THE DEVELOPMENT AND VALIDATION OF THE GOAL ORIENTATION AND LEARNING STRATEGIES SURVEY (GOALS-S)

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This article outlines the construction and validation of the Goal Orientation and Learning Strategies Survey (GOALS-S). This 84-item survey was designed to measure students' motivational goal orientations and their cognitive and metacognitive strategies. Results of first-order confirmatory factor analyses (CFAs) supported the factorial validity of the GOALS-S scales measuring students' goals and strategies (with goodness-of-fit indices in post-hoc models ranging from .908 to .981). In addition, higher order CFAs (HCFAs) support hierarchical structure of the GOALS-S scales (with goodness-of-fit indices ranging from .904 to .980). Finally, tests of invariance supported the factorial stability of the GOALS-S scales across gender groups (with goodness-of-fit indices ranging from .901 to .981).

Keywords: *goal orientations; cognitive strategies; metacognitive strategies; confirmatory factor analysis*

The purpose of the present research was to determine the reliability and validity of a new psychometric instrument developed to measure middle and senior school students' multiple achievement goals and their cognitive and metacognitive strategies. Such research is warranted for several reasons. First, students' (a) academic achievement goals (Ames, 1992; Harackiewicz & Sansone, 1991; McInerney, Hinkley, Dowson, & Van Etten, 1998; Meece,

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1994; Pintrich, Marx, & Boyle, 1993; Urdan & Maehr, 1995), (b) cognitive strategies (Bergin, 1998; Chamot & El-Dinary, 1996; Garcia & Pintrich, 1994; Montague, Applegate, & Marquard, 1993; Reid, Hresko, & Swanson, 1991), and (c) metacognitive processes and strategies (Derry, 1990; Graham & Harris, 1992; Paris & Winograd, 1990; Pintrich & Schrauben, 1992; Sink, Barnett, & Hixon, 1991; Zimmerman, 1989) have been shown to profoundly influence the quantity and quality of their engagement in learning (McCombs & Marzarno, 1990; Pervin, 1991; Ridley, 1991; Zimmerman, 1990; Zimmerman, Bandura, & Martinez-Pons, 1992). Hence, the accurate measurement of these attributes is of interest to educational psychologists and teaching practitioners.

Second, recent research and theory has suggested that a range of achievement goals, other than those typically measured by existing instruments, may also affect students' engagement in, and outcomes from, learning. Specifically, these goals include students' work avoidance and social achievement goals (Ainley, 1993; Blumenfeld, 1992; Dowson & McInerney, 2001; McInerney et al., 1998; Nicholls & Utesch, 1998; Urdan & Maehr, 1995; Wentzel, 1994). As these "new" goals may also affect students' learning and achievement, it would be advantageous to have an instrument available which accurately measures these goals.

Third, although some instruments—for example, the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich, Smith, Garcia, & McKeachie, 1991) and the Inventory of School Motivation (ISM) (McInerney & Sinclair, 1991; McInerney et al., 1998)—have attempted to measure various combinations of students' academic and social achievement goals, as well as cognitive and metacognitive strategies, none have attempted to measure these four sets of constructs in one instrument. Thus, a comprehensive instrument measuring an identified range of students' goals and strategies is not yet available in the literature.

This is an important point because the absence of a comprehensive instrument designed to measure an identified range of goals and strategies may force researchers to use different instruments to assess constructs relevant to their research. These scales, however, may have different psychometric properties that are unknown until after the data have been gathered. The present research, in contrast, specifically seeks to demonstrate the validity of multiple scales drawn from one instrument. As such, this instrument may provide a more coherent set of measures that are less likely to cause measurement difficulties when used alongside each other in research programs.

Fourth, recent research has emphasized that students can and do hold multiple goals and strategies in school settings (Ainley, 1993; Derry, 1990; Meece & Holt, 1993; Pintrich & Shrauben, 1992; Seifert, 1995). Moreover, the way students organize and coordinate their multiple goals and strategies is substantially related to their academic performance (Ainley, 1993; Dowson & McInerney, 1998; Meece, Blumenfeld, & Hoyle, 1988). Despite

this, the issue of how these goals and strategies may be structurally related to each other has not been evaluated (for one recent exception, see McInerney, Marsh, & Yeung, in press).

This is particularly important because the literature relating to students' goals and strategies has consistently made the theoretical distinction between students' academic and social goals (e.g., see Blumenfeld, 1992; Dowson & McInerney, 2001; Urdan & Maehr, 1995) and their cognitive and metacognitive strategies (Barker, Dowson, & McInerney, in press; Bergin, 1998; Biggs, 1987). But we are aware of no recent studies which have attempted to verify (from a psychometric perspective) the distinction between students' academic and social goals and between their cognitive and metacognitive strategies. The present study, in contrast, explicitly seeks to determine whether the conceptual distinction between these different classes of goals and strategies is, in fact, psychometrically supported.

Fifth, even where psychometric instruments exist that measure subsets of students' goals and strategies, their psychometric qualities are not always desirable. For example, the MSLQ, a widely used instrument for measuring students' goals and strategies, has a goodness-of-fit index (GFI) of 0.77 for its items measuring motivational goals and a GFI of 0.78 for items measuring students' strategies (Pintrich et al., 1991). Moreover, factor loadings for some items on their respective factors are as low as 0.17. There is the need, therefore, for the development of an instrument that measures students' goals and strategies with enhanced validity.

Sixth, most instruments used for measuring students' goals and/or strategies have been developed and validated with postsecondary students. These include the MSLQ, the Inventory of Learning Processes (ILP) (revised by Schmeck, Geisler-Brenstein, & Cercy, 1991), the Approaches to Study Inventory (ASI) (Entwistle & Ramsden, 1983), and the Strategic Flexibility Questionnaire (SFQ) (Cantwell, 1992). Few, if any, instruments in the literature have been specifically developed with (and for use with) middle and senior school students. The present instrument, however, has been specifically designed with this target audience in mind.

Finally, most instruments measuring students' motivational goals and strategies have used items that were generated on the basis of a priori theorizing concerning the content and structure of students' goals and strategies. The instrument developed in this research, however, used items that were specifically and intentionally developed from an inductive and qualitative approach to the content and structure of students' goals. Specifically, items in the present instrument are grounded in the interview statements of students regarding their motivational goals and strategies. These interview statements were generated in the context of a series of qualitative research projects conducted by present authors (i.e., Dowson & McInerney, 1997, 2001, in press). For this reason, the present instrument should display substantial content

validity, which should manifest itself in enhanced measures of the instruments' validity and reliability.

Gender Differences in Students' Motivation and Cognition

Recent studies have begun to examine relations between students' gender and their goal orientations (e.g., Anderman & Young, 1994; Kaplan & Maehr, 1996; Midgley & Urdan, 1995). Studies have also investigated gender differences in patterns of students' learning and achievement, and how these may be related to students' differing motivational and strategic orientations (e.g., Bouffard, Boisvert, Vezeau, & Larouche, 1995; Meece & Holt, 1993; Wentzel, 1991). The literature, however, is not clear about how potential gender differences may be related to students' motivation, cognition, and achievement (e.g., Ford, 1992; Meece & Jones, 1996; Midgley, Arunkumar, & Urdan, 1996). For these reasons, it is important to evaluate if the measurement of students' goals and strategies is equally valid with women and men. If may be, for example, that women and men interpret items relating to goals and/or strategies differently. This, in turn, may affect the measurement validity of an instrument measuring these constructs.

Objectives

Given the above, the development and validation of a new instrument designed to measure an expanded range of students' goals and strategies appears to be warranted and necessary. The specific objectives of the present study were the following:

- to describe the development of a new instrument designed to measure an identified range of students' academic and social goals, as well as students' cognitive and metacognitive strategies;
- to assess the psychometric properties of this instrument;
- to evaluate if a multidimensional, hierarchical structure is appropriate for measuring students' goals and strategies; and
- to determine whether the instrument is factorially invariant with women and men.

Instrument Development

The Goal Orientations and Learning Strategies Survey (GOALS-S) was designed to measure three academic goals, five social goals, three cognitive strategies, and three metacognitive strategies. As indicated above, the motivational goals measured by the GOALS-S corresponded to those goals identified in previous qualitative studies by the authors. Moreover, the items measuring these goals were based on the actual words of students' in interview

situations within these studies. Table 1 describes the constructs (goals) and the items on the GOALS-S for the constructs.

The cognitive and metacognitive strategies measured by the GOALS-S correspond to the key strategies identified in previous studies (e.g., Biggs, 1987; Derry, 1990; Pintrich et al., 1991; Schmeck et al., 1991). However, the actual items measuring these strategies in the GOALS-S were also generated from students' interview statements in the same qualitative research contexts as described above. Brief descriptions of these constructs (cognitive and metacognitive strategies) and the items on the GOALS-S for these constructs are also presented in Table 1.

Method

Participants

Participants were 720 middle (n = 602) and senior (n = 118) school students from six high schools in Sydney, Australia. Of these students, 328 (46%) were female and 392 (54%) were male, with the mean age of all students being 14.4 years. In addition, 598 (83%) of the students were from Anglo-Australian backgrounds, with the rest being primarily Asian Australians.

Procedures

Measures. The 84 items comprising the GOALS-S were initially reviewed by a sample of students (n = 8) and teachers (n = 2) for face validity of the items. This involved students and teachers commenting on the wording of the items with respect to their interpretability and coherence. Some items were reworded as a result of comments made by students and teachers regarding the meaning of particular items. A 5-point Likert-type scale was constructed for each item ranging from 1 (*strongly disagree*), 3 (*not sure*), to 5 (*strongly agree*).

Administration. The GOALS-S was administered to participants in class groups by the first author, with the assistance of teaching staff at each school. To standardize the delivery of the GOALS-S across class groups, teachers who assisted in the administration of the GOALS-S received a copy of the instrument, along with written instructions. The researchers also verbally briefed the participating teachers about the structure, purpose, and administration of the GOALS-S, prior to its administration with students. In particular, teachers were instructed not to interpret any of the GOALS-S items for students, but to instruct students to leave an item out if they did not understand it.

(text continues on page 299)

Table 1
Goals and Strategies Measured by the Goal Orientation and Learning Strategies Survey (GOALS-S)

Construct (Goal or Strategy)	GOALS-S Items	Alpha
	Academic goals	
Mastery: Wanting to achieve to demonstrate understanding, academic competence, or improved performance relative to self-established standards.	D2. I want to do well at school to show that I can learn new things. D5. I want to do well at school to show that I can learn difficult schoolwork. D11. I try hard to understand my schoolwork. D14. I work hard to understand new things at school. D22. I work hard at school because I am interested in what I am learning. D24. I try hard at school because I am interested in my work.	.78
Performance: Wanting to achieve to outperform other students, attain certain grades/marks, or obtain tangible rewards associated with academic performance.	D3. I want to do well in school because being better than others is important to me. D6. I try to do well at school because I am only happy when I am one of the best in the class. D9. I want to learn things so that I can come near the top of the class. D12. I want to learn things so that I can get good marks. D15. When I do good schoolwork it's because I am trying to be better than others. D18. I want to do well in school so that I am one of the best in my class.	.87
Work avoidance: Wanting to achieve with as little perceived effort as possible.	D7. I choose easy options in school so that I don't have to work too hard. D10. At school I want to do as little work as possible. D13. If schoolwork is too hard for me I just don't do it. D16. I don't ask questions in school even when I don't understand the work. D19. I don't do schoolwork if it looks too hard to learn. D23. I want to do well at school, but only if the work is easy.	.72
	Social goals	
Social affiliation: Wanting to achieve to enhance a sense of belonging to a group	C1. I want to do well at school so that I can feel close to my group of friends. C6. When I want to do well at school it's so that I can have a lot of friends.	.83

or groups and/or to build or maintain interpersonal relationships.	C11. I try to understand my schoolwork so that I will feel part of my group of friends. C16. I try to do well at school so that I won't feel left out if I don't do well. C20. I do good schoolwork so that other people will want to be friends with me. C26. I do my best at school so that my friends and I will be able to stay together.	
Social approval: Wanting to achieve to gain the approval of peers, teachers, and/or parents.	C3. I want to do well at school so that I can get praise from my teachers. C8. I do good work at school because I want to be recognized by my teachers. C12. I want to get praise from my teachers for good schoolwork. C17. I try to do well at school to please my teachers. C21. I want to do well in my schoolwork to please my parents. C26. I do good work at school so that I can get praise from my parents.	.84
Social concern: Wanting to achieve academically to be able to assist others in their academic or personal development.	C2. I try to do well at school so that I can I help my friends with their schoolwork when they need it. C7. I do my best at school so that I can give my friends help with their schoolwork. C14. I want to do well at school so that I can help other students with their work. C19. I do good schoolwork so that I can help other students do well at school. C24. I do good schoolwork so that other people can learn things from me if they ask. C28. When I want to do well at school it's so that I can help other students.	.74
Social responsibility: Wanting to achieve to maintain interpersonal commitments, meet social role obligations, or follow social and moral rules.	C5. I want to do good schoolwork because other people expect it of me. C10. I want to do well at school to show that I am being a responsible student. C15. When I do good schoolwork it's to show that I am being a responsible student. C20. I want to do well at school so that I don't get in any trouble. C25. I avoid getting into trouble at school by doing good schoolwork. C30. I do good schoolwork so that I don't have any trouble with my parents or teachers.	.82

(continued)

Table 1 (continued)

Construct (Goal or Strategy)	GOALS-S Items	Alpha
Social status: Wanting to achieve to attain wealth and/or position in school and/or later life.	C4. I do good schoolwork so that I can get a good job in the future. C9. I try to do well at school so that I can get a good job when I leave school. C13. I do good schoolwork so that I can have a good future. C18. I do well at school so that I can get a high-paying job later on. C22. I do my best in school because I am trying to have a good future. C27. I want to do well at school so that I can have lots of money later on.	.84
	Cognitive strategies	
Elaboration: Making connections between present and previously learned information—this may involve paraphrasing, generating analogies, and reviewing previous work.	B6. When learning things for school, I try to see how they fit together with other things I already know. B16. When learning things for school, I often try to remember what I learnt in other classes about the same or similar things. B22. I try to understand how the things I learn in school fit together with each other. B28. I try to understand how what I learn in school is related to other things I know. E2. I try to see the similarities and differences between things I am learning for school and things I know already. E3. I try to match what I already know with things I am trying to learn for school.	.73
Organization: Selecting, sequencing, outlining, reordering, or summarizing important information.	B5. I try to organize my school notes when I want to learn things for school. B10. I reorganize my schoolwork so that I can understand it better. B15. I organize what I have to do for school so that I can understand it better. B17. I use summaries to help me organize and learn my schoolwork. B23. When I want to learn things for school, I try to arrange them so that I can understand them better. E6. When I want to learn something for school, I make sure that I am organized.	.82

Rehearsal: Listing, memorizing, reciting, and/or naming facts/items to be learned.	B2. When I want to learn things for school, I practice repeating them to myself.	.76
	B8. When I want to learn things for school, I reread my notes.	
	B14. I try to memorize things I want to learn for school.	
	B20. I memorize the things I want to learn for school.	
	B26. I repeat things to myself when learning things for school.	
	B32. I reread my books when I want to learn things for school.	
	Meta-cognitive strategies	
Monitoring: Involves self-checking for understanding, self-testing, and organizing reviews of learned material—implies systematic attempt to evaluate the assimilation and organization of learned material.	B12. I often ask myself questions to see if I understand what I am learning.	.83
	E8. I try to decide what parts of my schoolwork I don't know as well as others.	
	E10. I often check to see if I understand what I have read.	
	E30. I often try to decide what parts of my schoolwork I don't know well.	
	E36. I check to see if I understand the things I am trying to learn.	
	E42. I try to make sure that I understand what I am learning.	
Planning: Involves prioritizing, time management, scheduling, setting realistic goals, and arranging work environments appropriately—implies thoughtful preparation for completing work.	E4. I often look through books to see how they are arranged before I start reading.	.81
	E5. When I want to learn things for school I pick out the most important parts first.	
	E7. Before trying to learn things for school I try to decide what the most important parts of what I am trying to learn are.	
	E9. I often plan ahead so that I can do well in my schoolwork.	
	E11. I often try to decide first what are the most important parts of what I have to learn for school.	
	E14. I try to plan out my schoolwork as best I can.	
Regulating: The strategies put in place to rectify deficits identified while monitoring—specific strategies include attempting different ways to learn material, seeking explanations from teachers, and identifying mistakes in reasoning.	E13. If I don't understand my schoolwork, I ask the teacher to help me.	.79
	E18. If I am having trouble learning something at school, I ask for help.	
	E25. When I don't understand something at school, I try to get someone to help me.	
	E34. If I get confused about something at school, I go back and try to figure it out.	
	E37. If I get confused about something at school, I try to work it out later.	
	E40. If I don't understand something in school, I go back and try to learn it again.	

Confirmatory Factor Analysis (CFA)

CFAs assess the extent to which the observed indicators (items) reflect the structure of the underlying constructs. CFAs allow the researcher to specify not only how many factors are measured by a given set of items but, also, which items function as indicators of which factors (Fleishman & Benson, 1987).

Model fit is assessed by (a) model parameter estimates and (b) a combination of model fit indices. In this study, chi-square statistic and several descriptive fit indices were used, including the Tucker-Lewis Index (TLI), the Parsimony Relative Noncentrality Index (PRNI), the root mean square error of approximation (RMSEA), and the chi-square/degrees of freedom ration.

It is generally accepted that, in good measurement models, the TLI and PRNI will be greater than 0.90 and the RMSEA will be less that 0.05. However, it should be noted that a TLI and/or PRNI of 0.90 (or greater) may not directly correspond to an RMSEA of .05 (or less) (see Hu & Bentler, 1999). For this reason, care should be exercised when interpreting models where discrepancies between the accepted values for the TLI, PRNI, and RMSEA do not directly correspond.

Higher Order CFAs (HCFAs)

First-order CFAs seek to ascertain whether various combinations of items may measure the same underlying construct or factor. In a similar way, HCFAs seek to ascertain whether various combinations of first-order factors may measure higher order factors. There are two distinct advantages in identifying higher order factors, if they exist. The first is that models may be simplified by their inclusion, that is, a smaller number of higher order factors may be shown to account for variations in and between individual items and first-order factors (Lance, Teachout, & Donnelly, 1992). The second is that the inclusion of higher order factors enables researchers to identify hierarchical relations between first-order factors (Marsh & Hocevar, 1985). If these hierarchical relations conform to relations predicted from theory, the theoretical substance of models is enhanced. One distinct disadvantage, however, of models incorporating higher order factors is that they may explain less variance in the data than first-order models. A criterion for evaluating the usefulness of higher order models, then, is the extent to which the advantages gained from model simplification are balanced by the losses incurred in the explanatory power of these models (Lance et al., 1992).

The HCFAs reported here hypothesized that:

- three academic goals (mastery, performance, and work avoidance) would reflect a second-order factor, academic goals;

- five social goals (social affiliation, approval, conformity, responsibility, present and future status, and concern) would reflect the second second-order factor, social goals;
- three cognitive strategy factors would reflect the second-order factor cognitive strategies; and
- three metacognitive strategy factors would reflect the second-order factor metacognitive strategies.

Assessing Factorial Invariance

Invariance analysis provides information about the equivalence of data structure across multiple groups (Marsh, 1993, 1994; Marsh & Hocevar, 1985). Different degrees of invariance may be assessed. The present investigation evaluates the invariance of factor structures between men and women to see if these structures are invariant in terms of factor pattern matrix across gender groups.

CFA Procedures

All cases exhibiting missing data were removed for CFA analyses. This left 702 cases available for analysis. It should be noted that (a) listwise deletion of cases may cause biases in parameter estimates and reliability estimates, and (b) other methods for dealing with missing data (such as maximum likelihood procedures) are available (Ding, Velicer, & Harlow, 1995). Despite this, listwise deletion of cases is still widely accepted as an appropriate and rigorous procedure for dealing with missing data (Bollen, 1989; Byrne, 1998; Mueller, 1996).

Following procedures used by McInerney, Marsh, and McInerney (1999), separate CFAs were used to assess conceptually distinct sets of scales relating to students' goal orientations and the scales relating to students' cognitive and meta-cognitive strategy use. All items were specified as indicators of only one factor, and the uniqueness of each item was modeled to be independent. The factor correlations (correlations between the eight goal orientation and six strategy scales) were allowed to freely associate with each other.

All analyses were conducted using LISREL 7, and all parameters were estimated using the maximum likelihood procedure. An underlying assumption of maximum likelihood estimation procedures is that responses are normally distributed (Hu, Bentler, & Kano, 1992). As is common in psychometric research, however, responses to the GOALS-S were not normally distributed. (In general, responses to the GOALS-S were negatively skewed and moderately leptokurtic.) Fortunately, however, maximum likelihood estimation procedures appear to be robust with respect to violations of normality, particularly in relation to parameter estimates and goodness-of-fit indices (Hu et al., 1992; Joreskog & Sorbom, 1993; Muthen & Kaplan,

1985). In fact, to the extent that estimation problems are associated with nonnormality, parameter estimates and observed goodness-of-fit measures tend to indicate a poorer fit if data are nonnormally distributed (Hau & Marsh, 2000). For this reason, nonnormality does not appear to be a significant problem with respect to maximum likelihood estimation procedures.

Results

Models for Goal Orientation Scales

The results for the initial goal orientation model (M1) indicate that this model fitted the data only marginally well. The chi-square/degrees of freedom ratio for M1 is greater than 2, the TLI is less than 0.9, and the RMSEA is only marginally less than 0.05. The PRNI, however, is greater than 0.9, and the solution as a whole was proper (i.e., no negative factor variances or other impossible parameters were identified).

Closer inspection of the factor loadings, uniquenesses, and modification indices (indices which measure the extent to which items load on factors other than the factor on which they were hypothesized to load) associated with the estimated model (M1) indicated that several items in the hypothesized model fit the data poorly. These 12 items displayed factor pattern coefficients less than 0.5, uniquenesses greater that 0.7, and maximum modification indices greater than 20.0. These items were removed from their respective scales.

Once the 12 poorly fitting items were removed, the new goal orientation model (model for best 36 items, or M2) was evaluated. This model showed a good fit with the data. The chi-square/degrees of freedom ration is less than 2, the TLI and PRNI are both greater than 0.9, and the RMSEA is substantially less than 0.05. Thus, removing the poorly fitting items from the original model substantially improved the models overall fit with the data.

Models for Cognitive and Metacognitive Strategy Scales

The results for the initial strategy model (M3) showed that this model fit the data reasonably well. The chi-square/degrees of freedom ratio for M6 is greater than 2, but not substantially so, the PRNI is greater than 0.9, the RMSEA is less than 0.05, and the solution as a whole was proper. However, the TLI was less than 0.90.

Inspection of the factor pattern coefficients, uniquenesses, and modification indices associated with M3 again indicated that several items in the hypothesized model fit the data poorly. These 8 items displayed factor pat-

Table 2
Model Fit Statistics for Goal Orientation and Learning Strategies Survey (GOALS-S) Scales

Model	χ^2	*df*	χ^2/df	TLI	PRNI	RMSEA	Model Description
Models for goal orientation scales							
M1	2,777.28	1,052	2.64	.864	.916	.048	Hypothesized model
M2	1,007.48	566	1.78	.908	.962	.041	Model for best 36 items
Models for cognitive and metacognitive strategy scales							
M3	1,277.59	579	2.21	.881	.937	.045	Hypothesized model
M4	455.6	335	1.36	.923	.981	.039	Model for best 28 items
Higher order models							
M5	1,030.45	557	1.85	.904	.959	.042	Goal orientations (36 items, 2 higher order factors)
M6	488.72	328	1.49	.916	.980	.038	Strategies (28 items, 2 higher order factors)
Tests of invariance for higher order models (invariant factor matrix)							
M7	875.58	521	1.68	.913	.970	.039	Goal orientations (women)
M8	998.63	521	1.92	.901	.959	.042	Goal orientations (men)
M9	421.50	300	1.41	.920	.981	.038	Strategies (women)
M10	462.38	300	1.54	.913	.975	.039	Strategies (men)

Note. TLI = Tucker-Lewis Index; PRNI = Parsimony Relative Noncentrality Index; RMSEA = root mean square error of approximation.

tern coefficients less than 0.5, uniquenesses greater that 0.7, and maximum modification indices greater than 20.0, and were removed from their respective scales.

Once the 8 poorly fitting items were removed, the new strategy model (best 28 items, or M3) was evaluated. This model showed a good fit with the data. The chi-square/degrees of freedom ratio is less than 2, the TLI and PRNI are both greater than 0.9, and the RMSEA is substantially less than 0.05. Thus, removing the poorly fitting items from the original model substantially improved the model's overall fit with the data.

Models for Higher Order Factors

Results of the HCFAs (Models M5 and M6) indicated that the higher order models for goal orientations and strategies fit the data well. Both solutions were proper, and all indices fell within the range indicating good fit. These results support the contention that a hierarchical structure of goals and strategies is indicated by the present data. Moreover, as both higher order models fit the data nearly as well as their corresponding first-order models, they may be accepted as a more parsimonious account of the data.

Test of Model Invariance

Given that the higher order models fit the data nearly as well as the first-order models, these were used in testing for invariance between men and women. The tests of invariance for the goal orientation and strategy higher order models constrained the factor pattern coefficients in these models to be invariant across groups. The tests of invariance for women (Models M7 and M8) and men (Models M9 and M10) all showed good fit with the data, with all indices falling within acceptable ranges. This indicates that the higher order models for the goal orientation and strategies can be considered invariant across gender groups. However, in both cases the models for men fit the data less well than the models for women. In particular, the TLI for the male goal orientation model (M8) is only marginally above 0.9. Nevertheless, the overall picture is that the factor structure of the higher order models, with the constraint of the factor pattern matrix being invariant, is consistent across groups.

Tables 3 and 4 present the factor pattern and structure matrices, as well as the interfactor correlations for the goal orientation and cognitive strategy scales. Table 5 presents the second-order factor loadings and correlations for the higher order factor models.

Table 3
Factor Pattern and Structure Coefficients and Factor Correlations for Goal Orientation and Learning Strategies Survey (GOALS-S) Orientation Scales

	Mastery	Performance	Work Avoidance	Social Affiliation	Social Approval	Social Responsibility	Social Status	Social Concern
D2	*.84*	.28	.22	.13	.12	.08	.12	.09
D11	*.80*	.29	.23	.14	.13	.09	.13	.10
D14	*.80*	.29	.23	.13	.14	.10	.13	.11
D22	*.79*	.31	.25	.15	.15	.11	.14	.12
D24	*.80*	.29	.23	.14	.13	.10	.13	.10
D3	.27	*.86*	.19	.09	.10	.12	.08	.07
D6	.30	*.76*	.22	.12	.12	.14	.10	.10
D9	.29	*.80*	.20	.11	.11	.13	.09	.08
D12	.30	*.78*	.21	.11	.11	.14	.10	.08
D15	.29	*.78*	.20	.12	.12	.14	.10	.09
D7	.21	.17	*.87*	.09	.10	.08	.07	.12
D13	.25	.21	*.76*	.12	.12	.12	.09	.14
D16	.26	.22	*.74*	.12	.13	.12	.10	.15
D19	.25	.21	*.77*	.11	.12	.11	.09	.14
D23	.22	.19	*.82*	.10	.10	.09	.08	.13
C1	.14	.12	.14	*.80*	.29	.32	.23	.37
C6	.13	.10	.12	*.86*	.27	.30	.21	.33
C11	.13	.11	.12	*.84*	.26	.31	.21	.34
C16	.15	.12	.15	*.79*	.30	.29	.24	.37
C3	.14	.10	.10	.27	*.84*	.33	.27	.30
C8	.14	.11	.11	.30	*.81*	.34	.27	.31
C21	.13	.10	.09	.26	*.86*	.32	.26	.29
C26	.15	.12	.11	.29	*.79*	.36	.28	.33
C5	.10	.14	.10	.33	.35	*.80*	.20	.36
C10	.09	.13	.09	.32	.34	*.88*	.19	.35
C15	.11	.14	.10	.33	.34	*.83*	.20	.36
C25	.13	.16	.10	.35	.37	*.76*	.21	.39
C4	.14	.11	.10	.24	.28	.22	*.81*	.20
C13	.15	.12	.12	.25	.29	.23	*.79*	.21
C18	.12	.09	.09	.21	.25	.19	*.87*	.18
C22	.11	.09	.09	.21	.25	.19	*.90*	.17
C27	.15	.11	.12	.24	.29	.22	*.80*	.20
C14	.12	.10	.15	.38	.33	.39	.20	*.77*
C19	.10	.08	.12	.35	.30	.36	.18	*.85*
C24	.10	.09	.13	.37	.31	.37	.19	*.82*
C28	.09	.07	.12	.33	.29	.34	.17	*.88*
Factor correlation (phi) matrix								
Mastery	1.00							
Performance	–.37	1.00						
Work Avoidance	.29	–.25	1.00					
Social Affiliation	.17	.13	.14	1.00				
Social Approval	.18	.14	.13	.34	1.00			
Social Responsibility	.11	.18	.11	.40	.42	1.00		
Social Status	.17	.12	.11	.27	.32	.24	1.00	
Social Concern	.12	.09	.16	.43	.38	.44	.22	1.00

Note. Italicized numbers are the factor pattern coefficients (i.e., the factor loadings) for each item with its designated factor. Nonitalicized numbers are the factor structure coefficients (i.e., the correlations) of each item with its nondesignated factors. For the present model, the factor pattern and factor structure coefficients are equal for the items with their designated factors.

Table 4
Factor Loadings, Item-Factor Correlations, and Factor Correlations for Goal Orientation and Learning Strategies Survey (GOALS-S) Cognitive and Metacognitive Strategy Scales

	Rehearsal	Elaboration	Organization	Planning	Monitoring	Regulating
B2	*.83*	.43	.37	.23	.24	.22
B8	*.82*	.43	.37	.24	.25	.21
B14	*.90*	.40	.35	.22	.23	.19
B20	*.84*	.42	.36	.23	.24	.21
B26	*.78*	.44	.39	.25	.26	.24
B16	.42	*.81*	.44	.17	.12	.11
B22	.43	*.81*	.43	.18	.11	.11
B28	.43	*.80*	.44	.18	.12	.12
E2	.38	*.92*	.40	.15	.09	.09
E3	.43	*.82*	.43	.17	.12	.11
B10	.36	.35	*.90*	.25	.24	.32
B17	.37	.38	*.87*	.26	.25	.33
B23	.39	.39	*.83*	.27	.26	.34
E6	.36	.35	*.90*	.25	.24	.32
E4	.26	.18	.26	*.80*	.40	.39
E5	.25	.18	.26	*.83*	.40	.38
E7	.23	.17	.25	*.90*	.38	.37
E9	.20	.16	.24	*.95*	.35	.36
E11	.27	.19	.27	*.79*	.42	.41
E8	.23	.09	.23	.35	*.89*	.35
E10	.24	.10	.23	.36	*.87*	.36
E30	.27	.11	.26	.44	*.75*	.42
E36	.24	.09	.22	.36	*.88*	.36
E13	.19	.09	.30	.36	.38	*.88*
E18	.20	.11	.32	.37	.39	*.83*
E34	.21	.12	.33	.38	.41	*.80*
E37	.20	.13	.32	.36	.39	*.84*
E40	.20	.12	.31	.37	.40	*.82*
Factor correlation (phi) matrix						
Rehearsal		1.00				
Elaboration		.52	1.00			
Organization		.43	.54	1.00		
Planning		.28	.20	.30	1.00	
Monitoring		.30	.12	.29	.50	1.00
Regulating		.24	.14	.38	.45	.47	1.00

Note. Italicized numbers are the factor pattern coefficients (i.e., the factor loadings) for each item with its designated factor. Nonitalicized numbers are the factor structure coefficients (i.e., the correlations) of each item with its nondesignated factors. For the present model, the factor pattern and factor structure coefficients are equal for the items with their designated factors.

Discussion

Several important features of the GOALS-S emerge from the results reported above. First, the analyses support the factorial validity of the first-order structure of the GOALS-S. This finding supported the hypothesized

Table 5
Factor Pattern Coefficients for Goal Orientation and Learning Strategies Survey (GOALS-S) Higher Order Models

Second-Order Factor	First-Order Factor	Factor Pattern Coefficients	Squared Factor Pattern Coefficients
Goal orientations higher order model (M9)			
Academic goals	Mastery	.83	.68
	Performance	.84	.71
	Work avoidance	.81	.65
Social goals	Affiliation	.75	.57
	Approval	.79	.62
	Responsibility	.73	.53
	Status	.78	.61
	Concern	.66	.44
Cognitive strategies	Rehearsal	.83	.69
	Elaboration	.76	.58
	Organization	.69	.47
Metacognitive strategies	Planning	.79	.62
	Monitoring	.85	.73
	Regulating	.89	.79

factor structure for students' academic and social achievement goals and their cognitive and metacognitive strategies. Moreover, the overall GOALS-S model fit is substantially better than some other instruments extant in the literature (as reviewed earlier in this article). Both points are important because a key objective of the present study was to develop a single instrument capable of measuring this range of constructs and to determine whether this instrument measured these constructs better than existing instruments.

Second, the results supported the second-order model structure of the GOALS-S. This finding is important because it showed that students' goals and strategies are multidimensional and hierarchical in structure, and the conceptual distinction between students' goals (academic and social) and their strategies (cognitive and meta-cognitive) is supported.

Given this, the GOALS-S may provide a means by which researchers can further investigate students' multiple goals and strategies and the ways these may interact to influence students' motivation, cognition, and achievement. The hierarchical structure of the GOALS-S may also provide researchers with a means of constructing more parsimonious models of student motivation and cognition through the use of fewer higher order latent factors that subsume individual goals and strategies at the first-order level.

Third, the results support the factorial invariance of the second-order models across gender groups. This finding is important because it addresses

the concern that women and men may respond differently to items/scales that measure their achievement goals and strategies.

Finally, the findings from the present sample provides support that the GOALS-S is a psychometrically sound instrument for use with middle and senior school students. This is important because, as indicated previously, other instruments measuring students' goals and strategies have largely been developed with postsecondary students. Thus, these instruments may not be suitable for use with high school students. Future research will be necessary, however, to evaluate the generalizability of the findings when the instrument is used in samples of different populations.

Limitations of the Study

The primary limitation of the present study is that the modified first-order models (M2 and M4) and second-order models (M5 and M6) were not evaluated by using independent samples. When model modifications are made on the basis of result of initial CFAs, it is often necessary to assess the validity of these modified models with new data. Despite this, testing modified models with current data is an acceptable, if not ideal, procedure (Marsh, 1993; Marsh & Hocevar, 1985; McInerney et al., 1999). This acceptability is primarily generated by the practical difficulties involved if new data sets need to be collected for every new model that is to be tested (Hayduk, 1987; Mueller, 1996). Nevertheless, a clear direction for future research will be to evaluate the modified models in other comparable samples.

Conclusion

The present research provides support for the GOALS-S as a psychometrically sound measure of middle and senior school students' academic and social goal orientations and their cognitive and metacognitive strategies. Moreover, in doing so, the present study also provides support for the multidimensionality and hierarchical structure of students' goals and strategies. Finally, the present study provides support for the factorial invariance of the GOALS-S across gender groups. For these reasons, the present research makes a useful and necessary contribution measurement of high school students' motivational and cognitive processes.

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