Paper Presented at the AARE Annual Conference, Adelaide 2006
Australian Association for Research in Education
BAR06851

Relations Between Students' Goal Orientations and Academic Self-concept: A More Comprehensive Model of Student Motivation

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This study aims to unify two substantial literatures relating to student motivation by proposing a more comprehensive model of students' motivation than has recently been provided to date. Notably, students' goal orientations, as operationalised by the General Achievement Goal Orientation Scale (GAGOS), and students' academic self-concept as operationalised by the Academic Self Description Questionnaire II (ASDQ II); are combined in one instrument in order to: (a) examine the psychometric properties of the combined instruments and (b) investigate the interrelated multidimensional and hierarchal structure of motivation and self-concept. Data collected over three years from 535 Australian High School students confirm the hypothesis that students' goals and academic self-concepts are interrelated components of an overall model of student motivation. Furthermore, this model remains stable and invariant across sex and over time. The model presents a unified framework within which the relations among students' goals and academic self-concept may be investigated more fully.

Academic motivation

Adolescence denotes a time of significant developmental change to one's physical, psychological and social wellbeing (McInerney & McInerney, 2006). Although all individuals progress through each of these developmental stages, the rate of speed and forms of effects due to these changes vary markedly for each individual. For some, adolescence is a time of achievement as they successfully navigate through each developmental stage. For many others, adolescence is a turbulent time and typically associated 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, increasing negative attitudes toward school and decreased perceptions of self (Anderman & Maehr, 1994; Marsh, 1989). While substantial evidence suggests high school settings are partly responsible for these maladaptive behaviours, few reforms have addressed motivational and developmental needs of adolescence (Anderman & Maehr, 1994). A primary objective for educators is the examination of this period of growth in an attempt to alleviate the 'storm and stress' associated with adolescence.

Impetus for all educators and parents is the fact that students' motivation declines rapidly for the first three years of high school and stoops to its lowest level in year 9 (Eccles, Wigfield & Schiefele, 1998; Watt, 2004; Zusho & Pintrich, 2001). Student motivation is a fundamental dimension to address as it predicts important educational outcomes including psychological wellbeing and academic achievement (Andersson, 1998; Gustafsson & Balke, 1993; Kaplan and Maehr, 1999; Wigfield & Eccles, 2000). 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, Rogers, Armstrong, & Leo, 1998, p.42). In order to address the complex nature of academic motivation it is integral to establish well validated instruments to measure the construct. For this reason, the current paper investigates adolescent students' academic motivation. Specifically, the paper addresses the relations of two related but independent motivational measurement instruments as operationalised by: a) the General Achievement Goal Orientation Scale (GAGOS) which is used to examine purposes for why students decide to engaging in work (goal theory); and b) the Academic Self Description Questionnaire II which focuses on student evaluations of self (self-concept). Once a clear measurement framework has been established it is possible to provide more comprehensive answers to complex questions that can contribute to useful implications for learning and teaching practices. Until the structure of students' goals and academic self-concept is thoroughly explored, any reforms to inform learning and teaching practices may be premature.

Calls for a More Comprehensive Model of Student Motivation

To date, few studies endeavour to unify the numerous competing motivational constructs. There have been repeated calls for a comprehensive model to provide a fuller explanation of the dynamic relations among motivational variables. Although not as complete as the proposed comprehensive model, this study attempts to display greater depth and breadth by combining two related yet independent motivational dimensions specifically, goal theory and academic self-concept. Researchers have investigated the role of achievement goals and self-related perceptions however these are more often applied to self-efficacy and rarely applied to self-concept. Curiously, there appears to be division between most researchers investigating motivation and those investigating self-concept (although see Skaalvik, 1997a; Skaalvik et al., 1994 and Skaalvik & Valas, 1999; (Urdan 1997) as exceptions). Researchers of goal theory evade the explicit discussion of self-concept instead refer exclusively to perceptions of ability. Self-concept researchers acknowledge the impact of motivation however evade a goal theory framework as an explanation. We endeavour to unify Goal theory and self-concept as they are interconnected and when combined can provide valuable insight into student achievement.

"Even if people are certain they can do a task, they may have no compelling reason to do it." (Eccles & Wigfield, 2002, p.11). For this reason it is clear to note that both students' perceptions of self combined with purposes for why one should engage in a task are influential to achievement related behaviour. Specifically, a high self-concept alone does not evoke motivation to engage in academic tasks but if an individual construes the academic task to be of importance such that they would like to improve existing skills or would like to demonstrate ability relative to others, than it is possible that the individual will have more purpose or motivation to apply themselves to that task. This example demonstrates the self-concept – goal theory linkage. For any given task, how much effort is expended, how much persistence will be demonstrated in the face of difficulty are all relative to one's sense of self and particular goal pursuit. Additionally, students' goals and academic self-concept effect students' academic performance and achievement (Wigfield & Eccles, 2000). Therefore, it is reasonable to suggest that goals and self-concept together, may provide a more inclusive explanation for students' achievement than either taken alone, especially when over-simplified structures for these constructs have been investigated. A vital requirement of such an approach, however, will be to design and validate instruments that capture the multidimensional and hierarchical structure of both self-concept and goals and to determine whether these instruments are invariant across sex groups.

Representing Students' Self-concept and Goals as Multidimensional and Hierarchical Structured

Academic Self-concept

Historically researchers conceptualised self-concept as uni-dimensional and hence instruments designed on this model provided limited insight into self-concept. This unidimensional model of self-concept purported disconcerting findings, which prompted Shavelson, Hubner & Stanton (1976) to further define the construct of self-concept. They proposed an empirical model describing self-concept as mulitdimensional 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 Shavelson and colleagues (1976) proposed model. Not until relatively recently have researchers developed instruments designed to measure the specific facets of academic self-concept. Marsh devised the Academic Self Description Questionnaire instruments 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.

Although an abundance of research substantiates the multidimensional nature of students' self-concept there remains little support for the hierarchy of students' self-concept (El-Hassan 2004). Considering the voluminous literature on self-concept, only a limited number of studies provide evidence for a hierarchical academic self-concept (Yeung, Chui, Lau, McInerney, & Russell-Bowie, 2000). Typically the hierarchy of academic self-concept has been weak, especially for high school student's self-concept in specific school subjects (Marsh & Yeung, 1998). It appears that the various school subjects studied by high school students are so distinct that attempting to capture the various self-concepts in each of these areas prove problematic. Therefore a higher order factor of academic self-concept has proved more complicated than anticipated.

Interactive effects of domain specific self-concepts, their structural relationship to global self-concept, and the impact of this entire hierarchical structure has not been typically tested (although see Marsh, 1992; Marsh & Yeung, 1998; Lau, Yeung, Jin & Low, 1999 for some recent exceptions to this generalisation). One of few studies that found convincing evidence for a hierarchy in high school students' academic self-concept was Yeung et al. (2000). They reported moderate (.26) correlations between maths and English self-concept which demonstrates that even though these subjects are distinct, there is evidence to show that students' self-concepts in these two domains are related. This study extends upon previous research by examining the possibility that domain-specific self-concepts (English and mathematics self-concepts) may be represented by a higher-order factor, academic self-concept. It is speculated that since English and mathematics subjects are both prioritised highly in (a) Australian high schools, (b) universities as a prerequisite for course entry, and (c) the workforce, that this commercial focus may explain why, what would appear to be two distinct subjects, may actually be related. Furthermore, similarities appear between the two subjects in schools because both subjects are usually taught at the beginning of the school day and scheduled more regularly due to their perceived importance. Hence, there are a number of underlying similarities relating to the perceived importance of both subject domains. Based on these speculations, previous research by Yeung et al. (2005) and El Hassan (2004), and correlations between English self-concept and mathematics self-concept reported from research conducted by Barker and colleagues (2005, 2006), 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. Figure 1 presents a visual representation of the academic self-concept hierarchy represented in the literature reviewed above.

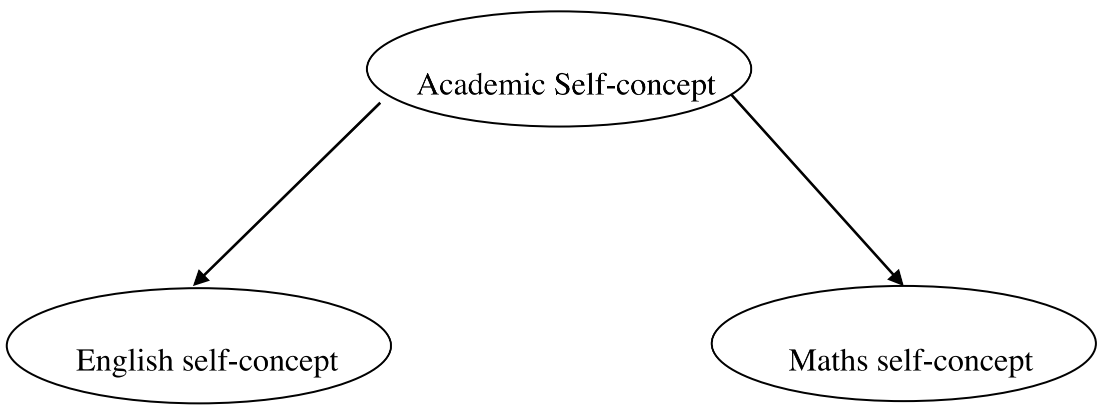


Figure 1. Multidimensional and hierarchical structure of self-concept.

Goal Theory

Goal theory focuses on the goals or purposes perceived for learning (Middleton & Midgley, 1997). 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) orientate students' intensity and direction of behaviour toward the academic task.

Predominant interest in achievement situations is on the demonstration of competence. This may be achieved in two significant ways that are associated with two distinct motivational goals. Diverse conceptualisation of these two tendencies exist within the literature, however, most research maintains that students who engage in a task to attain favourable judgements of competence are claimed to have *performance* goal orientation. In contrast, 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 (Ames & Archer, 1988; Rose & Thornburg, 1984).

More recently, studies have evolved from the initial conceptualization of mastery and performance goals, to examine the pursuit of multiple goals (e.g., mastery, performance, work-avoidance, and social). This development in research focuses on multiple goals independent and interactive effects (Barron & Harackiewicz, 2001; Dowson & McInerney, 2001; Harackiewicz, Barron, Pintrich, Elliot & Thrash, 2002; Linnenbrink & Pintrich, 2000; Pintrich, 2000).

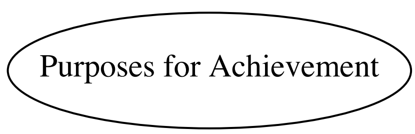
Although not as extensively examined as academic goals (mastery and performance goals), students' social goals are another important class of goals that influence achievement behaviour (Bempechat & Boulay, 2001; Dowson & McInerney, 2003). Unlike academic goals, social goals are directly referenced to individuals or groups associated with the academic task, in addition to being referenced to the tasks themselves (Dowson 1999). Social reasons for trying to achieve in academic situations are the dominant concerns for individuals pursuing social goals (McInerney, Roche, McInerney & Marsh, 1997; Urdan & Maehr, 1995).

In the past, social goals have been overlooked and ignored by studies examining motivation (Blumenfled 1992). Most of the research on social goals has been conducted mainly with adults and younger children, not adolescents (Jarvinen & Nicholls, 1996). This is astonishing given that adolescence is characterised by significant social changes (Snowman & Biehler, 2006), in particular, adolescent students have a preference for working with their peers (Whitton, Sinclair, Barker, Nanlohy & Nosworthy, 2004). Evidence exists that social goals could be significant motivators for students in academic situations, especially those going through adolescence. For this reason, social goals are examined within a goal theory framework as they combine with academic goals to influence achievement behaviour. This revised framework can enrich our understanding of motivation and achievement.

Central to the purpose of the present study was an exploration of three positively oriented goals (mastery, performance approach, 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 that case with work-avoidance or 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' way 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 examination of multiple goals (mastery, performance and social) allows for scrutiny of the individual goals, and some (first-order) relations between them. However, an exclusive focus on goals at the base (first-order) level, limits the opportunity to investigate the potential hierarchical structure of these goals and, hence, the full scope (i.e. first- and second- order) of interactions between them (McInerney, Marsh & Yeung, 2003). For this reason, examining individual goals and their effect on achievement may provide a fragmented and superficial view of student motivation. Examining a higher-order factor structure for goal orientations, in contrast, may enable a 'common quality' of various goal orientations to be extrapolated, which represents a pooled or generalised notion of purposes for motivation, and which may be useful for explaining and predicting achievement outcomes. To our knowledge only one other study (McInerney et al., 2003) explores this two level approach to examining multiple goals and their effect on achievement.

This study builds on this previous research by retaining a hierarchal model of students' goals, and integrating it with a hierarchical model of students' self-concept (explained further below). 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 2 presents a visual representation of the goal theory hierarchy represented in the literature reviewed above.



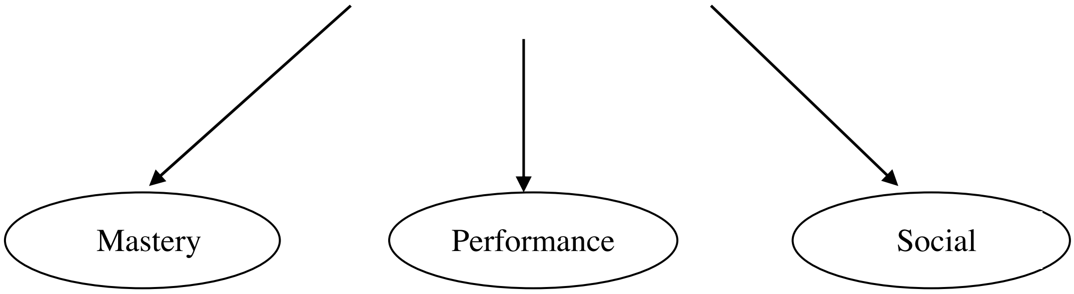


Figure 2. Hierarchical structure for goals (purposes for achievement).

A key goal of this study is to unify competing motivational constructs to provide a more meaningful model of student motivation. Although not as complete as the proposed comprehensive model, this study does unite two distinct fields, specifically self-concept and goal theory. Combining the GAGOS-ASDQ II allows for relations to be explored among students' academic self-concept and goals. Importantly this study examines these two dimensions of student motivation over a three year period. This longitudinal data provides valuable insights to whether students' self-concept and goals remain stable over a period of time.

Purpose

There were a number of purposes for conducting the first-order analyses. These include: (a) determining whether students' goal and academic self-concept could be operationalised by their respective instrument (GAGOS-ASDQ II) as multidimensional; (b) establishing the psychometric properties of the GAGOS-ASDQ II to ensure both instruments reliably and validly measure their underlying constructs when combined in the one instrument; and finally (c) testing for factor invariance across sex.

There were a number of purposes for conducting the higher order analyses (a) evaluating an a priori hierarchical CFA model positing one HO factor (academic self-concept) that was consistent with the design of the ASDQ II instrument and the Shavelson et al (1976) model on which these instruments were based; (b) evaluate 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; (c) evaluate whether the a priori HO model remains stable across three waves of data; (d) compare the a priori model with the corresponding first-order CFA model across all three waves; and finally (e) evaluate whether the HO model remains invariant across sex for all three waves. Figure 3 presents a visual representation of the two independent instruments (ASDQ II and GAGOS) combined in the one analyses to examine their hierarchical structure.

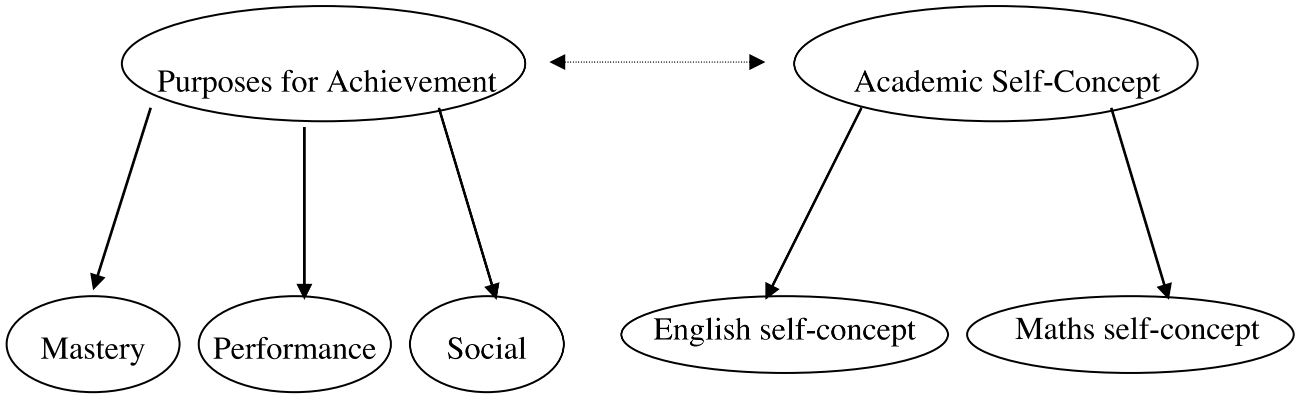


Figure 3. First- and Second-order Structure of Goals and Self-Concepts

Method

Participants

Participants in the study were 535 secondary school students in Years 7, 8 and 9 in the first year of data collection and Years 8, 9 and 10 in the second year and Years 9, 10 and 11 in the final year. Participants were from nine high schools broadly representative of school settings in New South Wales, Australia. 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 14.3 years (SD= 0.96) and at T3 was 15.1 years (SD= 0.89).

Measures

Recent research on the multidimensionality of self-concept focuses on domain-specific self-concepts (Lau, Yeung, Jin & Low, 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., maths, verbal and general school). Marsh and colleagues (Marsh, 1989; Marsh, Relich, & Smith, 1983) designed the Self-Description Survey II in order to examine adolescents' multidimensional self-concept between the ages of 12 and 18 years (Gonzalez-Pienda et al., 2002 Based on the SDQ II, Marsh (1990) developed the Academic Self-Description Survey II. The ASDQ II examines academic self-concepts in specific domains. The full ASDQ II comprises 136 items that measure a variety of domains including English and maths domains which are assessed in the present study. Five items measured English self-concept (eg. "I am good at English.") and 5 items measured math self-concept (eg. "I am good at maths."). Five items measured English self-concept (eg. "I am good at English.") and 5 items measured math self-concept (eg. "I am good at maths."). These items, their numerical identifiers, and their alpha estimates of reliability at both Time 1, Time 2 and Time 3, are recorded in Table 1. Students responded to the items in Table 1 on a five-point likert scale ranging from "strongly disagree" to "strongly agree".

Table 1

Sample Items From Academic Self-concept Subscales

Subscale	Numerical Identifier	Item
English self-concept		T1 α =.85; T2 α =.88; T3 α =.87
	ESC1	"I am good at English"
	ESC2	"I have always been good at English"
	ESC3	"Work in English is easy for me"
	ESC4	"I get good marks in English"
	ESC5	"I learn things quickly in English"
Maths self-concept		T1 α =.89; T2 α =.90; T3 α =.89
	MSC1	"I am good a mathematics"
	MSC2	"I have always been good at mathematics"
	MSC3	"Work in mathematics is easy for me"
	MSC4	"I get good marks in mathematics"
	MSC5	"I learn things quickly in mathematics"

Note. Numbers in brackets refer to Cronbach's alpha reliability for each scale at Time 1 and Time 2.

The nature of students' motivation was evaluated using the General Achievement Goal Orientation Scale (GAGOS) developed by McInerney (1997). The GAGOS measures three general goal orientations (General Mastery, General Performance and General Social). 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. A sample GAGOS item for mastery goals is "I am most motivated when I see my work improving". 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, Barron, Tauer & Elliot, 2002). A sample GAGOS item for performance goals is "I am most motivated when I am competing with 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). A sample GAGOS item for social goals is "I am most motivated when I am helping 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 seeking to help others, empathy for the interest of others.

Although a recent instrument, the GAGOS has demonstrated sound psychometric properties (see for example Barker, McInerney, & Dowson, 2002; Barker, McInerney, & Dowson, 2003; Barker, Dowson & McInerney, 2004; Barker, Dowson & McInerney, 2005). This validation process can not be underestimated 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. Specifically, the GAGOS comprises five items measuring general mastery, eight items measuring general performance, five items measuring general social, five items measuring global motivation and three items measuring valuing motivation. These items, their numerical identifiers, and their alpha estimates of reliability at both Time 1, Time 2 and Time 3 are recorded in Table 2. As with items from the ASDQ II, students responded to the items in Table 2 on a five-point likert scale ranging from "strongly disagree" to "strongly agree".

Table 2.
Items From the Achievement Motivation Subscales

Subscale	**Numerical Identifier**	**Item**
Mastery goals		T1 α =.76; T2 α =.84; T3 α =.79
	MAG27	"I am most motivated when I see my work improve"
	MAG32	"I am most motivated when I am good at something"
	MAG37	"I am most motivated when I solve problems"
	MAG42	"I am most motivated when I am becoming better at my work"

	MAG50	"I am most motivated when I am confident that I can do my school"
Performance goals		T1 α =.77; T2 α =.80; T3 α =.81
	PERG58	"I am most motivated when I receive rewards"
	PERG62	"I am most motivated when I receive good marks"
	PERG72	"I am most motivated when I am noticed by others"
	PERG78	"I am most motivated when I am competing with others"
	PERG83	"I am most motivated when I am in charge of a group"
	PERG90	"I am most motivated when I am praised"
	PERG95	"I am most motivated when I am doing better than others"
	PERG98	"I am most motivated when I become a leader"
Social goals		T1 α =.77, T2 α =.76, T3 α =.76
	SOG35	"I am most motivated when I work with others"
	SOG55	"I am most motivated when I am in a group"
	SOG67	"I am most motivated when I work with friends at school"
	SOG101	"I am most motivated when I am helping others"
	SOG108	"I am most motivated when I am showing concern for others"

Note. Numbers in brackets refer to Cronbach's alpha reliability for each scale at Time 1, Time 2, and Time 3.

Procedure

The items listed in Tables 1 and 2 were combined, and randomly ordered among 114 items from various other instruments forming a single survey instrument. A standardised explanation of the purpose of the survey was provided for participants before each administration. The survey was 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 (d) assist students with learning difficulties. At each session there were at least two research assistants present to assist the students completing the surveys. School teachers were not involved in the administration of the survey. Researchers collected the surveys from all students before they left the room. The same questionnaire and procedure was followed for all three waves of data collection. The first wave of data was collected in November 2001, and the second wave in November 2002 and the final wave in November 2003.

Analyses

Confirmatory Factor Analyses (CFAs: e.g., Hau, Kong & Marsh, 2000; Kaplan, 2000) using LISREL and Reliability Analyses using SPSS (Pedhazur & Pedazur-Schmelkin, 1991) were used to determine the psychometric properties of the combined GAGOS-ASDQ II scales at Time 1, Time 2 and Time 3, for the sample and for sex groups within the sample. The CFAs proceeded in two phases. Phase 1 incorporated the first-order models and Phase 2 the second (or higher) order models.

Phase 1 CFAs. Eleven first-order models were tested in a structured approach to determining the properties of the combined scales. These models were:

(a) Model 1 (M1): the null (no factor) model for the full set of 28 items at Time 1.

(b) Model 2 (M2): the hypothesised (five factor) model for the full set of 28 items at Time 1.

(c) Model 3 (M3): the null model with the six poorly fitting items from M2 deleted at Time 1.

(d) Model 4 (M4): the hypothesised (five factor) model with the revised set of 23 items at Time 1.

(e) Model 5 (M5): hypothesised first-order model invariance at T1.

(f) Model 6 (M6): the null model with the revised set of 23 items at Time 2.

(g) Model 7 (M7): the hypothesised (five factor) model with the revised set of 23 items at Time 2.

(h) Model 8 (M8): hypothesised first-order model invariance at T2.

(i) Model 9 (M9): the null model with the revised set of 23 items at Time 3.

(j) Model 10 (M10): the hypothesised (five factor) model with the revised set of 23 items at Time 3.

(k) Model 11 (M11): hypothesised first-order model invariance at T3.

Phase 2 CFAs. Nine second-order models were tested to determine the multi-dimensional and hierarchical structure of goals and self-concept, and to assess the stability of the solutions over the two waves of data collection. The multiple goals construct was related to the higher order factor Purposes for Achievement while English and maths self-concept were related to the higher order factor Academic Self-concept. The models tested were:

(a) Model 12 (M12): the second-order null model with 23 items for the total sample at T1

(b) Model 13 (M13): the hypothesised second-order model (following Figure 4 with five first-order and two second-order factors) with 23 items for the total sample at T1

(c) Model 14 (M14): hypothesised second-order model invariance at T1

(d) Model 15 (M15): the second-order null model at T2 for the total sample

(e) Model 16 (M16): the second-order hypothesised model at T2 for the total sample.

(f) Model 17 (M17): hypothesised second-order model invariance at T2

(g) Model 18 (M18): the second-order null model at T3 for the total sample

(h) Model 19 (M19): the second-order hypothesised model at T3 for the total sample.

(i) Model 20 (M20): hypothesised second-order model invariance at T3

Strict Confirmability. 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 the present study we followed this quasi-confirmatory approach for the first wave of data. However, for the second wave of data we followed a strictly confirmatory approach. Thus, both the first- and second-order models for Time 2 tested a 22 item model (albeit generated with the first wave of data) without modification. This strictly confirmatory approach is a feature of the present study, and represents a strong test of the factorial structure of the instrument.

Evaluating Model Fit. The indices used to assess the fit of models in this study were the Chi-square/degrees of freedom ratio, the Goodness of Fit Index (GFI), the Tucker Lewis Index (TLI), the parsimony Relative Non-centrality Index (PRNI) and the Root Mean Square Error of Approximation (RMSEA) (Byrne 1998). (Kelloway 1998), p.27) describes the GFI as "a ratio of the sum of the squared discrepancies [between the sample variance/covariance matrix and the model-implied variance-covariance matrix] to the observed variances". Values above 0.9 indicate good fit to the data for the GFI (Loehlin 1998).

The TLI and the PRNI both compare a null model with a hypothesised model. In a null model all variables are typically specified to be uncorrelated, that is, no relationship between the variables is specified (Kelloway, 1998). Null models serve as a valuable baseline for comparing alternative models which imply specified covariances between the observed variables (Byrne, 1998). The TLI and PRNI should ideally be greater than 0.95, although values greater than 0.90 indicate acceptable fit (Marsh, Balla, & Hau, 1996). In the present study, these indices were computed using formulae given in Marsh et al. (1996).

The RMSEA takes into account an error of approximation in the implied population covariance matrix, thus relaxing the stringent requirement in the Chi-square/degrees of freedom statistic that the model holds exactly in the population. The RMSEA should ideally be less than 0.05. However, values between 0.05 and 0.08 indicate reasonable fit (Byrne, 1998; Diamantopoulos & Siguaw, 2000).

Testing Nested Models. Where CFA (and other types of) models are 'nested' i.e. one model (the 'child' model) contains a sub-set of variables in another model (the 'parent' model), a Chi-square difference test ($\Delta\chi^2$) between the two models may be computed (see Marsh, Dowson, Pietsch, & Walker, in press). This test is conducted by subtracting the Chi-square and associated degrees of freedom for the child model from the Chi-square and associated degrees of freedom for the parent model. The remaining Chi-square value (compared against the remaining degrees of freedom) acts as measure of how much better the child model fits to the parent model. Where this difference is significant, the child model can be said to fit the data better than the parent model. The $\Delta\chi^2$ test can be used to test models at the same level (e.g. nested first-order models), or models at different levels (e.g. first-order models with nested higher-order models).

Results

Reliability

Results from the reliability estimates are reported in Tables 1 and 2. Reliability estimates for the scales ranged from .73 to .89 for Time 1, .76 to .90 for Time 2 and .79 to .89 for Time 3. The analyses indicate that the ASDQ II items had generally higher reliability than the GAGOS scales (.85 to .90 for the ASDQ scales compared to .73 to .84 for the GAGOS scales). Nevertheless, the lowest reliability of any scale at any Time was .73, suggesting that the scales as a whole demonstrated substantial reliability.

Model Fit

Overall results for the goodness-of-fit of the first-order models are presented in Tables 3 and 4. Results for the second-order models are presented in Tables 5 to 7. All hypothesised models considered in this study converged to proper solutions.

Factor Structure of Achievement Goals and Academic Self-concept. Model 2 (M2) tested the hypothesis that the 28 initial items loaded on five 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 2 (M2). These items were PERG58T1, PERG62T1, PERG83T1and A108SOCG, MAG37T1.

It is important to provide potential theoretical explanations for why the items above were deleted. 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 PERG83T1 ("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 PERG90T1 ("I am most motivated when I am praised"), PERG58T1 ("I am most motivated when I receive rewards") and PERG62T1 ("I am most motivated when I receive good marks) were considered conceptually redundant and therefore the two weakest items (PERG58T1 and PERG62T1) 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 –

Joreskog & Soborn, 1989a, 1989b) for the items (PERG83T1, PERG58T1 and PERG62T1) suggested a good degree of overlap.

Only one item from the mastery goal orientation scale (MAG37T1) 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, MAG37T1 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 MAG37T1 would substantially improve the overall model fit.

Although there were two poorly fitting items from the subscale (SOG101T1 and SOG108T1), only one was removed since it is preferable to maintain more than three items per subscale (Marsh & Byrne, 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 weak factor loadings. Examination of the modification indices demonstrated that the largest modification index was associated with SOG108T1. 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 varying interpretation as to how one actually demonstrates "concern for others".

The resulting model (Model 4) was tested with the same constraints as M2 i.e. the remaining items loading on their same 'target' factors, with no cross-loadings allowed. M4 showed a better fit to the data than M2. Unlike M2, M4's GFI and CFI are above 0.90 and the RMSEA is less than for M2. The TLI was above 0.90, and was substantially higher than that for M2. Thus, removing the five poorly fitting items from the original hypothesised model led to improved overall model fit. In order to assess whether M4 was a *significantly* improved overall fit to the data than M2, $\Delta\chi^2$ for the difference between the two models was computed. $\Delta\chi^2$ for this comparison was 661.56 with 120 degrees of freedom. This difference is significant, indicating that M4 represents a significant improvement in fit over M2.

The revised model (M4) was then tested without alteration with the second and third waves of data (M7 & M10). M7 and M10 both fitted the data well, with the Chi-square for the M7 being smaller than for M4 and slightly larger for M10. The fit indices for M7 and M10 were essentially comparable to that for M4. These results support the convergent and discriminant validity of the measures, and indicate support for the multidimensionality of both achievement goals and academic self-concept for both waves of data.

Table 3

First-Order Model Fit Statistics

Model	χ^2	**df**	χ^2**/df**	**TLI**	**CFI**	**RMSEA**	**Model Description**
							First-Order Models
M1	11083.05	378	29.3	n.a.	n.a.	n.a.	Null model T1 (28 items)
M2	1199.64	340	3.5	.92	.93	.69	Hypothesised model T1
M3	8093.05	253	32.0	n.a.	n.a.	n.a.	Null model T1 (23 items)
M4	538.08	220	2.5	.96	.96	.05	Hypothesised model T1
M5	838.49	496	1.7	.95	.96	.05	Invariance T1
M6	3063.80	253	12.1	n.a.	n.a.	n.a.	Null model T2 (23 items)
M7	339.87	220	1.5	.95	.96	.05	Hypothesised model T2
M8	918.69	496	1.9	.95	.95	.06	Invariance T2
M9	9401.08	253	37.2	n.a.	n.a.	n.a.	Null model T3 (23 items)
M10	585.67	220	2.7	.96	.96	.06	Hypothesised model T3
M11	861.92	496	1.7	.95	.96	.05	Invariance T3

Note.For both Tables 3 and 4: GFI = Goodness-of-fit; 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 both the TLI and PRNI.

TLI = [Chi-square/degrees of freedom (null model)] – [Chi-square/degrees of freedom (hypothesised model)]
Chi-square/(degrees of freedom – 1) (null model)

RMSEA= Square Root [(Chi-square – degrees of freedom) (n– 1) degrees of freedom]

Correlations among the students' academic self-concept and goals. The correlations between the variables are presented in Table 4. 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 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 maths self-concept. Conversely, performance goals at T2 and T3 correlated more highly with maths self-concept than with English self-concept. Relations between social goals and English self-concept and maths self-concept change over time. It appears that social goals are weakly correlated with English self-concept at Time 1 and then at Time 2 social goals are negatively correlated with English self-concept and at T3 are negatively correlated with both English self-concept and maths self-concept.

Table 4

Correlations Among the Five Factors for Time 1, Time 2, and Time 3

	Mastery	Performance	Social	English S-C	Math S-C
Mastery					
T1	1.00				
T2	1.00				
T3	1.00				

Performance					
T1	.44***	1.00			
T2	.29***	1.00			
T3	.37***	1.00			
Social					
T1	.22***	.36***	1.00		
T2	.16**	.43***	1.00		
T3	.10	.23***	1.00		
English self-concept					
T1	.39***	.22***	.03	1.00	
T2	.32***	.21***	-0.04	1.00	
T3	.28***	.23***	-0.11*	1.00	
Maths self-concept					
T1	.17**	.24***	.14**	.19***	1.00
T2	.10	.10	-0.07	.16**	1.00
T3	-0.00	.09	-0.01	.18***	1.00

Coefficients > .* are significant at p<0.05* p<0.01** p<0.001***

Models for Males and Females at Time 1, Time 2 and Time 3. The hypothesised models for Time 1 (M4), Time 2 (M7) and Time 3 (M10) fitted the data well and were used to determine whether the models fit equally well for males and females across all three waves of data. The factor loadings, factor correlations and error terms were constrained to be equal across sex groups. Table 3 presents the test of invariance fit statistics for all three waves of data. In summary of these results, the TLI was a good fit reaching 0.96 for all three waves, the CFI and RMSEA for Time 1 to Time 3 provided an acceptable fit to the data. On the basis of these results we can conclude that the structure and the measurement of students' goals and academic self-concept remain invariant across sex.

Higher Order Representations of Achievement Goals and Academic Self-concept. Model 13 (M13) at Time 1, Model 16 (M16) at Time 2 and Model 19 (M19) at Time 3, tested the ability of a hierarchical representation of multiple achievement goals and self-concepts (as per Figure 4) to fit the data (see Table 6 below for details). M13 (the higher-order version of M4), M16 and M19 (the higher-order versions of M7), demonstrated a good fit to the data. All indices for these Models met criterion values and are presented in Table 5. Significant and substantial paths were evident from mastery (T1= .68; T2=.54; T3=.49), performance (T1=.69; T2=.83; T3=.89) and social (T1=.39; T2=; T3=.29) goals to the higher-order factor (Purposes for Achievement). Similar paths were evident from English Self-concept (T1=.49; T2=.30; T3=.31), and Maths Self-concept (T1=.38; T2=.56; T3=.66), to Academic Self-Concept. Table 6 presents the factor loadings for the higher order analyses for all three time waves.

Table 5

Second-Order Model Fit Statistics

Model	χ^2	df	χ^2/df	TLI	CFI	RMSEA	Model Description
							Second-order Models
M12	8093.45	253	32.00	n.a.	n.a.	n.a.	Null model T1
M13	567.33	224	2.5	.95	.96	.05	Hypothesised model T1
M14	863.36	495	1.7	.95	.95	.05	Invariance T1
M15	7065.55	253	27.93	n.a.	n.a.	n.a.	Null model T2
M16	471.38	224	2.10	.96	.96	.05	Hypothesised model T2
M17	954.38	495	1.9	.94	.95	.05	Invariance T2
M18	9401.08	253	37.16	n.a.	n.a.	n.a.	Null model T3
M19	600.37	224	2.7	.96	.96	.06	Hypothesised model T3
M20	872.91	495	1.8	.95	.95	.05	Invariance T3

Table 6

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

	Structural regression coefficients					
	Goals T1	Self T1	Goals T2	Self T2	Goals T3	Self T3
Mastery T1	.68***					
Performance T1	.69***					
Social T1	.39***					
English self-concept T1		.49***				
Mathematics self-concept T1		.38***				
Mastery T2			.54***			
Performance T2			.83***			
Social T2			.43***			
English self-concept T2				.30***		
Mathematics self-concept T2				.56***		
Mastery T3					.49***	
Performance T3					.94***	
Social T3					.29***	

English self-concept T3						.31***
Mathematics self-concept T3						.66***
Correlations						
Goals T1	-					
Self T1	.80***	-				
Goals T2			-			
Self T2			.49***	-		
Goals T3					-	
Self T3					.41***	-

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

The $\Delta\chi^2$ for the difference between Model 13 and Model 4 (Time 1 second-order versus Time 1 first-order model) was 29.3 with 4 degrees of freedom, which was significant. The chi square difference test was also conducted between the corresponding second-order and first-order models for T2 and T3. Table 7 presents the results of these chi square difference tests. Results from all three chi square difference tests reveal significant differences between the second-order models with their corresponding first-order model. These findings indicate that the first-order model provides a significantly better representation of the data than the second-order. As predicted, the chi square difference values favour the first-order model, however the fit indices for higher order were in some cases identical or at least comparable with the first-order. In the case that higher order models approach that of the first-order model, then the higher order model is considered a better fit on the basis of greater parsimony. Taken together, these results appear to support a hierarchical representation of both achievement goals and academic self-concept for all three time waves.

Table 7

Chi-square Difference Tests

Models	Chi square difference	Degrees of freedom
Difference test between second-order model and first-order model		
M4	29.3	4***
M13		
M7	131.5	4***
M16		
M10	14.7	4***
M19		
Chi square difference test between invariant and unconstrained model		
M13 (unconstrained)	299.03	271
M14 (invariant)		
M16 (unconstrained)	438	271
M17 (invariant)		
M19 (unconstrained)	272.54	271

M20 (invariant)

Invariance across sex

A substantively important 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.

The TLI penalises model complexity therefore the introduction of invariance constraints provides for a more parsimonious model and results 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. Consequently, if the introduction of equality constraints results in an improved TLI and chi square difference and degrees of freedom ratio then it can be concluded that there is strong support for the equality constraints. As predicted there was an improvement at all three time waves for the chi square and degrees of freedom ratio however there was a modest reduction of the TLI at T2 and T3 rather than an improvement. A comparison between the invariant model at all three time points with the corresponding unconstrained model (M13, M16 and M19) using a chi square difference test was then conducted. Results for these chi square tests are reported in Table 7. Notably, the chi square difference statistic demonstrates that the invariant model at all three time points is not significantly different from their respective unconstrained model. Importantly, these findings demonstrate the equivalence of a solution for both males and females attesting the model is invariant across sex.

Discussion

This study aimed to unify two significant dimensions of student motivation in an attempt to provide for a comprehensive model. Essentially, three related components were investigated. The first was an examination of the (first-order) multidimensional nature of achievement motivation and academic self-concept i.e. an examination of multiple goals and domain specific self-concepts. The second was an examination of a hierarchical representation of achievement goals and academic self-concept, positing Purposes for Achievement and Academic Self-concept as the higher order factors. The third was an examination of whether the data at Time 1, Time 2 and Time 3 were invariant across sex groups.

First-Order Models and the Multidimensionality of Goals and Self-Concept

The first-order modelling process for the sample as a whole demonstrated that the modified 23 item model was a good fit for the data at Time 1 (M4) and, without alteration, at Time 2 (M7) and Time 3 (M10). These models demonstrated total invariance across sex groups. This suggests that that the multidimensional model was a good representation of the data at all three time points across sex groups. This, in turn, lends support to the theoretical argument goals and self-concept should be viewed as multi- rather than uni-dimensional constructs. Results of this study are, thus, congruent with other theoretical (e.g. Urdan and Maehr, 1995) qualitative (e.g. Dowson & McInerney, 2001, 2003) and quantitative studies (e.g. McInerney et al., 2003; McInerney et al., 1997) which also support the multidimensionality of students goals.. In particular, the models in this study worked well with the inclusion of social goals as a first-order construct. This, consistent with other studies (e.g. Dowson & McInerney, 2003) suggests that social goals in addition to academic (mastery and performance) goals are important for students in educational settings. It appears that social goals in combination with academic goals motivate adolescent students in achievement related settings. For these reasons, the study provides a measurement framework within which the relations of multiple goal orientations and domain-specific self-concept variables may be examined further. This revised framework can enrich our understanding of motivation and achievement.

Sex Differences. Before researchers can meaningfully examine mean structures it is necessary to determine whether males and females respond to instruments uniformly. Otherwise, variation between males and females could mistakenly be attributed to true score variation instead of measurement variation. In this study the error of measurement was equivalent across sex, which means the items had the same measurement accuracy for boys and girls.

Hierarchical Models

Although the purposes for engagement vary for each of these specific goals, such that mastery oriented individuals engage to seek competence while 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 such that they are posited to direct, select and energise behaviour (McClelland, Koestner, & Weinberger, 1999). Correlations among the three distinct goals presented in the results from the first-order (refer to Table 4) also support the hypothesis that there is a common quality underlying these constructs. For example, strong to moderate correlations are apparent among mastery goals and performance goals, social goals and performance goals and mastery goals and social goals. Confirmatory factor analyses of the first-order factors supported a hierarchical structure in which the higher order factors covaried to yield the possibility of a third order factor. This pattern of results provides strong support for the importance of combining and unifying the extensive literature on students' academic motivation. Consequently a higher order factor labelled "Purposes for achievement" is posited to represent the three distinct yet related goals. This conceptualisation of 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, was also supported for both males and females.

In addition, conceptualising students' academic self-concept as a singular latent construct, within a hierarchical factorial structure that comprised two first-order factors- English self-concept and maths self-concept, was also supported for both males and females. These results attest the ASDQ II reliably and validly measures students' specific facets of academic self-concept and these can be represented hierarchically. Typically the hierarchy of self-concept has been shown to be weak. In contrast, this study found along with El-Hassan (2004) and Yeung, Chui, Lau, McInerney and Russell-Bowie (2000) strong support for a hierarchical structure which posit academic self-concept to be represented by English and maths self-concept.

In summary this study found a) robust support for an a priori hierarchical CFA model positing one HO factor (academic self-concept) that is consistent with the design of the ASDQ II instrument and the Shavelson et al (1976) model on which this instrument was based; (b) robust 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; (c) evidence that the a priori HO model remains stable across three waves of data; (d) strong indication that the higher order model represented the data better than the corresponding first-order model; (e) clear evidence that the HO model remains invariant across sex for all three waves; and (f) confirmation, with a possible third higher order factor, which supports the aim of unifying students' goals and academic self-concept to provide for a more comprehensive model of student academic motivation.

Conclusion

Gorsuch (1983) believes that analysing data across different levels provides different perspectives on the constructs under investigation. Evidence in this study supports a multidimensional and hierarchical model of students' goals and academic self-concept. Support for these models is equivocal at the sex-group level. These findings illustrate that students' goals and academic self-concept are related and suggest that these two variables in combination may in fact affect academic motivation. By unifying these two dimensions, it is possible to address how both interact to predict significant educational outcomes such as achievement (Wigfield & Eccles, 2000).

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