TESTING A SOCIAL-COGNITIVE MODEL OF ACHIEVEMENT MOTIVATION

by

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A Dissertation Submitted to
the Faculty of The Graduate School at
The University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

Greensboro
1996

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3/25/96
Date of Acceptance by Committee

3/25/96
Date of Final Oral Examination

D'AGOSTINO, CYNTHIA ANNE FRASCO, Ph.D. Testing a Social-Cognitive Model of Achievement Motivation. (1996)
Directed by Dr. B. Kay Pasley. 86 pp.

The purpose of the research was to test a proposed conceptual model of mathematics achievement motivation. The model suggests that students' positive beliefs and cognitions about self and context result in mastery goal orientations and expectancies for success, a relationship moderated by beliefs about ability (self-efficacy). In turn, mastery goal orientation and expectancies positively affect process cognitions (e.g., better learning strategies, preference for challenging tasks, increased effort and persistence), and these cognitions affect mathematics performance outcomes (e.g., more time spent on work and academic activities, better grades). On the other hand, if a student comes to an academic situation with negative beliefs about self and/or context, he or she is more likely to have performance goal orientations and expectancies for failure. These are believed to negatively affect process cognitions (e.g., less effective strategies, preference for easy tasks, decreased effort and persistence) and results in mathematics performance outcomes that reflect a lack of motivation to achieve (e.g., less time spent on work, little or no time spent on academic activities, lower grades and test scores).

The sample was drawn from National Education Longitudinal Study (NELS) and included 2,254 students who were in-school (in or out of grade) and who completed all relevant items in the 8th, 10th, and 12th grades. These data allowed an examination of the model over time.

The results showed that beliefs about self, context, and efficacy related positively to mastery orientation, expectancies for future success, and strategy use. These were related positively to mathematics achievement outcomes. In contrast, performance orientation was negatively linked to the other variables in the model. Also, the results showed that beliefs about self and context, self-efficacy, expectancies, strategy use, and

mathematics achievement outcomes did not change from 8th to 12th grade. Goal orientation, however, was not stable over time, suggesting that this may be responsive to contextual influences.

ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to the members of my committee. I feel most fortunate to have been able to associate with such gifted individuals to guide and encourage me:

Kay Pasley, who has taught me more about the writing process than anyone else in my educational career.

John Hattie, who freely gave his extraordinary gifts of time and patience during the months of data analysis.

Jackie Gray, who has seen me through this process from the beginning of my Master's degree and now the completion of my Dissertation. I will always be grateful.

Jim Watson, who has helped me develop confidence, keep my sense of humor and stay motivated to get this far.

I would also like to express my appreciation to my family for their enduring support and encouragement through the last few years. My thanks to my children, Cristina, Steven, and Anthony, who probably have wondered at times if they had a mother anymore; and especially to my husband, Phil, without whom I could never have achieved this goal.

This research was supported by a grant from the American Educational Research Association which receives funds for its "AERA Grants Program" from the National Science Foundation and the National Center for Education Statistics (U.S. Department of Education) under NSF Grant #RED-9452861. Opinions reflect those of the authors and do not necessarily reflect those of the granting agencies.

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INTRODUCTION

Children come into the world curious, willing to explore, and actively involved with the people, objects, and physical properties around them. They approach this new environment with enthusiasm for learning and persistence in attempts to master new skills. As they grow older, some children continue to display a desire and motivation to learn and master new things, but others do not. These differences in children's motivation often are observed in school.

As American students appear to fall further and further behind their German, Japanese, and Chinese counterparts in academic achievement, motivation becomes an increasingly important area of study. Interestingly, it is often assumed that students who work less on academic tasks are unmotivated. It may be, however, they simply are motivated toward the achievement of different goals than those the educational system or the teacher have outlined. This would suggest that teachers have an opportunity and a responsibility to maximize students' motivation toward academic achievement and learning (Stipek, 1993).

What is motivation to learn? Historically, there are many theories relating to motivation. Some of these are still in the skeletal stages, while others are more comprehensive. For further reading about these various theories of motivation see Arkes and Garske (1977), Atkinson and Birch (1978), Beck (1978), Weiner (1989), Petri (1986), and Simon (1976). Importantly, researchers believe they have made some inroads into understanding motivation; however, they continue to struggle with the concept, how and why it originates, and what makes it work.

Theorists and researchers have tried to condense the concept of motivation to learn into one or two constructs that best explain it. For example, motivation has been explained by White (1959) through his theory of effectance motivation, by Weiner (1979, 1982) through his theory of attributions for success and failure, and by Rotter (1966) through his theory of locus of control. Whereas each of these individual concepts has made a valuable contribution to our understanding of students' motivation, more recent efforts suggest that achievement motivation is complex, and the use of simple models to explain achievement motivation are inadequate.

The notion of motivation as a unidimensional concept is questioned by findings of correlations between motivation to learn and other constructs such as self-concept measures, locus of control, and attitudinal measures. Therefore, social cognitive theories suggest that motivation to learn includes several cognitive and affective components and that a combination of some of them is needed to provide a more thorough understanding of motivation to learn (Bandura, 1986; Stipek, 1981, 1993). The purpose of this study was to examine this complexity by testing a more comprehensive conceptual model of achievement motivation.

Purpose

A conceptual model is proposed and tested. The model suggests that certain beliefs and cognitive processes affect achievement motivation. Specifically, the model suggests that students' positive beliefs and cognitions about self, as well as their beliefs and cognitions about context, are related to mastery goal orientations and expectancies for success. As suggested in the model, the student's analysis of the task (e.g., materials available, salience and novelty of the task, difficulty of the task, required steps to complete the task, etc.) and their established cognitive skills and beliefs about their ability (self-efficacy) affect the relationship between beliefs about self/context and goal orientation and expectancies. Mastery goal orientation and expectancies, in turn, are positively related to process cognitions, including better learning strategies, preference for challenging tasks, and increased effort and persistence. These cognitions affect mathematics performance outcomes (e.g., more time spent on work and academic activities outside of school, better grades).

On the other hand, if a student comes to an academic situation with negative beliefs and cognitions about self and/or about context, he or she is more likely to have performance goal orientations and expectancies for failure. These are believed to be related to the use of less effective learning strategies, preference for easy tasks that they are more likely to succeed in completing, and a decline in effort and persistence. Mathematics performance outcomes that indicate a lack of motivation to achieve, such as less time spent on work, little or no time spent on any academic activities outside of school, and lower grades and test scores, result.

CHAPTER 2

REVIEW OF THE LITERATURE

The purpose of this chapter was to review the literature pertaining to social cognitive theory, in which the model is grounded, and the key constructs noted in the model and their relationship to motivation to learn. The chapter focuses on relevant current research findings and provides support for the conceptual model being tested.

Social Cognitive Theory

Many theorists recognize that reinforcement and punishment could have tremendous effects on behavior. They oppose, however, the notion that individuals simply respond passively to environmental contingencies and are totally regulated by external forces. Therefore, social cognitive theory was developed as an alternative to strict reinforcement theory (Bandura, 1977, 1986).

According to social cognitive theory, the effects of the environment on behavior are assumed to be affected by cognitions. One's reinforcement history is filtered through personal memory, interpretations, and biases, having no direct effect on behavior. The resulting beliefs about future reinforcement are thought to be more important determinants of behavior than actual reinforcement histories (Bandura, 1977, 1986; Rotter, 1966).

Evidence for this perspective is provided by the findings of Deci (1971) and Anderson, Manoogian, and Reznick (1976). Here individuals' behaviors are not affected by previous reinforcement because individuals did not engage in a behavior if they believed that previously reinforced behavior would not be reinforced again. Rather than viewing humans as automatically behaving because of previous reinforcement contingencies, social cognitive theorists view individuals as active processors of events who develop expectations regarding reinforcement.

According to Bandura (1986), the capacity to use symbols, especially language, provides humans with a powerful tool for dealing with their environment and controlling their own behavior. Environmental influences are processed and transformed into symbols that have lasting effects on behavior. These cognitive representations of behavior and their consequences serve as a guide for future behavior. In addition, the cognitive capacities for symbolic representation and forethought (e.g., goals and expectations) allow people to persist in their efforts without regular reinforcement.

Finally, people do not behave just to satisfy the desire of others. Although self-regulatory functions can result from or be supported by external reinforcement, behavior often is internally motivated and regulated by personal standards and self-evaluative reactions to one's own actions (Bandura, 1977, 1986, 1989a, 1989b, 1990, 1993; Deci & Ryan, 1992). Bandura (1986) goes on to suggest that while very young children are primarily motivated by the immediate effects of their actions, symbolic incentives and the desire to master tasks become increasingly motivational as the child matures. It is at this point that a sense of personal efficacy and the self satisfaction that accompanies it is believed to become a powerful motivator.

The Conceptual Model

The conceptual model appears in Figure 1. From a social cognitive perspective, factors that influence motivation include: beliefs and cognitions about the self, the level of one's competence, confidence in and perceptions of ability, the nature of intelligence (whether it is malleable or fixed), and one's interests and values (what is important and enjoyable to the individual). In addition, beliefs and perceptions about contexts include situational cues (the nature of the task, the salience of the task, the evaluator, potential rewards, etc.), perceptions of the teacher, perceptions of the learning environment, and perceptions of the parents.

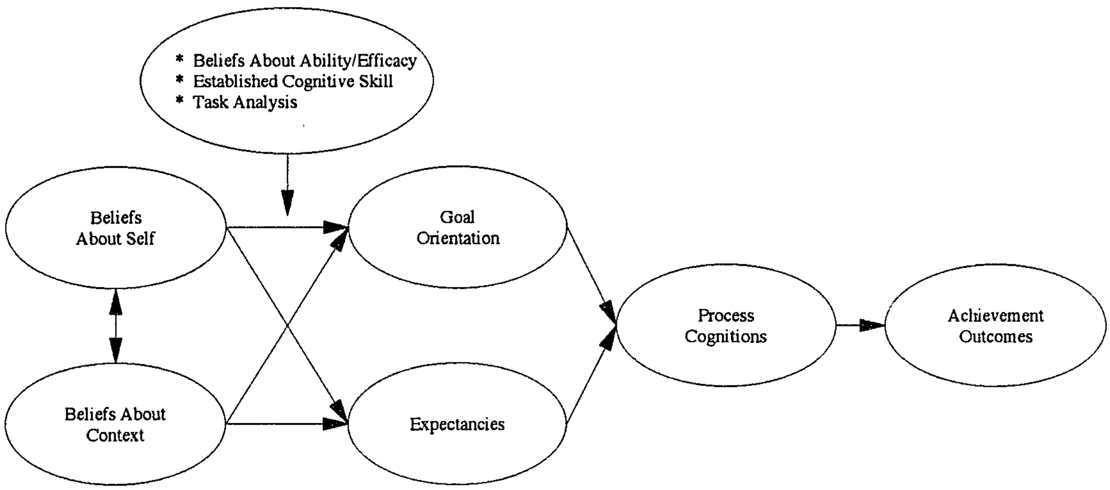
The proposed conceptual model includes several key variables: (a) beliefs and cognitions about self, including self-worth, beliefs about the nature of intelligence, competence level, outcome attributions, and perceived autonomy and control; (b) students' beliefs and cognitions about context, including teacher beliefs about the nature of intelligence, teacher goal orientations, and teacher expectations; (c) students' goal orientations that reflect mastery and performance; (d) students' expectancies for future academic success or failure; (e) cognitive processes, including learning strategies; and (f) motivation and performance outcomes as they relate to mathematics.

The model to be tested suggests that students' positive beliefs and cognitions about self and context, result in mastery goal orientations and expectancies for success. The student's analysis of the task and their established cognitive skills and beliefs about their ability (self-efficacy) moderate the relationship between beliefs about self/context, goal orientation, and expectancies. Mastery goal orientation and expectancies, in turn, lead to related process cognitions, including better learning strategies, preference for challenging tasks, and increased effort and persistence. These cognitions positively affect performance outcomes (Bandura, 1986; Boggiano, Main, & Katz, 1986; Dweck & Leggett, 1988; Harter & Connell, 1984; Locke & Latham, 1990).

On the other hand, if a student comes to an academic situation with negative beliefs and cognitions about self and/or about context, he or she is more likely to have performance goal orientations and expectancies for failure. These are believed to lead to the use of less effective learning strategies, preference for easy tasks, and dimished effortand persistence. These cognitions negatively affect performance outcomes. The key factors in the model and the related research are discussed below.

Figure 1

Conceptual Model of Achievement Motivation



Beliefs and Cognitions About the Self

Some researchers believe that the self-system is at the heart of motivation and action. Theoretically, when one wants, intends, or has a goal to achieve something, it is the self (the "I" and the "me") that has the desire, the intent, or the goal. It also is these self-relevant representations that are the instigators of motivated or goal-directed behavior (Mead, 1934).

According to Neisser (1988), self-concept refers to the notions that originate in social life that one has of himself or herself as a person in the world. He suggests that these beliefs about oneself reflect a cognitive model that is based upon what one is told or assumes and one's own observations. He suggests that this cognitive model includes our own notions of how we fit into society, how we view our bodies and minds, and personal beliefs such as whether we think we are attractive or ugly, or intelligent or stupid.

Finally, Neisser (1988) suggests that possible "selves," or the way we see ourselves in the future or past, are the cognitive/affective elements that inspire and direct self-relevant actions. Thus, motivated behavior depends on one's attributions, expectancies, and beliefs about the outcome, as well as the element that is psychologically experienced and a durable aspect of consciousness, or a possible self. Thus, by focusing on possible selves, some researchers believe that they are phenomenologically close to the actual thoughts and feelings that individuals experience as they are in the process of motivated behavior and instrumental action (Markus & Ruvolo, 1989).

Together, all of these aspects of self make up a general self-concept. Theorists indicate that beliefs about self is an important concept in academic situations and is, therefore, included in the conceptual model (Wigfield & Karpathian, 1991). Since self is difficult to measure, several components have been included as indicators: self-worth, students' perceptions of the nature of intelligence, interests and values, perceptions of competence level, outcome attributions and perceived autonomy and control.

Self-Worth

Covington (1984) suggests that students' emotional reactions and feelings of self-worth in achievement situations are influenced by the implications outcomes have for perceptions of ability (i.e., whether outcomes make them look competent or incompetent). Failure fosters feelings of shame and distress when the student believes that it reflects low ability. Thus, students may believe that negative feelings can be minimized by putting forth little effort or by appearing to put forth little effort (Raynor & McFarlin, 1986).

Covington and Omelich (1979a) found that students preferred to risk punishment for lack of effort. Their reasoning was that if they failed a test they preferred to think of themselves as able but having not tried, because greater effort in the face of failure might cast some doubt on their ability. In another study, however, these investigators showed that if students were successful, high effort did not lower ratings of competence (Covington & Omelich, 1979b). This suggests that greater effort does not involve a risk for students who expect to succeed.

Intelligence

Dweck and Elliott (1983) show that students have two concepts of intelligence. The entity concept suggests a stable, individual trait that cannot be altered. In contrast, an instrumental-incremental concept of intelligence reflects the belief that intelligence can be increased through study, practice, and effort. It also is more task specific, so ability in one area is not necessarily related to ability in another area. These concepts of intellectual ability have important implications for achievement behavior and the tasks in which students choose to engage (Dweck, 1989).

According to Dweck (1989), the goal of students with an entity concept is not to learn but to appear smart, and they probably have performance goals. Thus, if one is relatively confident about his or her ability, the tasks selected will allow for demonstration of ability but will have little risk of failure or are so difficult that failure will not necessarily be attributable to low ability. If these students lack confidence in their ability, they are more likely to avoid achievement situations, especially if their lack of ability were to become known. They believe that their inability to succeed cannot be corrected by practice or effort.

Children who hold an entity theory of intelligence and performance goals, especially if they have confidence in their intelligence, are more likely to exhibit a learned helplessness pattern of behavior in problem-solving contexts. In other words, when faced with setbacks or failure, they tend to attribute it to a lack of ability, to experience negative affect, and to exhibit a deterioration in performance (M. Bandura & Dweck, 1985; Elliott & Dweck, 1988; Diener & Dweck, 1978).

The goal of students with an instrumental-incremental concept of intelligence is to increase their skill level rather than to look smart, and they probably have mastery goals (Dweck, 1989). If they fail, students with an instrumental-incremental concept believe that their chances for future success can be increased through practice and effort. They also tend to select tasks that are moderately difficult and more likely to result in learning as opposed to easy tasks that require little effort or difficult tasks that may be impossible to complete. They also exhibit mastery-oriented behaviors, such as an intensification of effort, the use of effective learning strategies, and persistence when faced with difficulty (Dweck & Leggett, 1988). In addition, children with an instrumental-incremental theory of intelligence and mastery goals are more likely to display mastery-oriented behavior patterns, whether or not they are confident in their intelligence (Dweck, 1989).

Interests/Values

Research shows that even if they expect to succeed, individuals at all ages will not engage in achievement-related activities if they do not value the success. Feather (1988) found that college students' perceptions of the value of math as compared to English was a strong predictor of whether or not they chose to enroll in math courses.

Feather also suggested that values affect the amount of effort put into activities. For example, children who place more value on athletics than academics often put forth more effort in sports and report a greater sense of pride or shame as a consequence than as a result of classroom performances. Even within the arena of academics itself, there is variation in the value placed on competence and success in different subject areas. For example, chemistry often is valued more highly than is sociology. Thus, a student may put forth greater effort in a chemistry class than in a sociology class (Hattie, 1992).

Constructs such as the liking of tasks, the importance of the tasks to the individual, and the possible future usefulness of those tasks are referred to as students' achievement values. Eccles (1983) proposed three kinds of values important to achievement:

1. Attainment value is the degree to which one feels that doing well is important and fulfills his or her needs.

2. Utility value is the usefulness of a task in attaining goals that might not be related to the immediate task. For example, for a student hoping to attend medical school, a high grade in biology would have greater utility value than someone interested in architecture.

3. Intrinsic value is the immediate enjoyment one gets from doing a task.

Weiner (1986) suggested that individuals look for opportunities to experience feelings such as pride, and they avoid situations in which they are more likely to experience feelings such as shame or embarrassment. Therefore, if an achievement situation is expected to provide a sense of pride, the situation will have more value than one in which the individual expects to experience feelings of shame.

Competence Level

Harter and Connell (1984) identify the importance of competence as perceived by the individual and define it as the knowledge one claims to have about who or what is responsible for his/her successes and failures. Research has shown that individuals' beliefs about his/her competence level are related to his/her interests and values. Mac Iver, Stipek, and Daniels (1991) assessed junior and senior high school students' feelings of competence and interest in a particular subject at the beginning and the end of a semester. They found that if perceived competence changed, interest changed in the same direction. Their findings suggest that learning contexts that increase feelings of competence enhance motivation, while those that increase feelings of incompetence decrease motivation.

Outcome Attributions

Self-attributions of achievement to effort, ability, task difficulty, and luck have been found to affect motivation, expectancy of success, and confidence (Wagner, Powers, & Irwin, 1986). Weiner (1979, 1985, 1986) posits that most individuals view effort as being under their personal control, but they see ability as being out of their control. Presumably we have no control over luck, but we can control how much effort we exert. Outcomes that are consistent with past performance will probably be attributed to stable causes such as ability. However, if present outcomes are inconsistent with outcomes in the past, an individual is more likely to attribute it to unstable causes, such as effort, luck, or task difficulty (Stipek, 1993).

Some antecedents of attributions emphasize situational factors that affect students' attribution judgments. Weiner (1979, 1980, 1985, 1986) claimed that individuals make attribution judgments based primarily on current information in a particular achievement situation. Previous experience in similar contexts is relevant, but it is not the only thing the student considers. This would suggest that schools should be able to manipulate the current classroom environment to change students' causal attributions (Stipek, 1993).

Attribution theory (Weiner, 1979, 1980, 1985, 1986) emphasizes cognitive information processing as crucial to the understanding of behavior. The attribution approaches generally acknowledge the importance of motives in generating attributions and the role of attributions in the future direction of behavior. Thus, the attribution of past success to high effort may serve to motivate future achievement behavior.

Perceived Autonomy and Locus of Control

Rotter (1966) defines locus of control as the extent to which a person perceives rewards as being a consequence of his or her own actions (internal locus of control) or whether the reward is perceived as a consequence of some external force such as chance, luck, or fate (external locus of control). He suggests that individuals who have high internal locus of control tend to be more intrinsically motivated, and some reserach supports this.

Studies have found that students bring with them their own generalized belief system about achievement situations based on past experiences that may lead to the development of an external locus of control. For example, students who fail repeatedly no matter how much effort they exert often think that effort is not a contingency of success and will give up easily in future achievement situations. The generalized belief that they have no personal control may be a dominant influence even when faced with disparate information in new situations (Bandura, 1986; Deci, 1971; Deci & Ryan, 1985, 1990, 1992; Ford, 1992).

Weisz (1986) proposed two processes by which individuals seek a sense of control. Primary control is an attempt to change existing contexts to accommodate personal desires. Secondary control is an attempt to make personal adjustments in expectations, goals, or wishes to conform to existing situations. Weisz suggested that there may be stable individual and cultural differences with regard to which process is used. In addition, the distinction between these control processes also may have important implications in classroom settings. For example, students who do not experience a sense of primary control have the option of pursuing secondary control by lowering their expectations or changing their goals. By using this secondary control strategy students have the potential to develop a general feeling of control overall so the potential for achievement motivation remains high (Stipek, 1993).

In summary, self-concept is a construct that is elusive and difficult to measure. Based on theory and research, however, self-worth, interests and values, perceptions about the nature of intelligence, perceptions about competence level, attributions about outcome, and perceptions of autonomy and locus of control are believed to be measurable aspects of beliefs about self in academic situations. Thus, they are included in the proposed conceptual model.

Beliefs and Cognitions About Context

Research has shown that students' perceptions of the teacher and specific academic environment are important in subsequent motivation to achieve (Deci & Ryan, 1992; Dweck, 1989; Schunk, 1991; Stipek, 1993). Indicators of beliefs and cognitions about context are reflected in students' perceptions of teacher beliefs about the nature of intelligence, teacher goal orientations, and teacher expectations.

Teacher Beliefs about Intelligence

Research suggests that teachers, like students, differ in their perceptions of intellectual ability as fixed or malleable. Midgley, Feldlaufer, and Eccles (1988) conducted a study demonstrating the effects of teachers' beliefs on their instructional strategies. In contrast with teachers who believed that math ability was alterable, teachers who believed that ability in math was stable also perceived themselves as less efficacious and reported a stronger need to control student behavior. They found that students were more motivated to achieve in classrooms where teachers believed that math ability could be increased.

Teacher Goal Orientations

Ames and Archer (1988) found that the more students viewed their classroom as supportive of mastery goals as opposed to performance goals, the more they reported using active learning strategies, such as planning, organizing material, and setting goals. In a similar study, Nolen (1988) found that in reading a passage from a science magazine, mastery-oriented students used strategies that led to more in-depth learning of the material, such as distinguishing important information from unimportant information, fitting new information with what is already known, and monitoring their comprehension.

Teacher Expectations

Numerous findings indicate that students' perceived confidence in their ability to achieve is affected not only by their own expectations for success but by teachers' expectations as well. Studies on effective teachers has demonstrated that students of teachers who expect children to learn attain higher levels of achievement than do students of teachers who do not hold high expectations (Cooper & Goode, 1983; Eccles & Wigfield, 1985; Finn, 1972; Jussim, 1986; Meichenbaum, Bowers, & Ross, 1969; Rosenthal, 1974; Rosenthal & Jacobson, 1968).

Beliefs About Ability/Self-Efficacy

Social cognitive motivation theorists suggest that students who do not doubt their ability (a) choose more challenging tasks, (b) exert greater effort, (c) persist more when the task is difficult, (d) feel good about themselves, and (e) attribute their successes or failures to effort rather than ability (Bandura, 1988a; Bandura & Cervone, 1986; Meyer, 1987). Therefore, beliefs about ability/self-efficacy is included in the conceptual model, and a discussion of the evidence in support of this variable follows.

Bandura (1977, 1986, 1989a, 1989b, 1990, 1993) proposed that the ability to reflect upon experiences is central to one's judgments of his/her capabilities to achieve certain goals. These personal judgments of performance capabilities are referred to as self-efficacy. In Bandura's (1986) theory, efficacy is similar to Weisz' (1986) concept of competence and Skinner, Chapman, and Baltes (1988) concept of agency beliefs. However, self-efficacy concerns specific judgments in specific situations as opposed to global perceptions that can apply to several situations.

Research demonstrates the effect of self-efficacy beliefs on achievement behavior. For example, Collins (1982) categorized students as low, average, and high in math ability based on standardized test scores. Within each group students with higher self-efficacy solved more problems correctly and chose to rework more problems solved incorrectly than did students with low self-efficacy. Thus, self-efficacy predicted achievement behavior despite actual ability level in all three groups.

Paris and Newman (1990) and Pintrich and De Groot (1990) found a strong association between positive self-efficacy, strategy use, and self-regulated learning independent of prior achievement. Even when students' prior achievement was low, if self-efficacy was high, strategy use included more attempts to connect textbook and classroom instruction, re-reading material, and making outlines.

Not only do self-efficacy beliefs lead individuals to avoid tasks and situations that they believe are beyond their capabilities and seek out activities at which they believe they can succeed, such beliefs also affect students' thoughts and behaviors during engagement in a task. Students, who lack confidence in their ability to complete a task that they have started and who do not believe that practice and effort will lead to success, may experience increased anxiety and become preoccupied with feelings of incompetence. This is especially true if their performance is to be evaluated. Thus, they become performance oriented (Bandura, 1986; Dweck, 1989). Conversely, students who believe in their competence and capabilities can concentrate on more effective problem-solving strategies and become more mastery oriented (Bandura, 1986; Dweck, 1989).

Self-efficacy also is associated with positive emotional experiences, which encourage future mastery attempts. For example, successful completion of a difficult algebra problem can generate feelings of efficacy and should produce an eagerness to try more (Wigfield & Harold, 1992).

Goal and Task Orientation

Motivation theorists have begun to recognize that students' personal goals and reasons for engaging in achievement tasks must be considered in addition to their actual behaviors in achievement contexts (Bandura, 1986; Dweck, 1986; Stipek, 1993). If students are intrinsically motivated, they will choose to work on tasks they enjoy, that help to develop valued skills, or that result in a sense of personal mastery. On the other hand, if students are extrinsically motivated, the motivation is not to learn but to experience external feedback. Thus, students may choose to work for external rewards, such as stickers, good grades or parental approval. Finally, students who do not choose to work much at all may be thought of as "amotivated" in relation to school achievement (Brophy, 1985; Stipek, 1993).

Ames and Archer (1984, 1988), Bandura (1990), and Meece (1991) relate the distinction between intrinsic and extrinsic reasons for engaging in tasks to different learning goals. These goal orientations have been referred to as "learning" or "mastery" goals and concern mastering and developing understanding of new information or skills. "Performance," "ego," or "task" goals concern outperforming others, appearing intelligent or capable to the outside world, and social recognition or approval.

Performance-oriented students are at a distinct disadvantage because those who attribute failure to low ability see no reason to put forth great effort (Dweck, 1986, 1989). Studies indicate an association between performance or mastery orientation and willingness to attempt challenging tasks. For example, Vallerand, Gauvin, and Halliwell (1986) conducted a study with 23 10- to 12-year-old boys, assigning them either a group instructed to beat the other participants or to do as well as they could on a task. The study found that those boys who were mastery oriented looked for novel ways to complete the assigned task. Performance-oriented boys, however, displayed less effort on participating in a task.

Nicholls (1983) suggested that goal orientation also influences students' attention during task engagement. Peterson and Swing (1982) observed 72 5th and 6th graders during a math lesson. As an example, one student, who appeared to be paying attention throughout the lesson, was later asked about her thoughts during the lesson. She replied, "... since I was just beginning, I was nervous, and I thought maybe I wouldn't know how to do things ..." (p. 486). After a later lesson, her response was, "Well, I was mostly thinking ... I was making a fool of myself" (p. 486). A mastery-oriented child asked the same question responded with a detailed description of the strategies she used to solve the problems.

Expectancies

Expectations for success and anticipated pride or expectations for failure and anticipated shame have been found to be highly correlated with motivation to achieve (Atkinson, 1964; Bandura, 1977, 1986; Stipek, 1993). Thus, students whose expectations for success are high for specific tasks are more likely to approach those tasks than individuals whose expectations for success are less certain. Expectancies is included in the model and is reflected in students' future academic plans.

The concept of expectancy assumes that behavior is a function of one's judgment about obtaining a goal of value. Even a highly valued goal may not produce a behavior if the expectancy of reaching the goal is small. Expectancies are believed to be created through past experiences (Korman, 1974).

Achievement-related activities are said to evoke both positive and negative affective expectations. An individual's behavior is determined by the relative strength of both of these emotional experiences. Atkinson (1964) argued that students experience more pride when they succeed at a difficult task than when they succeed at a task that has a high probability of success anyway. Therefore, the potential of receiving an "A" in a difficult course has greater incentive value than an "A" in an easy course. Further, students are thought to experience greater shame following failure on easy tasks associated with a high probability of success and less shame following failure on difficult tasks. For example, a grade of "C" in chemistry might be less humiliating than a "C" in a less difficult course. Evidence is provided by a study involving 600 students in grades 5 though 12 (Parsons, 1980). The researchers found that students were more likely to continue their study of mathematics when they expected to succeed and experienced pride in receiving a high grade for a course they believed to be challenging.

Goal expectancies that are high, stable, and resilient tend to be related to challenge seeking, effective strategy use, and positive outcomes (Cooper & Goode, 1983). However, Dweck (1989) found that children with the highest competence do not necessarily have the highest, most stable or resilient expectancies. It would appear that there is not a close or consistent link between children's ability to perform well at a task and their expectancy that they will perform well at the task.

In a study by M. Bandura and Dweck (1981) studied 31 3rd grade children divided into high- and low-confidence groups based on their expectancies to attain a certain standard on an experimental task. The standard was how many problems out of 10 they needed to get right to feel satisfied. This was compared to how many they actually expected to get right. The mean standard was 6.83, and the mean expected number right was 4.58 for the low-confidence group. For the high-confidence group, the mean standard was 4.76, and the mean expected number right was 6.40. Low-confidence children also expected more children to outperform them than did high-confidence children. The low-confidence children had significantly higher achievement test scores (mean of 82.5 percentile) than did the high-confidence children (mean of 76.1 percentile). In addition, the low-confidence children rated themselves as having greater competency than did the high-confidence children. Even though they did not have bad feelings about their abilities or their past performances, the low-confidence children had low expectancies of performance (Dweck, 1989; Phillips, 1984). Thus, being a high achiever (one who has a higher achievement test score) and knowing one is a high achiever does not appear to lead directly to high confidence in one's abilities to perform a difficult task.

Dweck (1988) suggested that the presence of failure together with the opportunity to avoid challenging subjects may eventually lead to an accumulation of skill deficits. It is possible that elementary school may not provide tasks for good students that are difficult enough to lead to failure or the opportunity of opting out of a particular subject. Therefore, there is no chance for low confidence or performance disruption under failure to occur. Only later may maladaptive tendencies have an impact on achievement, when children can choose to avoid challenging courses, drop out of courses that may lead to failure, or show debilitation of performance under real difficulty.

Process Cognitions

Learning strategies, task preference, effort, and persistence are important aspects of motivation and achievement and are affected by several student and contextual factors. They are, therefore, included in the conceptual model as process cognitions.

Learning Strategies

In a study of 84 U.S. and 85 German 4th graders, Schneider, Borkowski, Kurtz, and Kerwin (1986) found that mastery orientation was related to the use of problem-solving strategies. Students who scored high on a measure of mastery orientation in science reported that they used more active metacognitive strategies, such as going back over material they did not understand, asking questions while they worked, and relating current problems to past ones. Students who were more performance oriented used more superficial engagement strategies, such as copying, guessing, and skipping questions. Meece, Blumenfeld, and Hoyle (1988) had similar findings in a study of 275 5th and 6th grade children.

Task Preference

Several studies have supported the association between performance or mastery orientation and willingness to attempt challenging tasks. In a study of 176 junior high and high school students, Ames and Archer (1988) showed that students who considered their classroom situations to be relatively mastery oriented would select a difficult science project over an easy one, if it was more likely to result in new learning. Elliott and Dweck (1988) found that children who were mastery oriented were more likely than children who were performance oriented to choose a task that had been described as difficult but that would facilitate the development of skills. The majority of performance-oriented children chose a task that would allow them to display their competence but not teach them anything new.

Several studies have shown that children's positive emotional responses are most profound when they master moderately difficult tasks. Harter (1974, 1978) studied smiling behavior as a positive emotion in a study of 64 first grade children's responses to mastery efforts. She provided the children with anagrams (i.e., letters that can be made into words), and observers rated the intensity of the children's pleasure at the time that they solved each puzzle. The children expressed little pleasure and reported feelings of annoyance and frustration when the puzzles were extremely difficult and required a greater amount of time and effort to complete. The children also expressed little pleasure when the anagrams were easily solved. Puzzles that were challenging and required some effort, but that were solvable and not overly difficult, resulted in the most positive emotional responses.

Effort/Persistence

Students with mastery or learning goals tend to prefer tasks that are challenging and that provide them with opportunities to increase their competencies. They see intelligence as related more to effort than ability. They assume that they can achieve if they choose the right strategies and work hard enough. As a result, they persist longer than students with performance goals, and they base their judgments of personal competence on effort and the learning or mastery achieved. They also view their teachers as guides to their learning process rather than as evaluators (Ames & Ames, 1985; Ames & Archer, 1988; Dweck, 1989, 1990; Nicholls, 1983; Nicholls, Cobb, Wood, Yackel, & Patashnick, 1990; Thorkildsen & Nicholls, 1991).

On the other hand, students with performance goals are focused on either the appearance of competence or the avoidance of appearing incompetent. These students believe that intelligence is related to ability. They tend to choose only those tasks that allow them to display their abilities. However, since the goal is to appear competent not be competent, the tasks chosen tend to require less effort and do not necessarily foster learning. These students judge their competence based on external feedback of their performance as compared to others rather than on mastery or understanding. Students with performance goals view their teachers as judges rather than as valuable resources (Ames & Archer, 1988; Dweck, 1989, 1990; Nicholls, 1983; Nicholls, et al., 1990).

Performance and Motivation Outcomes

What does motivation toward academic achievement look like? What are the outcomes of motivation to learn? Stipek (1993) has suggested several behavioral outcomes from which a student's motivation to learn can be inferred. First is the student's attention, activity level, and perseverance. If students are motivated toward a specific goal, they are likely to pay attention to the subject or complete the task. In addition, a student who is motivated to achieve will probably spend more time and work harder on tasks. Thus, outcomes of achievement motivation are reflected in more time spent on performing tasks, careful attention to detail, and task completion.

Stipek (1993) also suggested that individuals who choose to return to a task on their own are presumed to be highly motivated. Examples of continuing motivation might be spending free time reading about subjects discussed in school or solving extra math problems that were not assigned. Therefore, these types of behavior outside of the school setting are reflective of achievement motivation.

Finally, even though it may be thought of as a consequence of the other indices, actual performance or the quality of work can be a behavioral indicator of motivation. A student who works hard, perseveres in the face of difficulty, and chooses to work even in the absence of external reinforcers or incentives will probably learn more and perform better than one who does not engage in these behaviors.

In the past indicators of motivation have been confounded by performance outcomes. Since some children do not do well with great effort and others do well with little effort, motivation and performance demand independent assessment (Bandura, 1986, 1989a, 1989b; Hattie, 1992; Stipek, 1993). Unfortunately, little is known empirically about these outcomes.

Summary

In summary, it is evident that low performance and low motivation do not necessarily go hand in hand. While some children perform poorly no matter how hard they try, others do well with little effort. To understand the distinction between motivation and performance it is important to consider students' reasons for their efforts, the goals they set for themselves, and their achievement-related values (Bandura, 1986; Dweck, 1986, 1989; Stipek, 1993).

Clearly, teachers and their classroom practices have a profound effect on either fostering or inhibiting students' motivation to achieve (Keating, 1990). After the first few grades in school students often develop beliefs in their abilities and a level of motivation that can be entrenched and difficult and frustrating to change. Cognitive motivation theorists and related research suggest that schools can do much to maximize motivation to achieve and guide students toward as successful and fulfilling a school career.

Motivation is an important factor in school achievement. Understanding the dynamics of motivation is a key to school achievement. According to Feather (1961, 1982), behavior is selective and, therefore, the behavior that occurs is a joint product of one's motives and one's personality characteristics. Thus, we must take into account the individual's expectations, past experiences, values, attitudes, and beliefs. Also, we must understand how these various cognitive structures interact and are reflected in the processes that guide behavior.

Few studies have attempted to combine more than one or two cognitive factors pertaining to students' motivation to achieve. As such, we lack understanding of the complexity inherent in cognitive structures and behavioral outcomes. In addition, much of the research in this area is derived from cross sectional data. The proposed conceptual model tests the link between several cognitive and contextual factors believed to affect achievement motivation, using data from a longitudinal study. The testing of this model provides the opportunity to examine the following questions: (a) Is the proposed model accurately conceptualized and (b) How do the proposed relationships change over time?

CHAPTER 3

Methods

Sample

The data for the study were drawn from the 1988 National Education Longitudinal Study (NELS:88) conducted by the National Center for Education Statistics (NCES). This study was designed to identify attributes associated with academic achievement and to provide information about transitions experienced by students over time, beginning in the eighth grade (Ingels, Dowd, et al., 1994).

The NELS base-year sample is a nationally representative, two-stage, stratified probability sample. In the first stage, from an initial pool of about 39,000 schools nationwide, a sample of 1,057 schools were selected and surveyed. The sample was stratified based on probabilities in proportion to the schools' estimated enrollment, school type (public vs. private), region of the country, urbanicity, and percentage of minority enrollment. For the second stage of sampling, an average of 26 students from each school were selected at random (Ingels, Abraham, Karr, Spencer, & Frankel, 1990). Ninety-three percent of selected students participated in the study, resulting in a final student sample of 24,599 students. (For technical information about the NELS sample, see Spencer, Frankel, Ingels, Rasinski, & Tourangeau, 1990).

Data were collected at three times: 8th grade (1988), 10th grade (1990), and 12th grade (1992). (Data collection on a fourth-wave was completed in 1994, but the data were not yet available for use.) The NELS data include information from the students, their parents, their teachers (two teachers per student), and their school administrators. Students in each wave were asked to complete a 45-minute questionnaire and an 85-minute series of achievement tests. The questionnaires were designed to collect information about various aspects of students' lives, including students' and their families' backgrounds, self-perceptions, plans for the future, school life, and school work (Ingels et al., 1990).

The sample for the present study includes in-school students (in or out of grade) who completed a questionnaire in all three waves and who had no missing data on the variables of interest (n = 2254). Only information from the student was used. Variables of interest included items reflecting the constructs in the model. Responses were weighted by the second follow-up panel weight (F2PNLWT; second follow-up student user's manual) to account for disproportionate sampling of specific subgroups.

Table 1 shows the demographic characteristics of the sample. Composite demographic variables constructed by the NELS staff were used. For example, the composite variables representing socioeconomic status (SES) were derived from parent questionnaire data (father's education level, mother's education level, father's occupation, mother's occupation, and family income). Then categories were divided into four quartiles, with 1 being the lowest and 4 being the highest.

Of the students included in the sample, 78% were classified as White/not Hispanic (n=1757), 5.1% were Black/not Hispanic (n=116), 11.1% were Hispanic (n=250), 4.5% were Asian/Pacific Islander (n=101), and 1.3% were American Indian/Alaskan (n=29). The sample was made up of 39.2% males (n=1371) and 60.8% females (n=883). The sample was divided into four quartiles representing SES: 18.1% in quartile 1 (low), 26% in quartile 2, 26.9% in quartile 3, and 29% in quartile 4 (high).

Table 1

Description of the Sample

Characteristic	Base Year N	Base Year (%)	First Follow-up N	First Follow-up (%)	Second Follow-up N	Second Follow-up (%)
Race						
White/not hispanic	1746	(77.5)	1757	(78.0)	1757	(78.0)
Black/not hispanic	116	(5.1)	116	(5.1)	116	(5.1)
Hispanic	250	(11.1)	250	(11.1)	250	(11.1)
Asian/pacific islander	101	(4.5)	101	(4.5)	101	(4.5)
American indian/alaskan	27	(1.2)	29	(1.3)	29	(1.3)
Missing	14	(.6)	1	(.0)	1	(.0)
Sex						
Male	883	(39.2)	883	(39.2)	883	(39.2)
Female	1371	(60.8)	1371	(60.8)	1371	(60.8)
SES						
Quartile 1 (low)	435	(19.3)	444	(19.7)	407	(18.1)
Quartile 2	575	(25.5)	579	(25.7)	587	(26.0)
Quartile 3	590	(26.2)	580	(25.7)	606	(26.9)
Quartile 4 (high)	654	(29.0)	651	(28.9)	654	(29.0)

Key Variables in the Model

Items representing each of the constructs in the model are presented in Appendix A. These include: beliefs and cognitions about self, beliefs and cognitions about context, beliefs about ability/self-efficacy, goal orientation, expectancies, process cognitions, and achievement outcomes.

Beliefs and cognitions about self. Several areas of beliefs and cognitions were measured. Items that assess students' beliefs about the nature of intelligence, students' interests and values, students' perceptions of their competence level, and students' perceptions of control and outcome attributions were used.

To measure students' beliefs about the nature of intelligence, one item was drawn from each wave. It asked about whether the student was able to do things as well as most others. Responses ranged from strongly agree to strongly disagree on a 4-point scale. High scores represent an incremental theory of intelligence based on Dweck and Leggett's (1988) ideas.

To measure students' interests and values, no items were available from Wave 1, but there were eight in Wave 2 and nine in Wave 3. They ask about interest in school subjects and the importance of certain things (e.g., finding steady work, getting a good education). Responses ranged from strongly agree to strongly disagree on a 4-point scale or not at all important to very important on a 6-point scale. High scores represent greater interest in math, education in general, or certain implicit values.

To measure students' competence beliefs, the same three items were available in each wave. These items ask about the students' feelings about self and sense of worth. Responses range from strongly agree (1) to strongly disagree (4), and high scores represent greater beliefs about competence.

To measure students' perceptions of control, the same three items were available in all three waves. These items ask about the students' feeling regarding control over their lives and whether they feel blocked or successful in their efforts. Responses ranged from strongly agree (1) to strongly disagree (4). High scores represent perceptions of internal or personal control.

To assess students' outcome attributions, the same two items were from all three waves. These ask about the students' feelings regarding the role of luck or chance in affecting their success. Responses range from strongly agree (1) to strongly disagree (4), and high scores represent effort-based attributions.

Beliefs and cognitions about context. The focus here is on students' beliefs about the educational context and perceptions of teacher behavior. To measure students' perceptions of teachers, 5 items were taken from Wave 1, 12 from Wave 2, and 7 from

Wave 3. Responses ranged from strongly agree to strongly disagree and none to major emphasis on 4-point scales. High scores represent more positive beliefs about this context.

Beliefs about ability/self-efficacy. To assess students' beliefs about their own ability, five items were taken from each wave. These items ask about the students' feelings regarding following through with plans, feeling good, proud, and satisfied, and whether the student was able to do things as well as most others. Responses range from strongly agree (1) to strongly disagree (4), and high scores represent more positive beliefs.

Goal orientations. To assess students' mastery goal orientations, three items were taken from Wave 1, eight from Wave 2, and five from Wave 3. These items ask about whether the student is focused on the learning involved in their effort and about doing outside reading. High scores represent mastery goal orientations.

To assess students' performance goal orientations, two items were available from Wave 1, four from Wave 2, and four from Wave 3. These items ask whether the student is focused on the outcome of their effort (i.e., grades), rather than what they learn. High scores represent performance goal orientations.

Expectancies. To measure students' expectations for future success/failure, three items were from Waves 1 and 2; only one of which appeared in Wave 3. The common items ask about how far the student expects to go in school and how sure they are about this expectation. In addition, a question asking about intention to take various placement tests was asked at Waves 2 and 3. Also, at Waves 2 and 3, students were asked about their future with three items (e.g., graduate, go to college). High scores represent greater expectations for success.

Process cognitions. To measure students' use of learning strategies, no items were available in Wave 1; however, seven possible items were from Wave 2 and Wave 3. The items ask about the students use of certain learning strategies like reviewing or copying notes. Responses range from very rarely to everyday or often. High scores represent the use of more mastery learning strategies.

To measure students' task preference, one item was available from Wave 1. It asked whether the student participated in a math club. Responses ranged from did not participate to participated as an officer on a 3-point scale. One item was from both Wave 2 and Wave 3. This item asked whether the student participated in a school academic club. Responses ranged from school does not offer to participated as an officer on a 4-point scale. High scores represent preference for more challenge.

To measure students' effort and persistence, four items were drawn from all three waves. These ask about the frequency with which students came to class prepared and how much time was spent in doing homework. Responses ranged from usually to never on a 4-point scale and none to 10 hours or more on an 8-point scale. High scores represent greater effort and persistence.

Performance outcomes. To measure performance outcomes, the same three items were drawn from all three waves. They asked about standardized test scores. High scores represent students' math achievement. (Proficiency scores are based on a student weight adjusted for the condition that all students who completed the student questionnaire did not complete the cognitive tests.)

Analyses of the Model

A measurement model was specified for each construct by investigating the factor structure and reliability (coefficient alpha) of the items. This led to refining the item pool to ensure that there was only one factor per dimension for each data wave.

More specifically, preliminary analyses based on theory and statistical results were used to select and create the latent variables. First, the student surveys were reviewed to find potential items that measured the constructs of interest. Next, factor analyses and reliabilities (coefficients alpha) were conducted to eliminate any items that had loadings lower than .30 on the latent variables. This resulted in a measurement model that describes the relationship between the latent variables in the model and their measures.

Because the proposed model included multiple latent variables that cannot be directly assessed, an analysis of the structural model was conducted using the mainframe version of LISREL VII for SPSS (Joreskog & Sorbom, 1989). First, a measurement model was developed that included the relationship between the each latent variable and those items that measure it. Second, a structural model was tested that specified the relationship only between the latent variables, and then tested the stability of the latent variables across each data wave. Rather than using a series of regression analyses, latent variable structural equation modeling allows simultaneous analysis of the main paths of the model. Results from preliminary analyses, including correlations and factor analyses, were used to provide input for LISREL.

Limitations

Data used in the study were limited in several ways. While similar questions were asked at each data collection point, sometimes the response choices varied. In addition, only first follow-up data contained items to measure the self and efficacy variables as related specifically to math (i.e., "Mathematics is one of my best subjects"). Therefore, the analysis included general measures of Beliefs and Cognitions about Self, Beliefs about Ability/Self-Efficacy, Goal Orientations, and Expectancies. These limitations restrict the analysis to some degree, in that the correlations may be underestimated.

CHAPTER 4

RESULTS AND DISCUSSION

This chapter presents the results of the factor analyses, measurement models, and structural models for the various dimensions of the model. It also includes a discussion of these results.

Measurement Models

Results of the Factor Analyses

The first step in the analysis of the data was to establish a measurement model for each data wave separately. Item analyses and coefficient alpha estimates of reliability were computed separately for each of scales used to measure the key variables in the model. Results of these preliminary analyses of the measurement models are contained in Tables 2 through 8, in which the variables appear together with means, standard deviations, coefficient alphas, and factor loadings. Overall, the high estimates of reliabilities (coefficient alphas) indicate the variable measures are consistent, and the high factor loadings support construct validity of the variables. There were six latent variables for base year data wave and eight latent variables for both the first and second follow-ups. Each of the latent variables are discussed below.

The measurement model included: Beliefs and Cognitions about Self (measured by the same 8 items from all 3 data waves); Beliefs and Cognitions about Context (measured by the the same 5 items from Waves 2 and 3; no items were available in Wave 1); Beliefs about Ability/Self-Efficacy (measured by the same 5 items from all 3 data waves); Mastery Goal Orientation (measured by 2 items from Wave 1, 3 items from Wave 2, and 4 items from Wave 3); Performance Goal Orientation (measured by 3 items from Wave 2 and 4 items from Wave 3, but no items were available from Wave 1);

Expectancies (measured by the same 3 items from Wave 1 and Wave 2, two of the same items from Wave 3, and one additional item from Wave 3); Process Cognitions (measured by the same 6 items from Waves 2 and 3, but no items were available from Wave 1); and Achievement Outcomes (measured by the scores on a standardized math test in all three data waves). The items selected used Likert response scales and were coded so high scores were representative of the factor.

Beliefs and cognitions about self. As can be seen in Table 2, the results of the initial factor analysis indicate that the same eight items from all three data waves loaded highly on the latent variable, beliefs and cognitions about self. The items reflected locus of control, attributions about success and failure, and students' perceptions of their competence. None of the available items pertaining to the students' perceptions about the nature of intelligence or students' interest and values loaded on this factor, and they were dropped as one of the measures of beliefs and cognitions about self.

Table 2

Assessment of Factor Structure Specifying One Factor for Beliefs and Cognitions about Self

Variable	Item	Mean	SD	Std. factor loading
Base Year (alpha=.76)				
BYS44B	I don't have enough control over the direction my life is taking.	3.13	.79	.46
BYS44C	In my life, good luck is more important than hard work for success.	3.33	.70	.32
BYS44F	Every time I try to get ahead, something or somebody stops me.	2.90	.73	.54
BYS44G	My plans hardly ever work out, so planning only makes me unhappy.	3.10	.76	.54
BYS44I	I feel useless at times.	2.57	.82	.73
BYS44J	At times think I am no good at all.	2.79	.90	.76
BYS44L	I feel I do not have much to be proud of.	3.33	.76	.53
BYS44M	Chance and luck are very important for what happens in my life.	2.81	.87	.34
First Follow-up (alpha=.80)				
F1S62B	I don't have enough control over the direction my life is taking.	3.02	.75	.50

(table continues)

Variable	Item	Mean	SD	Std. factor loading
F1S62C	In my life, good luck is more important than hard work for success.	3.22	.66	.37
F1S62F	Every time I try to get ahead, something or somebody stops me.	2.90	.68	.57
F1S62G	My plans hardly ever work out, so planning only makes me unhappy.	3.01	.68	.60
F1S62I	I feel useless at times.	2.60	.76	.76
F1S62J	At times think I am no good at all.	2.81	.82	.78
F1S62L	I feel I do not have much to be proud of.	3.17	.72	.59
F1S62M	Chance and luck are very important for what happens in my life.	2.95	.76	.38
Second Follow-up (alpha=.82)				
F2S66B	I don't have enough control over the direction my life is taking.	3.03	.78	.51
F2S66C	In my life, good luck is more important than hard work for success.	3.22	.69	.45
F2S66F	Every time I try to get ahead, something or somebody stops me.	2.92	.70	.60
F2S66G	My plans hardly ever work out, so planning only makes me unhappy.	3.02	.71	.64
F2S66I	I feel useless at times.	2.68	.78	.77
F2S66J	At times think I am no good at all.	2.89	.82	.80
F2S66L	I feel I do not have much to be proud of.	3.20	.75	.61
F2S66M	Chance and luck are very important for what happens in my life.	2.97	.80	.45

Beliefs and cognitions About context. The items measuring this latent variable loaded on two factors. As seen in Table 3, the first factor, Perceptions of Teacher Quality, included the same five items drawn from Waves 1 and 2, and three items from Wave 3 (two of the items matched those from the first two waves). The second factor, Perceptions of Mathematics Teachers, included the same five items drawn from Waves 2 and 3. Recall that no items measuring this construct were available in Wave 1.

Table 3

Assessment of Factor Structure Specifying One Factor for Beliefs and Cognitions about Context

Variable	Item	Mean	SD	Std. factor loading
Context (Teacher Quality)				
Base Year (alpha=.78)				
BYS59F	The teaching is good.	1.99	.69	.66
BYS59G	Teachers are interested in students.	2.06	.72	.86

(table continues)

Variable	Item	Mean	SD	Std. factor loading
BYS59H	When I work hard on schoolwork, my teachers praise my effort.	2.24	.79	.61
BYS59I	In class I often feel 'put down' by my teachers.	2.00	.73	.41
BYS59J	Most of my teachers really listen to what I have to say.	2.19	.74	.69
First Follow-up (alpha=.76)				
F1S7G	The teaching is good.	2.05	.62	.52
F1S7H	Teachers are interested in students.	2.12	.65	.99
F1S7I	When I work hard on schoolwork, my teachers praise my effort.	2.39	.73	.43
F1S7J	In class I often feel 'put down' by my teachers.	1.93	.67	.31
F1S7L	Most of my teachers really listen to what I have to say.	2.22	.66	.46
Second Follow-up (alpha=.74)				
F2S7C	The teaching is good.	2.00	.60	.43
F2S7D	Teachers are interested in students.	2.03	.65	.43
F2S7I	Students are graded fairly in school.	2.14	.64	.99
Context (Quality of Math Class)				
First Follow-up (alpha=.83)				
F1S31A	Increasing your interest in mathematics.	1.63	.99	.72
F1S31B	Learning and memorizing facts, rules, and steps.	2.36	.82	.64
F1S31C	Preparing you for further study in math.	2.14	.91	.77
F1S31D	Thinking about what a problem means and ways it might be solved.	2.35	.83	.73
F1S31E	Showing you the importance of mathematics in daily life.	1.69	1.02	.69
Second Follow-up (alpha=.81)				
F2S20A	Increasing your interest in mathematics.	1.68	.95	.68
F2S20B	Learning and memorizing facts, rules, and steps.	2.31	.80	.42
F2S20C	Preparing you for further study in math.	2.07	.93	.63
F2S20D	Thinking about what a problem means and ways it might be solved.	2.24	.84	.62
F2S20E	Showing you the importance of mathematics in daily life.	1.69	1.00	.89

Beliefs about ability/self-efficacy. Based on the results of the factor analysis, the same five items from each wave loaded highly on the construct, Student Beliefs About Ability/ Self-efficacy. These results are contained in Table 4.

Table 4

Assessment of Factor Structure Specifying One Factor for Beliefs about Ability/Self-efficacy

Variable	Item	Mean	SD	Std. factor loading
Base Year (alpha=.74)				
BYS44E	I am able to do things as well as most other people.	1.67	.62	.61

(table continues)

Variable	Item	Mean	SD	Std. factor loading
BYS44H	On the whole, I am satisfied with myself.	1.76	.67	.72
BYS44K	When I make plans, I am almost certain I can make them work.	2.01	.67	.45
BYS44A	I feel good about myself.	1.72	.67	.70
BYS44D	I feel I'm a person of worth, the equal of other people.	1.66	.64	.61
First Follow-up (alpha=.79)				
F1S62E	I am able to do things as well as most other people.	1.75	.59	.93
F1S62H	On the whole, I am satisfied with myself.	1.87	.67	.54
F1S62K	When I make plans, I am almost certain I can make them work.	2.07	.62	.41
F1S62A	I feel good about myself.	1.76	.62	.53
F1S62D	I feel I'm a person of worth, the equal of other people.	1.73	.61	.62
Second Follow-up (alpha=.82)				
F2S66E	I am able to do things as well as most other people.	1.67	.61	.99
F2S66H	On the whole, I am satisfied with myself.	1.78	.68	.47
F2S66K	When I make plans, I am almost certain I can make them work.	1.99	.63	.39
F2S66A	I feel good about myself.	1.67	.63	.46
F2S66D	I feel I'm a person of worth, the equal of other people.	1.65	.64	.64

Mastery and performance goal orientations. As seen in Table 5, two items from Wave 1, three items from Wave 2, and four items from Wave 3 loaded highly on mastery goal orientation. None of the potential items from Wave 1 loaded on performance goal orientation, while three items from Wave 2, and four items from Wave 3 loaded highly on this factor (see Table 6).

Table 5

Assessment of Factor Structure Specifying One Factor for Mastery Goal Orientation

Variable	Item	Mean	SD	Std. factor loading
Base Year (alpha=.50)				
BYS69A	I usually look forward to math class.	2.40	.87	.58
BYS69C	Math will be useful in my future.	1.69	.74	.58
First Follow-up (alpha=.60)				
F1S11A	Work hard for good grades?	1.02	.14	.41
F1S11C	Solve problems using new and original ideas?	1.06	.24	.56
F1S11D	Help other students with their schoolwork?	1.06	.23	.38
Second Follow-up (alpha=.71)				
F2S21A	Pay attention in class.	4.21	.90	.91
F2S21B	Complete your work on time.	4.16	.91	.56
F2S21C	Do more work than was required of you.	2.26	1.18	.45
F2S21D	Participate actively in class.	3.60	1.17	.54

Table 6

Assessment of Factor Structure Specifying One Factor for Performance Goal Orientation

Variable	Item	Mean	SD	Std. factor loading
First Follow-up (alpha=.65)				
F1S66B	I get a feeling of satisfaction from doing what I'm supposed to do in class.	2.87	.62	.37
F1S38	How important are good grades to you?	3.45	.70	.47
F1S12D	Cheat on tests?	3.53	.75	.75
F1S12E	Copy someone else's homework?	2.95	.91	.76
Second Follow-up (alpha=.59)				
F2S22DA	It was not required for graduation.	1.36	.48	.43
F2S22DB	It was not required for college or vocational/trade school admission.	1.64	.48	.61
F2S22DC	I am not interested in mathematics.	1.58	.49	.67
F2S22DD	I don't do well in mathematics.	1.62	.49	.55

Expectancies. Table 7 shows the same three items from Wave 1 and Wave 2 loaded highly on students' expectations for future success or failure. Two of these items also appear in Wave 3, and together with an additional item from Wave 3, they also loaded highly on this factor.

Table 7

Assessment of Factor Structure Specifying One Factor for Expectancies

Variable	Item	Mean	SD	Std. factor loading
Base Year (alpha=.63)				
BYS45	How far in school do you think you will get?	2.18	1.14	.65
BYS46	How sure you that you will graduate from high school?	1.12	.34	.79
BYS47	How sure are you that you will go further than high school?	1.39	.65	.67
First Follow-up (alpha=.70)				
F1S49	How far in school do you think you will get?	6.68	1.90	.80
F1S64A	What are the chances that you will graduate from high school?	4.77	.53	.64
F1S64B	What are the chances that you will go to college?	4.27	1.06	.89
Second Follow-up (alpha=.62)				
F2S49	Do you plan to go to school right after high school?	2.74	.54	.98
F2S67A	What are the chances that you will have graduated from high school?	4.84	.51	.48
F2S67B	What are the chances that you will go to college?	4.39	1.04	.78

Process cognitions. Of the available items pertaining to task preference or effort/persistence none loaded on the Process Cognitions factor. While there were no items available in Wave 1 to measure strategy use, the same six items from Waves 2 and 3 loaded highly on this factor. Therefore, the latent variable, Process Cognitions, was represented in the model by strategies reported in Waves 2 and 3. These items are contained in Table 8.

Table 8

Assessment of Factor Structure Specifying One Factor for Strategy Use

Variable	Item	Mean	SD	Std. factor loading
First Follow-up (alpha=.51)				
F1S32A	Review the work from the previous day?	2.54	.62	.39
F1S32B	Use books other than text books?	1.35	.64	.22
F1S32C	Copy the teacher's notes from the blackboard?	2.30	.76	.27
F1S32D	Often do word problems or problem solving activities?	2.13	.69	.37
F1S32H	Participate in student-led discussions?	1.77	.75	.62
F1S32I	Explain your work to the class orally?	1.86	.78	.50
Second Follow-up(alpha=.63)				
F2S19BA	Review the work from the previous day?	3.87	1.22	.30
F2S19BD	Use books other than text books?	2.16	1.57	.39
F2S19BC	Copy the teacher's notes from the blackboard?	4.00	1.28	.30
F2S19BE	Often do word problems or problem solving activities?	3.40	1.24	.42
F2S19BI	Participate in student-led discussions?	2.06	1.30	.69
F2S19BH	Explain your work to the class orally?	2.39	1.39	.63
F2S19BL	Write about mathematics?	1.35	.87	.40

Motivation and performance outcomes. The intent was to measure these constructs separately. Of the possible items available, however, none loaded highly enough on any factor to assess motivation outcomes. Because all available outcome measures were variations of the same test scores, only standardized mathematics test scores were used to measure performance outcomes. Only one item was available as an indicator of this construct; thus, the reliability was arbitrarily set at a value of .80 so the error variances could be pre-specified in LISREL (Joreskog & Sorbom, 1989).

In all of the measurement models, each item was allowed to load only on the factor it was expected to measure, and then a correlation of all of the factors was conducted. Since the scales for latent variables have no inherent scale, a scale must be selected (Joreskog & Sorbom, 1989). In this case the scales were fixed by assigning values of 1.0 to one item for each latent variable. The values of the remaining items were estimated using this scale. Each item specified was selected based on the highest loadings for each factor from the initial factor analyses and then standardized and reported in Tables 9, 10, and 11, together with the standard errors and uniquenesses. The factor loadings are the standardized regression coefficients for the effects of the latent variables on the measurement variables and describe the relationship between them.

Table 9

Assessment of Base Year Latent Variables

Measure and variable	Standardized factor loading	SE	Uniqueness
Self			
BYS44B	.50	.01	.75
BYS44C	.34	.01	.88
BYS44F	.61	.01	.63
BYS44G	.61	.01	.63
BYS44I	.62	.01	.62
BYS44J	.67	--	.55
BYS44L	.59	.01	.65
BYS44M	.35	.01	.88
Context			
BYS59F	.66	.01	.57
BYS59G	.72	--	.48
BYS59H	.66	.01	.56
BYS59I	.44	.01	.81
BYS59J	.72	.01	.49

(table continues)

Measure and variable	Standardized factor loading	SE	Uniqueness
Efficacy			
BYS44E	.53	.01	.72
BYS44H	.73	--	.46
BYS44K	.48	.01	.77
BYS44A	.72	.01	.49
BYS44D	.62	.01	.62
Mastery			
BYS69A	.62	.04	.62
BYS69C	.52	--	.73
Performance			
BYS69B	.71	--	--
Expectancies			
BYS45	.79	.08	.37
BYS46	.47	--	.78
BYS47	.78	.05	.40
Outcome			
BY2XMSTD	.79	--	.37

Note: Dashes indicate standard error was not estimated.

Table 10

Assessment of First Follow-up Latent Variables

Measure and variable	Standardized factor loading	SE	Uniqueness
Self			
F1S62B	.53	.01	.74
F1S62C	.39	.01	.90
F1S62F	.63	.01	.67
F1S62G	.65	.01	.58
F1S62I	.65	.01	.57
F1S62J	.69	--	.52
F1S62L	.66	.01	.62
F1S62M	.41	.01	.88
Context (Teacher quality)			
F1S7G	.65	.01	.63
F1S7H	.74	--	.45
F1S7I	.59	.01	.68
F1S7J	.51	.01	.70
F1S7L	.68	.01	.52
Context (Math class)			
F1S31A	.71	.01	.49
F1S31B	.64	.01	.68
F1S31C	.79	--	.43
F1S31D	.75	.01	.51
F1S31E	.65	.01	.55

(table continues)

Measure and variable	Standardized factor loading	SE	Uniqueness
Efficacy			
F1S62E	.61	--	.66
F1S62H	.74	.02	.46
F1S62K	.53	.02	.70
F1S62A	.73	.02	.46
F1S62D	.68	.02	.57
Mastery			
F1S11A	.47	.01	.70
F1S11B	.68	--	.54
F1S11C	.59	.02	.82
F1S11D	.40	.02	.89
Performance			
F1S66B	.39	.01	.85
F1S38	.40	.01	.84
F1S12D	.74	.01	.43
F1S12E	.74	--	.39
Expectancies			
F1S64A	.56	.01	.31
F1S64B	.90	--	.76
F1S49	.85	.02	.21
Strategies			
F1S32A	.41	.02	.90
F1S32B	.29	.02	.95
F1S32C	.33	.03	.93
F1S32D	.43	.03	.84
F1S32H	.48	--	.72
F1S32I	.46	.03	.82
Outcome			
F12XMSTD	.71	--	.02

Note: Dashes indicate that standard error was not estimated.

Table 11

Assessment of Second Follow-up Variables

Measure and variable	Standardized factor loading	SE	Uniqueness
Self			
F2S66B	.54	.02	.71
F2S66C	.42	.02	.83
F2S66F	.63	.02	.60
F2S66G	.64	.02	.59
F2S66I	.70	.02	.51
F2S66J	.75	--	.44
F2S66L	.66	.02	.57
F2S66M	.45	.02	.80
Context (Teacher quality)			
F2S7C	.73	.04	.46
F2S7D	.78	.04	.39
F2S7I	.56	--	.69

(table continues)

Measure and variable	Standardized factor loading	SE	Uniqueness
Context (Math class)			
F2S20A	.72	.03	.48
F2S20B	.59	.02	.65
F2S20C	.76	.03	.42
F2S20D	.74	.02	.45
F2S20E	.65	--	.58
Efficacy			
F2S66E	.68	--	.54
F2S66H	.77	.03	.40
F2S66K	.57	.02	.68
F2S66A	.75	.02	.43
F2S66D	.73	.03	.47
Mastery			
F2S21A	.76	--	.42
F2S21B	.65	.02	.57
F2S21C	.55	.03	.70
F2S21D	.67	.03	.55
Performance			
F2S22DA	.29	.02	.92
F2S22DB	.32	.02	.90
F2S22DC	.76	--	.42
F2S22DD	.67	.03	.55
Expectancies			
F2S49	.56	--	.68
F2S67A	.41	.03	.84
F2S67B	.88	.10	.23
Strategies			
F2S19BA	.40	.03	.84
F2S19BC	.41	.03	.83
F2S19BD	.39	.04	.85
F2S19BE	.45	.03	.80
F2S19BH	.56	.04	.69
F2S19BI	.61	--	.63
F2S19BL	.36	.02	.87
Outcome			
F22XMSTD	.94	--	.11

Note: Dashes indicate that standard error was not estimated.

Structural Models

In light of the measurement models, the conceptual model in Figure 1 was tested using LISREL to allow assessment of causal paths across the various phases of the model and, importantly, included information about change over time. LISREL is a general procedure for estimating the goodness-of-fit of various measurement and structural models and can indicate how improvements to models can be made (Joreskog & Sorbom, 1989). For ease of interpretation, standardized structural weights are reported.

Assessment of Model Fit for Each Data Wave

The intercorrelations among the variables shown in Tables 12, 13, and 14 resulted from estimating the structural model separately for each wave. Since instruments tend to be wave-specific, the results are not expected to be exactly the same for all three data collection points. In assessing the fit of the model, the first step was to determine whether the parameter estimates were reasonable. Results for each data wave revealed no negative variances, correlations greater than 1.00, and covariance or correlation matrices that were not positive definite that would be indicative of unreasonable parameter estimates. If a matrix is positive definite, all of the diagonal elements of the matrix are positive. If the covariance or correlation is not positive definite, it would be an indication that one or more parameters in the model were not identified.

Table 12

Correlations Between Base Year Latent Variables

	Self	Context	Efficacy	Mastery	Performance	Expectancies	Outcome
Self	1.00						
Context	.33	1.00					
Efficacy	.68	.37	1.00				
Mastery	.25	.44	.36	1.00			
Performance	-.46	-.23	-.32	-.33	1.00		
Expectancies	.39	.24	.28	.24	-.23	1.00	
Outcome	.42	.17	.11	.18	-.34	.62	1.00

Table 13

Correlations Between First Follow-up Latent Variables

	Self	Context	ContextB	Efficacy	Mastery	Performance	Expectancies	Strategies	Outcome
Self	1.00								
Context	.38	1.00							
ContextB	.19	.36	1.00						
Efficacy	.70	.35	.20	1.00					
Mastery	.22	.29	.23	.18	1.00				
Performance	-.27	-.42	-.26	-.23	-.32	1.00			
Expectancies	.36	.27	.21	.28	.34	-.24	1.00		
Strategies	.13	.30	.66	.19	.19	-.27	.21	1.00	
Outcome	.37	.25	.20	.16	.36	-.11	.74	.06	1.00

Table 14

Correlations Between Second Follow-up Latent Variables

	Self	Context	ContextB	Efficacy	Mastery	Performance	Expectancies	Strategies	Outcome
Self	1.00								
Context	.28	1.00							
ContextB	.18	.30	1.00						
Efficacy	.59	.23	.18	1.00					
Mastery	.22	.25	.48	.21	1.00				
Performance	-.05	-.05	-.22	-.09	-.37	1.00			
Expectancies	.37	.22	.16	.24	.17	-.10	1.00		
Strategies	.05	.13	.46	.16	.61	-.20	.03	1.00	
Outcome	.40	.33	.19	.15	.01	-.02	.70	.27	1.00

The next step in assessing model fit for each data wave was to examine goodness-of-fit indices available in LISREL. Chi-square (X^2), goodness-of-fit (GFI), and adjusted goodness-of-fit (AGFI) were indices used for evaluating the overall fit of the model to the actual data.

Chi-square values that are not significant indicate a good fit. It should be noted, however, that chi-square is sensitive to sample size, such that small variances with a large enough sample can lead to rejection of a good model; with small enough samples, chi-square values can indicate a good fit where the fit actually is not good (Loehlin, 1992). Keeping these criteria in mind, chi-square results for the model tested indicate a poor fit of the model to the data for all three waves: $X^2(254, N = 20{,}001) = 16512.96$, $p < .001$ for base year data; $X^2(743, N = 14{,}147) = 27586.36$, $p < .001$ for first follow-up data; and $X^2(704, N = 5026) = 10745.46$, $p < .001$ for second follow-up data.

The GFI indicates the relative amount of variance and covariance jointly explained by the model, while the AGFI also takes into account the degrees of freedom. Values can range from 0 to 1.00, with values greater than .90 indicating a good fit. The goodness-of-fit index (GFI) for the model tested using base year data is was .932, representing a good fit between the model and the observed data. GFI using first follow-up data was .898, representing a good fit, and GFI using second follow-up data was .774, also representing a good fit between the model and the observed data. Although the adjusted goodness-of-fit indices used in the present analysis decreased somewhat (AGFI = .913 for base year; AGFI = .882 for first follow-up; AGFI = .864 for second follow-up), these results also confirmed a moderately good to good overall fit of the model for each data wave.

In general, the direction and pattern of relationships among the factors were as expected and support the basic conceptual model. For example, there was a strong and positive correlation between Beliefs and Cognitions about Self and Beliefs about Ability/Self-efficacy. There was also a strong and positive correlation between Beliefs and Cognitions about Context and Process Cognitions as measured by strategy use, as well as between Beliefs and Cognitions about Context and mastery goal orientation. Interestingly, base-year, first, and second follow-up performance goal orientation were negatively related to the other variables, while mastery goal orientation was positively correlated.

Stability Models Over Time

Based on the results and satisfactory fit of the structural models for each wave, the next step in the analysis of the model was to look at the stability of the variables across the three waves. Due to difficulty in converging on a proper solution, the item designed to measure performance orientation for the base-year data (BYS69B) was dropped from further analysis as was one item measuring mastery orientation for the follow-up data (F1S11B). A proper solution is one which has no negative variances, correlations greater than 1.00, or covariance/correlation matrices that are not positive definite. The positive definiteness of the matrices is assessed mathematically. If a matrix is positive definite, all of the diagonal elements of the matrix are positive. If the covariance or correlation is not positive definite, it would be an indication that one or more parameters in the model were not identified (Joreskog & Sorbom, 1989).

The results for the base-year to first follow-up model are presented in Table 15 and for first follow-up to second follow-up in Table 16. The results show that the other variables from base year to first follow-up were stable with the exception of goal orientation, which also did not remain stable from the first wave to the second. Although performance goal orientation at base year was dropped from the analysis, this suggests that mastery and performance goal orientation are changeable over time.

Table 15

Stability Model for Base Year and First Follow-up

	Byself	Bycont	Byeffi	BYmast	BYexp	BYout
F1self	.577	0	0	0	0	0
F1cont	0	.505	0	0	0	0
F1effi	0	0	.569	0	0	0
F1mast	0	0	0	.130	0	0
F1exp	0	0	0	0	.731	0
F1out	0	0	0	0	0	.944

Table 16

Stability Model for First and Second Follow-up

	F1self	F1cont	F1contB	F1effi	F1mast	F1perf	F1exp	F1strat	F1out
F2self	.603	0	0	0	0	0	0	0	0
F2cont	0	.550	0	0	0	0	0	0	0
F2contB	0	0	.319	0	0	0	0	0	0
F2effi	0	0	0	.596	0	0	0	0	0
F2mast	0	0	0	0	.157	0	0	0	0
F2perf	0	0	0	0	0	.096	0	0	0
F2exp	0	0	0	0	0	0	.734	0	0
F2strat	0	0	0	0	0	0	0	.414	0
F2out	0	0	0	0	0	0	0	0	.944

Assessment of Model Fit for All Three Times

In assessing the fit of the model, again the first step was to determine whether the parameter estimates were reasonable. Results revealed no negative variances, correlations greater than 1.00, and covariance or correlation matrices that were not positive definite that would be indicative of unreasonable parameter estimates.

The next step in assessing model fit was to examine goodness-of-fit indices available in LISREL. Chi-square (X^2), goodness-of-fit (GFI), and adjusted goodness-of-fit (AGFI) were indices used for evaluating the overall fit of the model to the actual data.

Again, it should be noted that chi-square is sensitive to sample size, such that small variances with a large enough sample can lead to rejection of a good model; with small enough samples, chi-square values can indicate a good fit where the fit actually is not good (Loehlin, 1992). Keeping these criteria in mind, chi-square results for the model tested indicate a poor fit of the model to the data, $X^2(4961, N = 2254) = 96265.15$, $p < .001$.

The goodness-of-fit index (GFI) for the model tested is .846 and represents a fairly good fit between the model and the observed data. Although the adjusted goodness-of-fit index used in the present analysis was somewhat lower (AGFI=.831), it also confirmed a moderately good overall fit of the model.

The goodness-of-fit indices suggest that the stability model provides a reasonable fit, but sufficient unexplained variance remains. Thus, there may be other factors that could be added or changed to improve the model. For example, Beliefs and Cognitions about Self could be measured more specifically as it relates to mathematics, or it could be divided into separate constructs of self-worth, beliefs about the nature of intelligence, competence level, outcome attributions, and perceived autonomy and control. This also would be the case for the other key constructs in the model. It is unfortunate that the dataset used for the present study did not allow for testing these possibilities.

Results of the Structural Model

Tables 17 and 18 contain the correlation matrices for the three data waves, with standardized stability path coefficients highlighted along the main diagonal. Figure 2 depicts the final structural model based on these tables and includes path coefficients greater than .30.

Table 17

Structural Model - Correlation Matrix for Base Year and First Follow-up

	BYself	BYcont	BYeffi	BYmast	BYexp	BYout
F1self	**.577**	.254	.426	.182	.270	.271
F1cont	.236	**.505**	.241	.245	.175	.193
F1effi	.420	.252	**.569**	.217	.200	.113
F1mast	.154	.206	.082	**.130**	.257	.264
F1exp	.277	.203	.214	.148	**.731**	.574
F1out	.290	.124	.081	.123	.455	**.944**

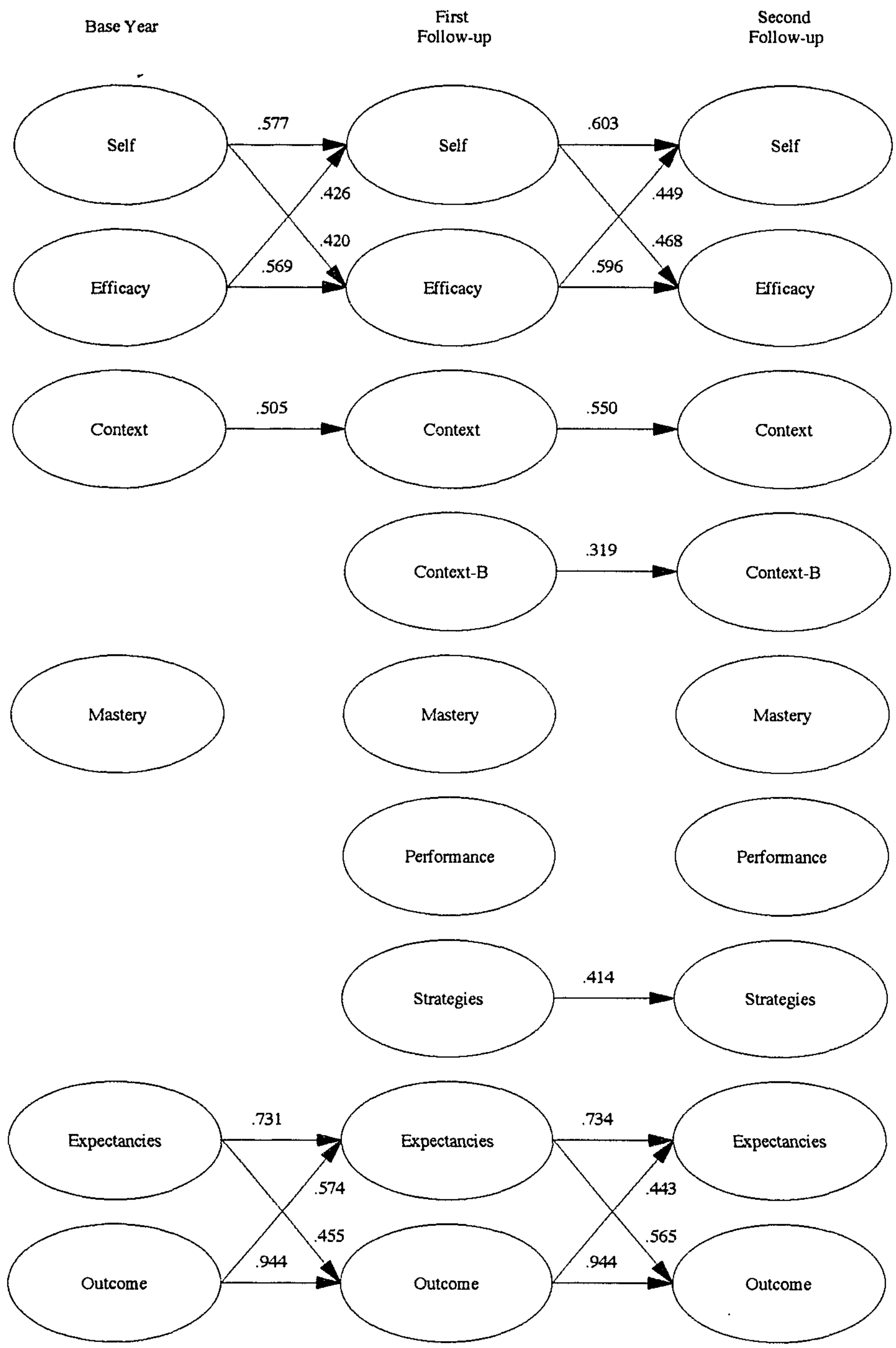
Table 18

Structural Model - Correlation Matrix for First Follow-up and Second Follow-up

	F1self	F1cont	F1contB	F1effi	F1mast	F1perf	F1exp	F1strat	F1out
F2self	**.603**	.276	.142	.449	.163	.190	.278	.111	.241
F2cont	.232	**.550**	.220	.194	.205	.260	.185	.181	.220
F2contB	.148	.231	**.319**	.141	.125	.175	.150	.254	.112
F2effi	.468	.244	.127	**.596**	.102	.147	.177	.119	.090
F2mast	.161	.184	.191	.161	**.157**	.278	.128	.281	.022
F2perf	.036	.020	.106	.047	.007	**.096**	.081	.130	.013
F2exp	.274	.214	.144	.193	.251	.171	**.734**	.135	.443
F2strat	.040	.097	.168	.119	.069	.151	.040	**.414**	.190
F2out	.272	.194	.116	.113	.266	.103	.565	.009	**.944**

Figure 2

Structural Model for Base Year, First Follow-up, and Second Follow-up



The figure indicates that Beliefs and Cognitions About Self, Beliefs and Cognitions About Context, Beliefs About Ability/Self-efficacy, Expectancies, Process Cognitions (strategy use), and Outcomes are stable over the three times. Mastery and performance goal orientations, however, are not stable over time. Other findings from this data that are noteworthy indicate that expectancies and outcomes are the best predictors of each other, as are self and self-efficacy.

Discussion

The study did not test the direction of effects or the proposed mediators or moderators. In addition, there were no items at base year to measure strategy use or context as it relates specifically to math class, and these constructs were not included for the base year model. Overall, in all three models tested there was a positive relationship between mastery goal orientation and a negative relationship between performance goal orientation and all other constructs. This finding is supported by previous research and suggests that mastery goal orientation is positively affected by or has a positive affect on other factors related to motivation to achieve. Based on the fit of the structural models for each time separately and the existence of the high correlations between the measurable constructs, it was possible to examine which relationships held over time.

It is important to note that several constructs that may be related to achievement motivation are excluded from the proposed conceptual model. For example, research has shown that relationships among peers and within families can affect students' motivation to achieve. Students' attention to peer relationships may influence beliefs about self and beliefs about context as well as other factors included in the proposed model of motivation to achieve (Berndt, Miller, & Park, 1989; O'Brien & Bierman, 1988). Parents also may influence the factors that affect achievement motivation. Parents, who are warm, value education, and encourage and support their children's efforts, influence students' beliefs about self, beliefs about context, and other aspects of the motivation to achieve (Ames & Archer, 1987; Berndt, Miller, & Park, 1989; Stipek, 1993). It should be kept in mind that peer and parental effects on achievement motivation were not tested when evaluating the results of the present study.

Regarding change over time, the item measuring performance goal orientation at base year had to be dropped as did one of the items measuring mastery goal orientation at first follow-up. This eliminated any measure of performance orientation for base year and reduced the number of items measuring mastery goal orientation at first follow-up to only three. Therefore, caution should be used in interpreting results based on these measures. However, three findings are noteworthy that reflect the relationship between expectancies and achievement outcome, beliefs about self and self-efficacy, and goal orientation. First, the structural model depicted indicates that expectancies were the best predictor of outcome for the model tested, and it was stable over time. This finding is supported by other research (Eccles, 1984; Eccles, Adler, & Meece, 1984; Meece, Wigfield, & Eccles, 1990). Research has shown that if expectancies are measured as they related to specific tasks, some variation can occur. When measured as a global construct, however, expectancies tend to be fairly stable over time (Ford, 1992). The use of a global measure in this study may have emphasized this stability.

Second, as seen by the cross-paths of the structural model in Figure 2, self and efficacy also were strong predictors of each other. This was expected, given that self-concept has been defined as one's collective self-perceptions and is a global construct consisting of self-efficacy and other aspects of the self (Bandura, 1986; Berry & West, 1993; Hattie, 1992; Marsh & Shavelson, 1985). Previous research has reported correlations between beliefs about self and efficacy, although they are conceptually different constructs (Bandura, 1986, 1993; Berry & West, 1993; Schunk, 1991). For example, students might judge their efficacy in atheltics as high but have low self-concept as they cannot train successfully to attain their goal. Since beliefs about self was measured as a general construct, this finding was expected. Support is provided by Hattie (1992) who reports several research findings that show that in a hierarchical model of self-concept, general self-concept is stable over time.

Third, and surprisingly, although the relationships between mastery and performance were as expected in the individual models, over time mastery and performance did not relate to the other factors in the model. In addition, data available in Tables 17 and 18 indicate the instability of mastery and performance goal orientations over time. These results suggest that as students move from 8th to 12th grades, their goal orientations are highly changeable. This finding fails to support Pintrich and Schrauben's (1992) suggestion that goal orientation may be a global and stable trait. Several other researchers, however, have shown that goal orientations are changeable at least temporarily. Ames and Archer (1988) and Nolen (1988) found that students who perceived their teachers as being more supportive of mastery orientation used more active learning strategies, such as planning, organizing material, and setting goals, that led to more in-depth learning of material presented. Also, in a study of the effects of a classroom intervention designed to increase mastery goal orientation, Ames (1990) trained teachers to instruct children in the use of effective goal-setting strategies, involve students in decision making, and recognize individual progress and improvement. As in past research (Eccles, Midegley, & Adler, 1984; Harter, 1986), students in the control group were found to show a decline in intrinsic motivation, mastery goal orientation, and related motivational variables as they move through the school year. In contrast, students mastery goal orientation was sustained in the group who received the learning goal intervention. Thus, it appears that when mastery orientation is maintained in the classroom, it can be maintained in the student.

There are several issues to consider in explaining the instability of goal orientation over time. First, the finding could be a measurement issue. The items used to measure goal orientation were not the same items at each data point. Although all of the items selected for each model were found to be reliable when used in different scales by other researchers, there may be variability between the general items in first follow-up (i.e., "Do you feel it's okay to ask challenging questions") and the items that relate specifically to math in second follow-up (i.e., "In your most current or recent math class, how often do you do more work than is required"). Therefore, any conclusions regarding this instability should be made with caution.

Another explanation for the instability of goal orientation may be in the assumption of linearity. Some researchers suggest that there are situations when an individual might be more mastery oriented and other situations when the same individual might be more performance oriented, suggesting a non-linear relationship (Jagacinski, 1992; Dweck, 1992; Nicholls, 1992). Non-linearity was not addressed in the analysis of the present study.

Crooks (1988) and Pintrich (1989) posit that many tasks in the classroom focus on simple recall of information and do not necessitate mastery-oriented processing strategies (e.g., summarizing, paraphrasing) to demonstrate learning of the required task and receive a good grade. Therefore, the use of these strategies may not be an adaptive response to the particular environment, suggesting that goal orientation as it relates to strategy use may be task specific. If goal orientation is situationally specific, then, in and of itself, goal orientation is not a key construct in motivation afterall.

Goal orientation has been shown in the individual models in the present study, as well as previous research, to be related to strategy use (Ames & Archer, 1988; Meece, Blumenfeld, & Hoyle, 1988). If goal orientation is task specific and is not to be a key construct in motivation, perhaps it should conceptualized as an additional strategy that students use in a given situation. As students progress through school, tasks become more difficult and longer to complete, and their choice of strategies changes to accommodate the demands of these tasks (Zimmerman, 1989). Further, as they approach 12th grade, students' immediate goals for achievement tend to become more performance oriented (i.e., graduation from high school, higher SAT scores, higher GPA) (Wentzel, 1992). The proximal goal to perform well can be reflected in the strategies used to achieve goals (i.e., classes in test-taking strategies to increase SAT scores). Perhaps the orientation to perform represents a specific strategy in a particular situation. This possibility is one that might be considered when interpreting the results of the present study.

CHAPTER 5

SUMMARY, CONCLUSIONS AND IMPLICATIONS

Summary

The purpose of the research was to test a proposed conceptual model of mathematics achievement motivation. Specifically, the model suggests that students' positive beliefs and cognitions about self and context result in mastery goal orientations and expectancies for success. Beliefs about ability (self-efficacy) affect the relationship between beliefs about self/context, goal orientation and expectancies. Mastery goal orientation and expectancies also are related positively to process cognitions (e.g., better learning strategies, preference for challenging tasks, increased effort and persistence). These cognitions affect mathematics performance outcomes (e.g., more time spent on work and academic activities, better grades). On the other hand, if a student comes to an academic situation with negative beliefs about self and/or context, he or she is more likely to have performance goal orientations and expectancies for failure. These are believed to relate negatively to process cognitions (e.g., less effective strategies, preference for easy tasks, decreased effort and persistence). Mathematics performance outcomes indicating a lack of motivation to achieve (e.g., less time spent on work, little or no time spent on academic activities, lower grades and test scores) result.

The sample was taken from the National Education Longitudinal Study and included 2,254 students who were in-school (in or out of grade), who completed a questionnaire in the 8th, 10th, and 12th grades, and had no missing data on the variables of interest. Only information from students was used.

The analyses examined the following questions: (a) Is the proposed model accurately conceptualized, and (b) how do the proposed relationships change over time? The results showed that beliefs about self, context, and efficacy related positively to mastery orientation, expectancies for future success, and strategy use. These were related positively to mathematics achievement outcomes. In contrast, performance orientation was negatively linked to the other variables in the model.

Regarding change over time, the analyses show that beliefs about self and context, self-efficacy, expectancies, strategy use, and mathematics achievement outcomes did not change from 8th to 12th grade. Goal orientation, however, was <u>not</u> stable over time, suggesting that this factor may be responsive to contextual influences.

Conclusions

There were too few items across each data wave to measure certain constructs (e.g., Beliefs and Cognitions About Self, Beliefs About Ability/Self-efficacy, Goal Orientations, and Expectancies) as they relate specifically to mathematics. Because previous research suggests that these may be domain specific, the measurement weaknesses may underestimate their relationship to the specific mathematics outcome measures used (Bandura, 1986; Hattie, 1992; Marsh, 1992, 1994; Randhawa, Beamer, & Lundberg, 1993; Williams, 1993).

Although the effects of moderators and the direction of effects was not tested in this study, the results from estimating the structural model for each data wave confirm the expected relationships between the key constructs in the proposed model. Mastery goal orientation at each time was correlated positively with the other variables while performance goal orientation within time was correlated negatively. Further, the limitations of the data used call into question thes use of standardized test scores as the measure of achievement outcomes. Instead, strategies may be a better outcome to assess when examining the effects of goal orientations.

The results from estimating the structural model over time indicate several expected findings. For example, expectancies for future success or failure, beliefs about self, nor beliefs about ability/self-efficacy change. However, an unexpected finding from use of longitudinal data here was the instability of goal orientations. Past studies examining the stability of goal orientations have been cross-sectional (Harter, 1985; Pintrich & De Groot, 1990). Although goal orientations were related to other factors in the model within time, they did not hold over time. The relationships between goal orientations and strategy use within time and the instability over time suggest that mastery and performance may be situation or even strategy specific. Given these findings, there may be some question as to whether goal orientations are unique constructs in one's motivation to achieve or simply another aspect of process cognitions.

Implications for Future Research

In light of the findings regarding goal orientation, there are several issues that should be considered for future research. First, in the individual models the correlations between goal orientations and strategy use were high and the correlations between goal orientations and outcomes were low. Further, goal orientation did not predict math performance over time. Thus, future research should test both a specific measure of mathematics goal orientation and a specific measure of mathematics strategy use as a measure of outcome. When goal orientations at second follow-up were measured as they relate specifically to math, it was highly correlated with math strategy use. This finding has been supported in previous research by Ames and Archer (1988) and Meece, Blumenfeld, and Hoyle (1988) who found that, at least for 5th and 6th graders, mastery goal orientation was related more to deeper processing strategy use than was performance goal orientation when both orientation and strategy use were measured specifically for the subject area. Research with high school students could examine whether these findings also hold for older students.

Second, research is needed to examine how differences in goal orientations interact with contextual situations. Dweck (1988) suggests that students who are low in perceived ability and high in performance orientation have lower achievement outcome scores. However, it might be that the performance of such students varies with the situation. For example, it is possible that students who are low in perceived ability and high in performance orientation perform poorly in a mastery-oriented context, but perform well in a performance-oriented one. Therefore, goal orientation and contextual demands should systematically explore whether a relationship exists between them.

A third area for future research is to variations in goal orientationthat includes combinations of both mastery and performance. It may be that students who include both use more varied or different strategies and may use them more effectively. Some work has been done in this area. For example, Meece and Holt (as cited in Jagacinski, 1992) found that 5th and 6th graders who were high in mastery orientation but low in performance orientation used "deeper" learning strategies such as organization and elaboration. Wentzel (1991) found that for high school students the pursuit of <u>both</u> mastery and performance goals at the same time was related to the highest academic outcome. Heyman and Dweck (1992) suggest that the ability to coordinate different goal orientations may play a role in academic achievement and may be important in adaptive motivation. The data used in the present study did not allow testing variations in goal orientations. Thus, continued research is needed to explore this area more thoroughly, and to determine changes over time.

Fourth, more research is needed to examine the multidimensionality of goal orientation. Although mastery and performance goal orientations have been described as extremes on a continuum (Harter, 1981), Wentzel (1992) and Nicholls (1992) suggests that mastery and performance goal orientations instead are simply separate dimensions and that other dimensions of goal orientation may exist. For example, Nicholls, Cobb, Yackel, Wood, and Wheatley (1990) added work avoidance as a third goal in a measure used to study elementary school students. If goal orientation is a multidimensional construct, work that explores the possibility of additional dimensions and develops new measures reflecting such multidimensionality should continue. It may be that work avoidance affects strategies differently from mastery. By conceptualizing goal orientation as multidimensional, then the specific ways in which these measures could be used in examining the interactions between goal orientation and other factors affecting achievement can be explored to better understand the role of goal orientation in one's motivation to achieve.

Finally, the findings of the instability of goal orientation over time together with the suggestion of task specificity indicate that goal orientation is not a key construct in achievement motivation. Research should examine the possibility that goal orientation is one aspect of another larger factor such as strategy use.

Implications for Practice

The nature of the relationships between context and mastery or performance goal orientation have been reported by Jagacinski (1992) and Nicholls, Cheung, Lauer, and Patashnick (1989). There is an important implication of this finding when taken together with the finding of the instability of goal orientation over time and the stability of other motivational constructs. Although the school context may have little impact on other factors related to motivation, the important implication is that the teacher may be able to influence students' goal orientations in the classroom. Earlier research (Butler, 1987; Jagacinski, 1992) showed that feedback that was mastery oriented resulted in higher motivation. Taken together with the suggestion that goal orientation may be situationally specific and the findings of this study that goal orientation is not stable, four recommendations are warranted for teacher training that incorporate both the motivational and cognitive components of the model.

First, Thorkildsen and Nicholls (1991) found that an emphasis on mastery was important for students learning substantive matters such as the logic of math. However, didactic teaching was more valuable for teaching the steps to reaching the correct answer in an addition problem. Therefore, teachers might vary their teaching methods to incorporate and coordinate the outcome goals for the specific situation.

Generally, interventions that incorporate challenge within a mastery-oriented context and that address other underlying motivational mediators have been successful in promoting achievement motivation in the classroom (Andrews & Debus, 1978; Bandura & Schunk, 1981; Dweck, 1975; Schunk, 1982). Unfortunately, many schools have implemented programs that emphasize increasing students' confidence in their ability in an effort to increase their motivation to achieve in spite of research to the contrary . This is accomplished using continuous reinforcement of success on easy tasks. For example, praise often has been used to convince children they have high ability, even when they do not. Not only has this been ineffective in promoting achievement motivation, praise may have a negative effect if children perceive it to be insincere (Brophy, 1981; Meyer, Mittag, Engler, 1986).

Instead, teaching children to attribute failure to effort or strategy instead of ability increases students' persistence, even when faced with the possibility of failure, and this may generalize across tasks (Dweck, 1988; Harter, 1986; Stipek, 1993). Thus, teachers' instructional approach should be designed to promote positive peer relationships and emphasize the intrinsic value of learning by establishing realistic, challenging goals and encouraging effort. Short-term goals can help students manage their classwork and focus on what they are learning. As such, confidence in their ability to do the work is enhanced as they progress toward their goals (Andrews & Debus, 1978; Dweck, 1975; Schunk, 1989).

A second recommendation is to promote an autonomous environment in the classroom by providing students with opportunities to make choices and involving them in decision making in the classroom. Evidence suggests a positive relationship between students' mastery orientation and teachers' orientation toward autonomy. However, choices must be guided by some constraints and structure. For example, giving students a choice among a range of equally desirable assignments allows him or her to make a choice based on interest rather than choosing something that is either too difficult or too easy (Deci & Ryan, 1992).

A third recommendation is to emphasize individual goals or cooperative learning to promote greater effort and mastery orientation. Classrooms that emphasize competition or social comparison have been found to impede learning and motivation (Ames & Ames, 1984). Cooperative structures also promote students' perceptions of autonomy and control over their learning which fosters task involvement. Importantly, that emphasis should be on individual accountability within the cooperative structure to avoid a willingness to let others take responsibility for the work (Meece, et al., 1988).

Finally, within a mastery goal orientation, students should be made to believe that mistakes are a part of learning rather than a measure of failure and that they have an opportunity to improve past performances. Some strategies known to work in doing this include evaluating students for individual progress, improvement, and mastery, as well as varying the method of evaluation and making evaluation private (Stipek, 1993). Evaluation practices can (a) orient children toward different goals and (b) may affect motivation. For example, evaluations that emphasize social comparison tend to lower children's perceptions of their ability when the comparison is unfavorable. This can cause an increase in performance goal orientation and a decrease in intrinsic motivation. In addition, public evaluation (e.g., perfect papers are posted, highest and lowest grades are announced when returning papers) promotes social comparison (Ames & Ames, 1984). Students are more likely to adopt mastery goal orientations when evaluation is based on progress toward individual goals, persistence, and effort. As a result, children focus on effort, rather than ability, and use task strategies that contribute to improvement and mastery (Brophy & Merrick, 1987).

Research suggests that motivation is a multifaceted phenomenon that is affected by personal as well as contextual variables. The social-cognitive approach to the study of achievement motivation highlights various factors, including students' beliefs about the context, perception of control, expectancies for success, self-efficacy, and goal orientation. The present study attempted to integrate many of the variables believed to be important in social-cognitive theory into one model. The results, indicating the instability of goal orientation over time, provides evidence of the need for future research regarding this factor in a model of motivation to achieve. By examining students' perceptions and environments, it is hoped that studies such as the present one will contribute to the study of students' academic success.

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Appendix A

Variable Prompt: Item:	Response Set	1988	Wave 1990	1992
BELIEFS AND COGNITIONS ABOUT SELF				
Nature of Intelligence				
I am able to do things as well as most other people.	Strongly Agree (1) Strongly Disagree (4)	x	x	x
Interests/Values				
What is the main reason you are taking math?	Not taking it (1) School Assigned It (7)		x	
How important is each of the following to you in your life?	Not important (1)			
Important to be able to find steady work.	Very important (3)		x	x
Important to give my children better opportunities.			x	x
Important having leisure time.			x	x
Important to be expert in my field.				x
Important to get good education.				x
Do you agree with the following statements about why you go to school?	Strongly Agree (1) Strongly Disagree (4)			
I think the classes are interesting.			x	
I get satisfaction doing what is expected in class.			x	
I have nothing better to do.			x	
Education is important to get a job later.			x	
Please rate these reasons in terms of how important they were to you in deciding to take the math course you are taking this term.	Not at all important (0) Very important (5)			
I am interested in math.				x
I need math for college.				x
I need math for a job.				x
I am taking math for college credit.				x

Variable Prompt: Item:	Response Set	Wave 1988	 1990	 1992
BELIEFS AND COGNITIONS ABOUT SELF (continued)				
Competence				
How do you feel about the following statements:	Strongly Agree (1)			
I feel I do not have much to be proud of.	Strongly Disagree (4)	x	x	x
I certainly feel useless at times.		x	x	x
At times I think I am no good at all.		x	x	x
Perceived Control				
How do you feel about the following statements?	Strongly Agree (1)			
I don't have enough control over my life.	Strongly Disagree (4)	x	x	x
Every time I get ahead something stops me.		x	x	x
Plans hardly work out.		x	x	x
Outcome Attributions				
How do you feel about the following statements?	Strongly Agree (1)			
Good luck is more important than hard work.	Strongly Disagree (4)	x	x	x
Chance and luck are important in my life.		x	x	x
BELIEFS AND COGNITIONS ABOUT CONTEXT				
How much do you agree with each of the following statements about your school and teachers?	Strongly Agree (1) Strongly Disagree (4)			
The teaching is good.		x	x	x
Teachers are interested in students.		x	x	x
Teachers praise my efforts.		x	x	
In class I feel put down by my teachers.		x	x	
Most of my teachers listen to what I say.		x	x	
Students get along well with teachers.			x	
In your math class, how often are you asked to show that you really understand the material?	Not Taking Subject (1) Almost Every Day (6)		x	

Variable Prompt: Item:	Response Set	Wave 1988	 1990	 1992
BELIEFS AND COGNITIONS ABOUT CONTEXT (continued)				
In your most recent or current math class, how much emphasis does/did the teacher place on the following objectives?	None (0) Major Emphasis (3)			
Emphasis on increasing interest in math.			x	x
Emphasis on learning math facts/rules.			x	x
Emphasis on further study in math.			x	x
Emphasis on ways to solve math problems.			x	x
Emphasis on importance of math in life.			x	x
BELIEFS ABOUT ABILITY/SELF-EFFICACY				
How do you feel about the following statements?	Strongly Agree (1)			
When I make plans, I can make them work.	Strongly Disagree (4)	x	x	x
I feel good about myself.		x	x	x
I am able to do things as well as most other people.		x	x	x
On the whole, I am satisfied with myself.		x	x	x
I am a person of worth, equal of others		x	x	x
GOAL ORIENTATION				
Mastery				
I usually look forward to mathematics class.	Strongly Agree (1) Strongly Disagree (4)	x		
How often do you feel challenged in math class.	Not taking subject (1) Almost every day (6)		x	
How oten do you work hard in math class.	Not taking subject (1) Almost every day (6)		x	
For each of the subjects listed below, mark the statement that best expresses your opinion:	Strongly Agree (1) Strongly Disagree (4)			
Math will be useful in my future		x		

Variable Prompt: Item:	Response Set	1988	Wave 1990	1992
GOAL ORIENTATION (continued)				
How much additional reading do you do each week on your own outside of school?	None (0) 6 Hrs. or More (5)	x	x	x
Do you feel it's okay for you to:	Yes (1) No (2)			
Work hard for good grades.			x	
Ask challenging questions.			x	
Solve problems using new ideas.			x	
Help students with schoolwork.			x	
In your current or most recent math class, how often do/did you do the following:	Never (1) Always (5)			
Pay attention.				x
Do work on time.				x
Do more work than needed.				x
Actively participate.				x
In your current math class, how often do you try as hard as you can?	Not Taking Subject (1) Almost Every Day (6)		x	
<u>Performance</u>				
I often am afraid to ask questions in mathematics class.	Strongly Agree (1) Strongly Disagree (4)	x		
Do you ever feel bored when you are at school?	Never (0) Most of the Time (3)	x		
How important are good grades to you?	Not Important (1) Very Important (4)		x	
I get a feeling of satisfaction from doing what I'm supposed to do in class.	Strongly Agree (1) Strongly Disagree (4)		x	

Variable Prompt: Item:	Response Set	1988	Wave 1990	1992
EXPECTANCIES				
As things stand now, how far in school do you think you will get?	Won't Finish HS (01) Don't Know (11)	x	x	x
How sure are you that you will graduate from high school?	Very Sure Will (1) Very Sure Won't (4)	x	x	
How sure are you that you will go further than high school?	Very Sure Will (1) Very Sure Won't (4)	x	x	
Have you taken or are you planning to take any of the following tests in the next 2 years or this year?	Haven't Thought About (1) Yes, in 12th Grade (5)			
Pre-SAT			x	x
College Board SAT			x	x
ACT Test			x	x
Advanced Placement Test			x	x
PACT Test			x	
Other admissions test				x
How often do you feel it's okay to	Often (1)			
Cheat on tests?	Never (4)		x	
Copy someone else's homework?			x	
Do any of the following sentences describe why you are not taking a mathematics class this term?	Yes (1) No (2)			
It was not required for graduation.				x
It was not required for college or vocational/trade school admission.				x
I am not interested in mathematics.				x
I don't do well in mathematics.				x

Variable Prompt: Item:	Response Set	1988	Wave 1990	1992
EXPECTANCIES (continued)				
Do you plan to go to college after you graduate from high school?	No (1) I Don't Know (5)		x	
Think about how you see your future. What are the chances that:	Very Low (1) Very High (5)			
you will graduate from high school.			x	x
you will go to college.			x	x
your children's lives will be better than yours.			x	x
PROCESS COGNITIONS				
Strategies				
In your most recent or current math class, how often do/did you...	Never (1) Often (3)			
review math work from previous day.			x	x
copy teacher's notes in math class.			x	x
do problem-solving in math.			x	
use hands-on materials in math.			x	x
use calculators in math class.				x
use computers in math class.				x
explain work orally.				x
Task Preference				
Participated in Math Club.	Did not participate (1) Participated Officer (3)	x		
Participated in school academic clubs.	School does not offer (1) Participated Officer (4)		x	x

Variable Prompt: Item:	Response Set	1988	Wave 1990	1992
PROCESS COGNITIONS (continued)				
Effort				
How often do you come to class and find yourself without these things?	Usually (1) Never (4)			
pencil and paper.		x	x	x
books.		x	x	x
homework.		x	x	x
In math, about how much time do you spend on homework each week?	None (0) 10 Hours or More (7)	x	x	x
PERFORMANCE OUTCOMES				
Mathematics Standardized Score		x	x	x
Mathematics Quartile	Quartile 1 Low (1)	x	x	x
Overall Math Proficiency	Below Level 1 (0)	x	x	x