0 0 0 1)
LE
MAST1 PERT1 SOCT1 ESCT1 MASCT1
LK
GOALS SELF
FR LY (1 1) LY (5 2) LY (10 3) LY (14 4) LY (19 5)
FR GA (1 1) GA (2 1) GA (3 1) GA (4 2) GA (5 2)
VA 1.0 LY (1 1) LY (5 2) LY (10 3) LY (14 4) LY (19 5)
P1
OU TV EF SS MI SE SC RS ND=3
APPENDIX I

LISREL SYNTAX FOR THE HIGHER-ORDER CFA SEX INvariance MODEL M9CT1

Male Factor structure for T1 2nd order CFA
DA NI=103 NO=315 NG=2
CM FI=Male23items.cmm
LA/
   ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
   Q12YR2 Q12YR3 Q13 Q132 Q133
   EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
   MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
   PER58T1 PER62T1 PER72T1 PER78T1
   PER83T1 PER90T1 PER95T1 PER98T1
   SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
   ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
   MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
   MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
   PER58T2 PER62T2 PER72T2 PER78T2
   PER83T2 PER90T2 PER95T2 PER98T2
   SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
   ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
   MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
   MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
   PER58T3 PER62T3 PER72T3 PER78T3
   PER83T3 PER90T3 PER95T3 PER98T3
   SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
   ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
   MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
   SE/
   MAS27T1 MAS32T1 MAS42T1 MAS50T1
   PER72T1 PER78T1 PER90T1 PER95T1 PER98T1
   SOC35T1 SOC55T1 SOC67T1 SOC101T1
   ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
   MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1 /
MO NY=23 NE=5 NK=2 LY=FU,FI BE=FU,FI GA=FU,FI TE=DI,FR
PA LY
   4 (1 0 0 0 0)
   5 (0 1 0 0 0)
   4 (0 0 1 0 0)
   5 (0 0 0 1 0)
   5 (0 0 0 0 1)
FI LY (1 1) LY (5 2) LY (10 3) LY (14 4) LY (19 5)
VA 1 LY (1 1) LY (5 2) LY (10 3) LY (14 4) LY (19 5)
FR GA (1 1) GA (2 1) GA (3 1) GA (4 2) GA (5 2)
Female factor structure for T1 2\textsuperscript{nd} order CFA.

DA NI=103 NO=220 NG=2
CM FI=Female23items.cmm
LA/
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR Q12YR2 Q12YR3 Q13 Q132 Q133
EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
SE/
MAS27T1 MAS32T1 MAS42T1 MAS50T1
PER72T1 PER78T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MO LY=IN PH=IN TE=IN GA=IN
LE
MAST1 PERT1 SOCT1 ESCT1 MASCT1 /
LK
GOALS SELF
PD
OU tv sc AD=OFF
APPENDIX J

LISREL SYNTAX FOR THE FULL-FORWARD MODEL M11

Reciprocal effects model (M11)
DA NI=103 NO=535
LA
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
Q12YR2 Q12YR3 Q13 Q132 Q133
EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
CM FI=MERanks.cmm
SE
20 21 23 24
27 28 30 31 32
33 34 35 36
38 39 40 41 42
43 44 45 46 47
14 15
48 49 51 52
55 56 58 59 60
61 62 63 64
66 67 68 69 70
71 72 73 74 75
16 17
76 77 79 80
83 84 86 87 88
89 90 91 92
94 95 96 97 98
99 100 101 102 103
18 19 /
MO NY=75 NE=21 LY=FU,FI BE=FU,FI PS=SY,FI TE=FU,FI
VA 1 TE 24 24 TE 25 25 TE 49 49 TE 50 50 TE 74 74 TE 75 75 LE
MAST1 PERT1 SOCT1 ESCT1 MASCT1 EACHT1 MACHT1
MAST2 PERT2 SOCT2 ESCT2 MASCT2 EACHT2 MACHT2
MAST3 PERT3 SOCT3 ESCT3 MASCT3 EACHT3 MACHT3
PD
OU TV EF SS MI SE SC RS ND=3 AD=500
APPENDIX K

LISREL SYNTAX FOR THE COMPETING MODELS M12 AND M13

ALTERNATIVE MODEL 1
GOALS T1, SELF-CONCEPT T2, AND ACHIEVEMENT T3 (M12)

Competing model with goals causally predominant
DA NI=103 NO=535
LA
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
Q12YR2 Q12YR3 Q13 Q132 Q133
EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
CM FI=MERanks.cmm
SE
20 21 23 24
27 28 30 31 32
33 34 35 36
38 39 40 41 42
43 44 45 46 47
14 15
48 49 51 52
55 56 58 59 60
61 62 63 64
66 67 68 69 70
71 72 73 74 75
16 17
76 77 79 80
83 84 86 87 88
89 90 91 92
VA 1 TE 24 24 TE 25 25 TE 49 49 TE 50 50 TE 74 74 TE 75 75
ST 1 LY 1 1 LY 5 2 LY 10 3 LY 14 4 LY 19 5 LY 24 6
ST 1 LY 25 7 LY 26 8 LY 30 9 LY 35 10 LY 39 11 LY 44 12
ST 1 LY 49 13 LY 50 14 LY 51 15 LY 55 16 LY 60 17
ST 1 LY 64 18 LY 69 19 LY 74 20 LY 75 21
LE
MAST1 PERT1 SOCT1 ESCT1 MASCT1 EACHT1 MACHT1
MAST2 PERT2 SOCT2 ESCT2 MASCT2 EACHT2 MACHT2
MAST3 PERT3 SOCT3 ESCT3 MASCT3 EACHT3 MACHT3
PD
OU TV EF SS MI SE SC RS ND=3 AD=500
ALTERNATIVE MODEL 2

SELF-CONCEPT T1, GOALS T2, AND ACHIEVEMENT T3 (M13)

Competing model with self causally predominant
DA NI=103 NO=535

LA
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
Q12YR2 Q12YR3 Q13 Q132 Q133
EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
CM FI=MERanks.cmm
SE
20 21 23 24
27 28 30 31 32
33 34 35 36
38 39 40 41 42
43 44 45 46 47
14 15
48 49 51 52
55 56 58 59 60
61 62 63 64
66 67 68 69 70
71 72 73 74 75
16 17
76 77 79 80
83 84 86 87 88
89 90 91 92
94 95 96 97 98
99 100 101 102 103
18 19 /
MO NY=75 NE=21 LY=FU,FI BE=FU,FI PS=SY,FI TE=FU,FI
VA 1 TE 24 24 TE 25 25 TE 49 49 TE 50 50 TE 74 74 TE 75 75
ST 1 LY 1 1 LY 5 2 LY 10 3 LY 14 4 LY 19 5 LY 24 6
ST 1 LY 25 7 LY 26 8 LY 30 9 LY 35 10 LY 39 11 LY 44 12
ST 1 LY 49 13 LY 50 14 LY 51 15 LY 55 16 LY 60 17
ST 1 LY 64 18 LY 69 19 LY 74 20 LY 75 21
LE
MAST1 PERT1 SOCT1 ESCT1 MASCT1 EACHT1 MACHT1
MAST2 PERT2 SOCT2 ESCT2 MASCT2 EACHT2 MACHT2
MAST3 PERT3 SOCT3 ESCT3 MASCT3 EACHT3 MACHT3
PD
OU TV EF SS MI SE SC RS ND=3 AD=500
<table>
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<tr>
<th></th>
<th>TIME 2</th>
<th>TIME 3</th>
<th>TIME 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>D</strong></td>
<td><strong>0.24</strong></td>
<td><strong>0.06</strong></td>
<td><strong>0.12</strong></td>
</tr>
<tr>
<td><strong>TE</strong></td>
<td><strong>0.32</strong></td>
<td><strong>0.18</strong></td>
<td><strong>0.35</strong></td>
</tr>
<tr>
<td><strong>ESC</strong></td>
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<td><strong>0.06</strong></td>
<td><strong>0.06</strong></td>
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<tr>
<td><strong>D</strong></td>
<td><strong>0.56</strong></td>
<td><strong>0.54</strong></td>
<td><strong>0.52</strong></td>
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<tr>
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<td><strong>0.06</strong></td>
<td><strong>0.06</strong></td>
</tr>
<tr>
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<td><strong>0.06</strong></td>
<td><strong>0.06</strong></td>
</tr>
<tr>
<td><strong>D</strong></td>
<td><strong>0.13</strong></td>
<td><strong>0.10</strong></td>
<td><strong>0.09</strong></td>
</tr>
<tr>
<td><strong>TE</strong></td>
<td><strong>0.07</strong></td>
<td><strong>0.06</strong></td>
<td><strong>0.06</strong></td>
</tr>
<tr>
<td><strong>SOC</strong></td>
<td><strong>0.08</strong></td>
<td><strong>0.06</strong></td>
<td><strong>0.06</strong></td>
</tr>
<tr>
<td><strong>D</strong></td>
<td><strong>0.06</strong></td>
<td><strong>0.05</strong></td>
<td><strong>0.05</strong></td>
</tr>
<tr>
<td><strong>TE</strong></td>
<td><strong>0.03</strong></td>
<td><strong>0.03</strong></td>
<td><strong>0.03</strong></td>
</tr>
<tr>
<td><strong>PER</strong></td>
<td><strong>0.15</strong></td>
<td><strong>0.14</strong></td>
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</tr>
<tr>
<td><strong>D</strong></td>
<td><strong>0.07</strong></td>
<td><strong>0.06</strong></td>
<td><strong>0.06</strong></td>
</tr>
<tr>
<td><strong>TE</strong></td>
<td><strong>0.05</strong></td>
<td><strong>0.04</strong></td>
<td><strong>0.04</strong></td>
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<tr>
<td><strong>MACH</strong></td>
<td><strong>0.12</strong></td>
<td><strong>0.10</strong></td>
<td><strong>0.10</strong></td>
</tr>
<tr>
<td><strong>D</strong></td>
<td><strong>0.08</strong></td>
<td><strong>0.06</strong></td>
<td><strong>0.06</strong></td>
</tr>
<tr>
<td><strong>TE</strong></td>
<td><strong>0.04</strong></td>
<td><strong>0.04</strong></td>
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</table>

**Notes:**
- **TIME 2** includes data from 0.00 to 0.20.
- **TIME 3** includes data from 0.20 to 0.40.
- **TIME 4** includes data from 0.40 to 0.60.
## APPENDIX M

**DIRECT, INDIRECT, AND TOTAL EFFECTS TABLE FOR ACADEMIC SELF-CONCEPT CAUSALLY PREDOMINANT MODEL**

<table>
<thead>
<tr>
<th></th>
<th>ESC TIME 1</th>
<th>MSC TIME 1</th>
<th>ESC TIME 2</th>
<th>MSC TIME 2</th>
<th>MAS TIME 2</th>
<th>PER TIME 2</th>
<th>SOC TIME 2</th>
<th>EACH TIME 2</th>
<th>MACH TIME 2</th>
</tr>
</thead>
</table>
REFERENCES


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APPENDICES
APPENDIX A

LISREL SYNTAX FOR THE STRAIGHTFORWARD FIRST-ORDER CONFIRMATORY FACTOR ANALYSIS (CFA) MODEL M1AT1 (28 ITEMS)

Straightforward hypothesised CFA 1st order T1 28 items
DA NI=103 NO= 535
LA
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
Q12YR2 Q12YR3 Q13 Q132 Q133
EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
CM FI=MERanks.cmm
SE
20 21 22 23 24
25 26 27 28 29 30 31 32
33 34 35 36 37
38 39 40 41 42
43 44 45 46 47 /
MO NX=28 NK=5 LX=FU,FI PH=ST TD=DI,FR
PA LX
5 (1 0 0 0 0)
8 (0 1 0 0 0)
5 (0 0 1 0 0)
5 (0 0 0 1 0)
5 (0 0 0 0 1)
LK
MAST1 PERT1 SOCT1 ESCT1 MASCT1
PD
OU TV EF SS MI SE SC RS ND=3
APPENDIX B

LISREL SYNTAX FOR THE STRAIGHTFORWARD FIRST-ORDER CFA MODEL M2AT1 (REFINED MODEL WITH 23 ITEMS)

Straightforward CFA 1st order T1 23 items- refined model
DA NI=103 NO= 535
LA
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
Q12YR2 Q12YR3 Q13 Q132 Q133
EACHT1 MACH1 EACHT2 MACH2 EACHT3 MACH3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
CM FI=MERanks.cmm
SE
20 21 23 24
27 28 30 31 32
33 34 35 36
38 39 40 41 42
43 44 45 46 47 /
MO NX=23 NK=5 LX=FU,FI PH=ST TD=DI,FR
PA LX
4 (1 0 0 0 0)
5 (0 1 0 0 0)
4 (0 0 1 0 0)
5 (0 0 0 1 0)
5 (0 0 0 0 1)
LK
MAST2 PERT2 SOCT2 ESCT2 MASCT2
PD
OU TV EF SS MI SE SC RS ND=3

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APPENDIX C

LISREL SYNTAX FOR THE STRAIGHTFORWARD FIRST-ORDER CFA
SEX INVARIANT MODEL M5T1

Straightforward CFA T1 sex invariance
Male Factor structure for T1 23items.
DA NI=103 NO=315 NG=2
CM FI=Male23items.cmm
LA/
   ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
   Q12YR2 Q12YR3 Q13 Q132 Q133
   EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
   MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
   PER58T1 PER62T1 PER72T1 PER78T1
   PER83T1 PER90T1 PER95T1 PER98T1
   SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
   ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
   MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
   MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
   PER58T2 PER62T2 PER72T2 PER78T2
   PER83T2 PER90T2 PER95T2 PER98T2
   SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
   ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
   MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
   MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
   PER58T3 PER62T3 PER72T3 PER78T3
   PER83T3 PER90T3 PER95T3 PER98T3
   SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
   ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
   MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
SE/
   MAS27T1 MAS32T1 MAS42T1 MAS50T1
   PER72T1 PER78T1 PER90T1 PER95T1 PER98T1
   SOC35T1 SOC55T1 SOC67T1 SOC101T1
   ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
   MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1 /
MO NX=23 NK=5 LX=FU,FI PH=FU, FR TD=DI,FR
PA LX
4 (1 0 0 0 0)
5 (0 1 0 0 0)
4 (0 0 1 0 0)
5 (0 0 0 1 0)
5 (0 0 0 0 1)
ST 1 LX 1 1 LX 5 2 LX 10 3 LX 14 4 LX 19 5
FI LX 1 1 LX 5 2 LX 10 3 LX 14 4 LX 19 5

319
Female data structure for T1 23 item model.
DA NI=103 NO=220 NG=2
CM FI=Female23items.cmm
LA/
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
Q12YR2 Q12YR3 Q13 Q132 Q133
EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
SE/
MAS27T1 MAS32T1 MAS42T1 MAS50T1
PER72T1 PER78T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1 /
MO LX=IN PH=IN TD=IN
st .7 all
LK
MAST1 PERT1 SOCT1 ESCT1 MASCT1 /
PD
OU tv sc AD=OFF
APPENDIX D

LISREL SYNTAX FOR THE COMPLICATED FIRST-ORDER CFA MODEL

M7A (5V3W)

Complicated CFA with 5V3W
DA NI=103 NO=535
LA
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
Q12YR2 Q12YR3 Q13 Q132 Q133
EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
CM FI=MERanks.cmm
SE
20 21 23 24
27 28 30 31 32
33 34 35 36
38 39 40 41 42
43 44 45 46 47
48 49 51 52
55 56 58 59 60
61 62 63 64
66 67 68 69 70
71 72 73 74 75
76 77 79 80
83 84 86 87 88
89 90 91 92
94 95 96 97 98
99 100 101 102 103 /
MO NY=69 NE=15 LY=FU,FI PS=FU,FR TE=FU,FI
PA LY
4 (1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0)
APPENDIX E

LISREL SYNTAX FOR THE COMPLICATED FIRST-ORDER CFA SEX INVARIANT MODEL M7B (SEX INVARIANT 5V3W)

Complicated CFA sex invariance 5V3W model
Male Factor structure for 5V3W model.
DA NI=103 NO=315 NG=2
CM FI=Male23items.cmm
LA/
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
Q12YR2 Q12YR3 Q13 Q132 Q133
EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
SE/
MAS27T1 MAS32T1 MAS42T1 MAS50T1
PER72T1 PER78T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS42T2 MAS50T2
PER72T2 PER78T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS42T3 MAS50T3
PER72T3 PER78T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
/}
MO NX=69 NK=15 LX=FU,FI PH=FU,FR TD=DI,FR

323
Female data structure for 5V3W model.
DA NI=103 NO=220 NG=2
CM FI=Female23items.cmm
LA/
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
Q12YR2 Q12YR3 Q13 Q132 Q133
EACH1 T1 MACH1 EACH2 T2 MACH2 EACH3 T3 MACH3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
SE/
MAS27T1 MAS32T1 MAS42T1 MAS50T1
PER72T1 PER78T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS42T2 MAS50T2
PER72T2 PER78T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS42T3 MAS50T3
PER72T3 PER78T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3 / 
MO LX=IN PH=IN TD=IN
ST .7 all
LK
MAST1 PERT1 SOCT1 ESC1T1 MASCT1
MAST2 PERT2 SOCT2 ESC2T2 MASCT2
MAST3 PERT3 SOCT3 ESC3T3 MASCT3 / 
PD
OU tv sc AD=OFF
APPENDIX F

LISREL SYNTAX FOR THE COMPLICATED FIRST-ORDER CFA MODEL
M8A (7V3W)

Complicated CFA with 7V3W
DA NI=103 NO=535
LA
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
Q12YR2 Q12YR3 Q13 Q132 Q133
EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
CM FI=MERanks.cmm
SE
20 21 23 24
27 28 30 31 32
33 34 35 36
38 39 40 41 42
43 44 45 46 47
14 15
48 49 51 52
55 56 58 59 60
61 62 63 64
66 67 68 69 70
71 72 73 74 75
16 17
76 77 79 80
83 84 86 87 88
89 90 91 92
94 95 96 97 98
99 100 101 102 103
18 19/
FI TE 24 24 TE 25 25 TE 49 49 TE 50 50 TE 74 74 TE 75 75
VA 1 TE 24 24 TE 25 25 TE 49 49 TE 50 50 TE 74 74 TE 75 75
FI PS 21 19
VA .1 PS 21 19
LE
MAST1 PERT1 SOCT1 ESCT1 MASCT1 EACHT1 MACT1
MAST2 PERT2 SOCT2 ESCT2 MASCT2 EACHT2 MACT2
MAST3 PERT3 SOCT3 ESCT3 MASCT3 EACHT3 MACT3
PD
OU TV EF SS MI SE SC RS ND=3 AD=500
APPENDIX G

LISREL SYNTAX FOR THE COMPLICATED FIRST-ORDER CFA SEX INVARIANT MODEL M8B (SEX INVARIANT 7V3W)

Male Factor structure for 7V3W model.
DA NI=103 NO=315 NG=2
CM FI=Male23items.cmm
LA/
  ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
  Q12YR2 Q12YR3 Q13 Q132 Q133
  EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
  MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
  PER58T1 PER62T1 PER72T1 PER78T1
  PER83T1 PER90T1 PER95T1 PER98T1
  SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
  ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
  MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
  MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
  PER58T2 PER62T2 PER72T2 PER78T2
  PER83T2 PER90T2 PER95T2 PER98T2
  SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
  ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
  MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
  MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
  PER58T3 PER62T3 PER72T3 PER78T3
  PER83T3 PER90T3 PER95T3 PER98T3
  SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
  ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
  MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
SE
  20 21 23 24
  27 28 30 31 32
  33 34 35 36
  38 39 40 41 42
  43 44 45 46 47
  14 15
  48 49 51 52
  55 56 58 59 60
  61 62 63 64
  66 67 68 69 70
  71 72 73 74 75
  16 17
  76 77 79 80
  83 84 86 87 88
  89 90 91 92
  94 95 96 97 98
  99 100 101 102 103
18 19/
MO NY=75 NE=21 LY=FU,FI PS=FU,FR TE=FU,FI
PA LY
4 (1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0)
5 (0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0)
4 (0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0)
5 (0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0)
5 (0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0)
1 (0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0)
1 (0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0)
4 (0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0)
5 (0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0)
4 (0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0)
5 (0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0)
5 (0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0)
1 (0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0)
1 (0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0)
4 (0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0)
5 (0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0)
4 (0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0)
5 (0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0)
5 (0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0)
1 (0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1)
1 (0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0)
FR TE 51 1 TE 52 2 TE 53 3 TE 54 4
FR TE 55 5 TE 56 6 TE 57 7 TE 58 8 TE 59 9
FR TE 60 10 TE 61 11 TE 62 12 TE 63 13
FR TE 64 14 TE 65 15 TE 66 16 TE 67 17 TE 68 18
FR TE 69 19 TE 70 20 TE 71 21 TE 72 22 TE 73 23
FR TE 26 1 TE 27 2 TE 28 3 TE 29 4
FR TE 30 5 TE 31 6 TE 32 7 TE 33 8 TE 34 9
FR TE 35 10 TE 36 11 TE 37 12 TE 38 13
FR TE 39 14 TE 40 15 TE 41 16 TE 42 17 TE 43 18
FR TE 44 19 TE 45 20 TE 46 21 TE 47 22 TE 48 23
FR TE 51 26 TE 52 27 TE 53 28 TE 54 29
FR TE 55 30 TE 56 31 TE 57 32 TE 58 33 TE 59 34
FR TE 60 35 TE 61 36 TE 62 37 TE 63 38
FR TE 64 39 TE 65 40 TE 66 41 TE 67 42 TE 68 43
FR TE 69 44 TE 70 45 TE 71 46 TE 72 47 TE 73 48
FR TE 1 1 TE 2 2 TE 3 3 TE 4 4 TE 5 5 TE 6 6 TE 7 7
FR TE 8 8 TE 9 9 TE 10 10 TE 11 11 TE 12 12 TE 13 13
FR TE 14 14 TE 15 15 TE 16 16 TE 17 17 TE 18 18 TE 19 19
FR TE 20 20 TE 21 21 TE 22 22 TE 23 23 TE 24 24 TE 25 25
FR TE 26 26 TE 27 27 TE 28 28 TE 29 29 TE 30 30 TE 31 31
FR TE 32 32 TE 33 33 TE 34 34 TE 35 35 TE 36 36 TE 37 37
FR TE 38 38 TE 39 39 TE 40 40 TE 41 41 TE 42 42 TE 43 43
FR TE 44 44 TE 45 45 TE 46 46 TE 47 47 TE 48 48 TE 49 49
FR TE 50 50 TE 51 51 TE 52 52 TE 53 53 TE 54 54 TE 55 55
FR TE 56 56 TE 57 57 TE 58 58 TE 59 59 TE 60 60 TE 61 61
FR TE 62 62 TE 63 63 TE 64 64 TE 65 65 TE 66 66 TE 67 67
FR TE 68 68 TE 69 69 TE 70 70 TE 71 71 TE 72 72 TE 73 73
FR TE 74 74 TE 75 75

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Female data structure for 7V3W model.
DA NI=103 NO=220 NG=2
CM FI=Female23items.cmm
LA/
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR Q12YR2 Q12YR3 Q13 Q132 Q133
EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
SE/
MAS27T1 MAS32T1 MAS42T1 MAS50T1
PER72T1 PER78T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
EACHT1 MACHT1
MAS27T2 MAS32T2 MAS42T2 MAS50T2
PER72T2 PER78T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
EACHT2 MACHT2
MAS27T3 MAS32T3 MAS42T3 MAS50T3
PER72T3 PER78T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
EACHT3 MACHT3
/ 
MO LY=IN PS=IN TE=IN
ST .7 all
LE
MAST1 PERT1 SOCT1 ESCT1 MASCT1 EACHT1 MACHT1
MAST2 PERT2 SOCT2 ESCT2 MASCT2 EACHT2 MACHT2
MAST3 PERT3 SOCT3 ESCT3 MASCT3 EACHT3 MACHT3/ 
PD
OU tv sc AD=50
APPENDIX H

LISREL SYNTAX FOR THE HIGHER-ORDER CFA MODEL M9AT1

2nd order CFA T1
DA NI=103 NO= 535
LA
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
Q12YR2 Q12YR3 Q13 Q132 Q133
EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
CM FI=MERanks.cmm
SE
20 21 23 24
27 28 30 31 32
33 34 35 36
38 39 40 41 42
43 44 45 46 47 /
MO NY=23 NE=5 NK=2 LY=FU,FI BE=FU,FI GA=FU,FI PH=ST E=DI,FR
PA LY
4 (1 0 0 0 0)
5 (0 1 0 0 0)
4 (0 0 1 0 0)
5 (0 0 0 1 0)
5 (0 0 0 0 1)
LE
MAST1 PERT1 SOCT1 ESCT1 MASCT1
LK
GOALS SELF
FR LY (1 1) LY (5 2) LY (10 3) LY (14 4) LY (19 5)
FR GA (1 1) GA (2 1) GA (3 1) GA (4 2) GA (5 2)
VA 1.0 LY (1 1) LY (5 2) LY (10 3) LY (14 4) LY (19 5)
PD
OU TV EF SS MI SE SC RS ND=3

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APPENDIX I

LISREL SYNTAX FOR THE HIGHER-ORDER CFA SEX INVARIANCE MODEL M9CT1

Male Factor structure for T1 2nd order CFA
DA NI=103 NO=315 NG=2
CM FI=Male23items.cmm
LA/
   ID1  Q3  QQ32  QQ33  Q11  Q112  Q113  Q12YR
   Q12YR2  Q12YR3  Q13  Q132  Q133
   EACT1  MACHT1  EACT2  MACHT2  EACT3  MACHT3
   MAS27T1  MAS32T1  MAS37T1  MAS42T1  MAS50T1
   PER58T1  PER62T1  PER72T1  PER78T1
   PER83T1  PER90T1  PER95T1  PER98T1
   SOC35T1  SOC55T1  SOC67T1  SOC101T1  SOC108T1
   ESC1T1  ESC2T1  ESC3T1  ESC4T1  ESC5T1
   MSC1T1  MSC2T1  MSC3T1  MSC4T1  MSC5T1
   MAS27T2  MAS32T2  MAS37T2  MAS42T2  MAS50T2
   PER58T2  PER62T2  PER72T2  PER78T2
   PER83T2  PER90T2  PER95T2  PER98T2
   SOC35T2  SOC55T2  SOC67T2  SOC101T2  SOC108T2
   ESC1T2  ESC2T2  ESC3T2  ESC4T2  ESC5T2
   MSC1T2  MSC2T2  MSC3T2  MSC4T2  MSC5T2
   MAS27T3  MAS32T3  MAS37T3  MAS42T3  MAS50T3
   PER58T3  PER62T3  PER72T3  PER78T3
   PER83T3  PER90T3  PER95T3  PER98T3
   SOC35T3  SOC55T3  SOC67T3  SOC101T3  SOC108T3
   ESC1T3  ESC2T3  ESC3T3  ESC4T3  ESC5T3
   MSC1T3  MSC2T3  MSC3T3  MSC4T3  MSC5T3
SE/
   MAS27T1  MAS32T1  MAS42T1  MAS50T1
   PER72T1  PER78T1  PER90T1  PER95T1  PER98T1
   SOC35T1  SOC55T1  SOC67T1  SOC101T1
   ESC1T1  ESC2T1  ESC3T1  ESC4T1  ESC5T1
   MSC1T1  MSC2T1  MSC3T1  MSC4T1  MSC5T1 /
MO NY=23 NE=5 NK=2 LY=FU,FI BE=FU,FI GA=FU,FI TE=DI,FR
PA LY
4 (1 0 0 0 0)
5 (0 1 0 0 0)
4 (0 0 1 0 0)
5 (0 0 0 1 0)
5 (0 0 0 0 1)
FI LY (1 1) LY (5 2) LY (10 3) LY (14 4) LY (19 5)
VA 1 LY (1 1) LY (5 2) LY (10 3) LY (14 4) LY (19 5)
FR GA (1 1) GA (2 1) GA (3 1) GA (4 2) GA (5 2)
Female factor structure for T1 2nd order CFA.
DA NI=103 NO=220 NG=2
CM FI=Female23items.cmm
LA/
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR Q12YR2 Q12YR3 Q13 Q132 Q133 EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3 MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1 PER58T1 PER62T1 PER72T1 PER78T1 PER83T1 PER90T1 PER95T1 PER98T1 SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1 ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1 MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1 MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2 PER58T2 PER62T2 PER72T2 PER78T2 PER83T2 PER90T2 PER95T2 PER98T2 SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2 ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2 MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2 MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3 PER58T3 PER62T3 PER72T3 PER78T3 PER83T3 PER90T3 PER95T3 PER98T3 SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3 ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3 MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3 SE/
MAS27T1 MAS32T1 MAS42T1 MAS50T1 PER72T1 PER78T1 PER90T1 PER95T1 PER98T1 SOC35T1 SOC55T1 SOC67T1 SOC101T1 ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1 MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1 / MO LY=IN PH=IN TE=IN GA=IN LE MAST1 PERT1 SOCT1 ESCT1 MASCT1 / LK GOALS SELF PD OU tv sc AD=OFF
APPENDIX J

LISREL SYNTAX FOR THE FULL-FORWARD MODEL M11

Reciprocal effects model (M11)
DA NI=103 NO=535
LA
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
Q12YR2 Q12YR3 Q13 Q132 Q133
EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC5T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC5T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC5T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
CM FI=MERanks.cmm
SE
20 21 23 24
27 28 30 31 32
33 34 35 36
38 39 40 41 42
43 44 45 46 47
14 15
48 49 51 52
55 56 58 59 60
61 62 63 64
66 67 68 69 70
71 72 73 74 75
16 17
76 77 79 80
83 84 86 87 88
89 90 91 92
94 95 96 97 98
99 100 101 102 103
18 19 /
MO NY=75 NE=21 LY=FU,FI BE=FU,FI PS=SY,FI TE=FU,FI

336
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VA  1  TE  24  24  TE  25  25  TE  49  49  TE  50  50  TE  74  74  TE  75  75
LE
MAST1  PERT1  SOCT1  ESCT1  MASCT1  EACHT1  MACHT1
MAST2  PERT2  SOCT2  ESCT2  MASCT2  EACHT2  MACHT2
MAST3  PERT3  SOCT3  ESCT3  MASCT3  EACHT3  MACHT3
PD
OU TV EF SS MI SE SC RS ND=3  AD=500
APPENDIX K

LISREL SYNTAX FOR THE COMPETING MODELS M12 AND M13

ALTERNATIVE MODEL 1
GOALS T1, SELF-CONCEPT T2, AND ACHIEVEMENT T3 (M12)

Competing model with goals causally predominant
DA NI=103 NO=535
LA
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
Q12YR2 Q12YR3 Q13 Q132 Q133
EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
CM FI=MERanks.cmm
SE
20 21 23 24
27 28 30 31 32
33 34 35 36
38 39 40 41 42
43 44 45 46 47
14 15
48 49 51 52
55 56 58 59 60
61 62 63 64
66 67 68 69 70
71 72 73 74 75
16 17
76 77 79 80
83 84 86 87 88
89 90 91 92

340
VA 1 TE 24 24 TE 25 25 TE 49 49 TE 50 50 TE 74 74 TE 75 75
ST 1 LY 1 1 LY 5 2 LY 10 3 LY 14 4 LY 19 5 LY 24 6
ST 1 LY 25 7 LY 26 8 LY 30 9 LY 35 10 LY 39 11 LY 44 12
ST 1 LY 49 13 LY 50 14 LY 51 15 LY 55 16 LY 60 17
ST 1 LY 64 18 LY 69 19 LY 74 20 LY 75 21
LE
MAST1 PERT1 SOCT1 ESCT1 MASCT1 EACHT1 MACHT1
MAST2 PERT2 SOCT2 ESCT2 MASCT2 EACHT2 MACHT2
MAST3 PERT3 SOCT3 ESCT3 MASCT3 EACHT3 MACHT3
PD
OU TV EF SS MI SE SC RS ND=3 AD=500
ALTERNATIVE MODEL 2
SELF-CONCEPT T1, GOALS T2, AND ACHIEVEMENT T3 (M13)

Competing model with self causally predominant
DA NI=103 NO=535
LA
ID1 Q3 QQ32 QQ33 Q11 Q112 Q113 Q12YR
Q12YR2 Q12YR3 Q13 Q132 Q133
EACHT1 MACHT1 EACHT2 MACHT2 EACHT3 MACHT3
MAS27T1 MAS32T1 MAS37T1 MAS42T1 MAS50T1
PER58T1 PER62T1 PER72T1 PER78T1
PER83T1 PER90T1 PER95T1 PER98T1
SOC35T1 SOC55T1 SOC67T1 SOC101T1 SOC108T1
ESC1T1 ESC2T1 ESC3T1 ESC4T1 ESC5T1
MSC1T1 MSC2T1 MSC3T1 MSC4T1 MSC5T1
MAS27T2 MAS32T2 MAS37T2 MAS42T2 MAS50T2
PER58T2 PER62T2 PER72T2 PER78T2
PER83T2 PER90T2 PER95T2 PER98T2
SOC35T2 SOC55T2 SOC67T2 SOC101T2 SOC108T2
ESC1T2 ESC2T2 ESC3T2 ESC4T2 ESC5T2
MSC1T2 MSC2T2 MSC3T2 MSC4T2 MSC5T2
MAS27T3 MAS32T3 MAS37T3 MAS42T3 MAS50T3
PER58T3 PER62T3 PER72T3 PER78T3
PER83T3 PER90T3 PER95T3 PER98T3
SOC35T3 SOC55T3 SOC67T3 SOC101T3 SOC108T3
ESC1T3 ESC2T3 ESC3T3 ESC4T3 ESC5T3
MSC1T3 MSC2T3 MSC3T3 MSC4T3 MSC5T3
CM FI=MERanks.cmm
SE
20 21 23 24
27 28 30 31 32
33 34 35 36
38 39 40 41 42
43 44 45 46 47
14 15
48 49 51 52
55 56 58 59 60
61 62 63 64
66 67 68 69 70
71 72 73 74 75
16 17
76 77 79 80
83 84 86 87 88
89 90 91 92
94 95 96 97 98
99 100 101 102 103
18 19 /
MO NY=75 NE=21 LY=FU,FI BE=FU,FI PS=SY,FI TE=FU,FI
PA  LY
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5 (0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0)
4 (0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0)
5 (0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0)
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0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
VA 1 TE 24 24 TE 25 25 TE 49 49 TE 50 50 TE 74 74 TE 75 75
ST 1 LY 1 1 LY 5 2 LY 10 3 LY 14 4 LY 19 5 LY 24 6
ST 1 LY 25 7 LY 26 8 LY 30 9 LY 35 10 LY 39 11 LY 44 12
ST 1 LY 49 13 LY 50 14 LY 51 15 LY 55 16 LY 60 17
ST 1 LY 64 18 LY 69 19 LY 74 20 LY 75 21
LE
MAST1 PERT1 SOCT1 ESCT1 MASCT1 EACHT1 MACHT1
MAST2 PERT2 SOCT2 ESCT2 MASCT2 EACHT2 MACHT2
MAST3 PERT3 SOCT3 ESCT3 MASCT3 EACHT3 MACHT3
PD
OU TV EF SS MI SE SC RS ND=3 AD=500
ID
TE
ESC
D
ID
TE
MSC
D
ID
TE
EACH
D
ID
TE
MACH
D
ID
TE
TIME 3
MAS
D
ID
TE
PER
D
ID
TE
SOC
D
ID
TE
ESC
D
ID
TE
MSC
D
ID
TE
EACH
D
ID
TE
MACH
D
ID
TE
TIME 3
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ID
TE
PER
D
ID
TE
SOC
D
ID
TE
ESC
D

-0.15

0.07

-2.04

-0.13

0.07

-1.89

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0.07

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0.06

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-0.08

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-0.04

0.08

-0.95

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2.43

0.13

0.10

1.23

0.01

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0.08

0.56

0.09

6.01

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-0.17

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-1.76

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1.23

0.01

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0.08

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-0.20

0.10

-1.98

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0.10

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-0.15

0.09

-1.63

0.60

0.08

7.82

-0.03

0.12

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0.26

0.10

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0.17

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0.16

2.11

0.01

0.02

0.12

0.68

0.21

3.28

0.32

0.17

1.88

0.06

0.17

0.35

-0.51

0.18

-2.75

-0.18

0.17

-1.07

0.33

0.16

2.11

0.01

0.02

0.12

0.68

0.21

3.28

0.32

0.17

1.88

-0.06

0.18

-0.36

0.39

0.19

2.10

0.13

0.17

0.75

0.27

0.16

1.59

-0.02

0.13

-0.12

-0.06

0.21

-0.28

0.27

0.17

1.57

-0.06

0.18

-0.36

0.39

0.19

2.10

0.13

0.17

0.75

0.27

0.16

1.59

-0.02

0.13

-0.12

-0.06

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-0.28

0.27

0.17

1.57

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0.75

0.27

0.16

1.59

-0.02

0.13

-0.12

-0.06

0.21

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0.17

1.57

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-0.06

0.18
0.18

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-0.06
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1.57

-0.06
-0.06
0.03

0.18
0.18
0.06

-0.36
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# APPENDIX M

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### Note.
All effect sizes are based on a fully Standardised Solution. Boldfaced figures represent significant coefficients at least *p < .05. MAS = Mastery goal items, PER = Performance goal items, SOC = Social goal items, ESC = English self-concept items, MSC = Mathematics self-concept items, EACH = English achievement, MACH = Mathematics achievement, EA = English achievement, MA = Mathematics achievement, D = Direct effect, ID = Indirect effect, TE = Total effects.