The Development of Student Self-Regulated Learning in Middle-School Classrooms

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ABSTRACT

Students who engage in self-regulated learning have been consistently found to employ deeper cognitive processing and attain higher academic achievement (Anderman & Maehr, 1994; VanderStoep, Pintrich, & Fagerlin, 1996). The present study extended self-regulation research by looking at the developmental trajectories of student self-regulated learning across the middle-school years and how these trajectories might be affected by the goal structure of the classroom environment and the sex of learners. Hierarchical linear modeling (HLM) was used to analyse the longitudinal data of 475 middle-school students responses to the *Motivated Strategies for Learning Questionnaire* (Pintrich & DeGroot, 1990) and *Student Classroom Environment Measure* (Feldlaufer, Midgely, & Eccles, 1988). HLM analyses showed that students intrinsic value and self-regulation decreased, and test anxiety increased over the middle-school years. Self-efficacy and cognitive-strategy use remained stable during this period. The goal structure of the classroom environment influenced all of the self-regulated learning components of the MSLQ, such that the more mastery oriented the classroom environment, the more intrinsic value students had in their learning and the higher was their self-efficacy, self-regulation and cognitive-strategy use, and the lower their test anxiety. In the final HLM model that included all of the predictors and the interaction term, the results highlighted the continuing influence of a mastery-oriented classroom environment on students self-regulated learning. In addition, the results showed that a mastery-oriented classroom helped to minimize students decrease in intrinsic value over the middle-school years. No sex differences were found. The important practical implication of this study s findings is that educators may be able to help foster student self-regulated learning by making modifications to their learning environments.

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Chapter I

Introduction

One of the most important goals of developing adolescents is to achieve academically at school. Academic achievement positively affects future employment opportunities, self-esteem, and general satisfaction in life (Anderman & Maehr, 1994; Anisef, 1994). Student achievement also fosters senses of accomplishment and mastery of many fundamental cognitive and social skills necessary to thrive in Western Society.

The developmental trajectory of academic growth is the result of myriad complex interactions across time. Students' aptitude and relevant prior knowledge interact with teacher and instructional variables as both peers and environmental factors interplay across time. Ultimately the amount of academic change is individualistic where students grow at different rates and levels (Schunk & Zimmerman, 1994). Some students will learn all of what is taught in the classroom and more, while other students will learn only a fragment of the instructed material. The difference among students' academic achievements is not just a result of their aptitude, but also a result of their achievement motivation to use the various cognitive strategies needed to learn (Garcia & Pintrich, 1996; Pintrich & Schunk, 1996; Wolters, 2003).

Achievement motivation is the process where goal-directed activity is instigated and sustained (Pintrich & Schunk, 1996). Motivation is typically beneficial to learning in that it influences what, when, and how we learn (Schunk, 1991). Regardless of whether or not students are especially able learners, they need to be motivated to learn (Linnenbrink & Pintrich, 2002b). Without motivation, students will not learn to their potential. For example, motivated students will likely attend to their teacher's instruction, use cognitive strategies to commit material to memory, and take notes that will facilitate future studying. These students are likely to be motivated because they feel that they are able to succeed and that what they are learning is valuable. On the other hand, unmotivated students are not likely to be as systematic in their learning efforts. Unmotivated students may not attend to their teacher's instruction, use cognitive strategies to help memorize class material, nor take notes that are organized carefully enough to study at a later time. These students are likely to be unmotivated because they feel that they do not have a chance at success and that what they are learning is meaningless.

In the worst case scenario, unmotivated students' academic performance may gradually decrease to a level of failure, which could then result in feelings of incompetence, isolation, and low self-esteem (Eccles et al., 1993a). The cumulative effects of low motivation may even lead to school drop out, which has been documented at a staggering rate of 12% to 30% in Canadian and American schools (Anisef, 1994; Christenson & Thurlow, 2004; Eccles, Lord, & Midgley, 1991). Conversely, in an exemplary case scenario, disadvantaged yet motivated students can beat the odds and rise to academic excellence. There are examples of recent immigrant refugee children who have overcome language barriers, gaps in their schooling, economic deprivation, discrimination, and emotional scars to then excel in their academics (Schunk & Zimmerman, 1994). These children were not the offspring of highly educated parents, nor did they benefit from any exceptional academic resources; rather, they were highly persistent, resourceful, and self-reliable.

Although motivation is a significant component of learning, it does not directly cause academic achievement, rather it is mediated by enabling the persistent use of metacognitive and cognitive skills (Patrick, Ryan, & Pintrich, 1999; Pintrich & DeGroot, 1990; Wolters, 2003). Metacognitive and cognitive skills are tools that help students encode, understand, and retain learning material (Garcia & Pintrich, 1996; Paris & Paris, 2001; Slavin, 2000). Metacognitive skills, such as monitoring and planning, help students make judgments about how they are learning. Cognitive skills, such as rehearsal, elaboration, and mental organization, help foster active cognitive engagement. A strategy that assists both the use of metacognitive and cognitive skills is resource management. Examples of resource management strategies consist of controlling the learning environment, study-time allocation, and asking for peer help when needed. Without the knowledge and use of these various learning strategies, learning is often more arduous and academic achievement is less attainable (Schunk & Zimmerman, 1994). However, even when students have the knowledge of various learning strategies that does not ensure that they will use them. Students need to be motivated to be at school to learn, in which case they will likely use these learning strategies.

When students are both motivated and possess a repertoire of metacognitive and cognitive skills (i.e., learning strategies), there is a greater likelihood that they will be successful learners (Pintrich & DeGroot, 1990; VanderStoep, Pintrich, & Fagerlin, 1996). This combination of motivation with cognitive and metacognitive strategies is termed self-regulated learning in educational research. Although there are variants of the definition of self-regulated learning, a general view can be expressed as the process whereby students activate and sustain cognitions, behaviours, and affects that are purposefully oriented toward the attainment of goals (Pintrich, Smith, Garcia, & McKeachie, 1993). Self-regulated students are described by their teachers as persistent, confident, resourceful, self-starters, and managerial-like (Schunk & Zimmerman, 1994).

The importance of self-regulation to student learning can be illustrated by over a decade's worth of educational and psychological research that answers how, when, and where students use self-regulatory strategies (Pintrich, 2003; Pintrich, 2000; Pintrich & Schunk, 1996; Zeidner, Boekaerts, & Pintrich, 2000). Despite the progress research has made on understanding the many aspects of student self-regulated learning, many questions are unanswered. The following research sheds light on one question in particular that many researchers have been asking: What does the development of self-regulated learning look like (Pintrich, 2003; Wolters, 2003)? More precisely, the purpose of this study was to examine classroom influences on the developmental patterns of student self-regulated learning during the middle-school years.

The development of student self-regulated learning during the middle-school years is an important area of research for two dominant reasons. First, research has shown a general decline in students' motivation and academic performance upon entry into the middle school. This overall decline in performance and motivation has been attributed to the developmental phase of adolescence and the change in school environment, as well as to the interaction of these two components (Eccles et al., 1993a). As students develop through adolescence, their use of cognitive strategies, interest and value in learning, and levels of self-efficacy and anxiety, as well as their sex (i.e., man or woman), may moderate their decline in academic performance (Pintrich, 2003). Within the middle school classroom, the amount of cooperative learning used in the classroom, the evaluation process of students, and the interest and friendliness conveyed by the teacher are also factors that may mediate students' decline in academic performance and motivation (Ames, 1992; Pintrich, 2003). The greater understanding of what underlies the decrease in students' motivation and performance, the sooner preventative and protective measures can be instituted to counter these declines. These issues are further discussed in the ensuing chapters. Second, there are no known studies that have looked at the development of students' self-regulated learning over the three-year period during the middle-school years. It was anticipated that this study would provide useful information by showing the change in each student's self-regulated learning from grade six to grade eight, in addition to the influencing variables on these developmental trajectories.

Chapter II

A Review of Self-Regulated Learning Research

A brief overview of empirical findings related to the current study on self-regulated learning is presented in three sections in this chapter. First, an introduction of the various self-regulation models is discussed. Second, the self-regulated learning model and its components used in the present study are outlined. Third, the factors influencing self-regulated learning in relation to its developmental change are outlined.

Self-Regulation Models

Self-regulation in the context of academic achievement has diverse theoretical origins (Pintrich & Schunk, 1996). Self-regulation has roots predominantly in cognitive, attributional, volitional, and social-cognitive theories. A consequence of the diverse theoretical perspectives of self-regulation is the lack of a comprehensive model and consistent terminology (Bong, 1996; Murphy & Alexander, 2000). In fact, there are researchers of achievement motivation and self-regulation who are concerned about these "fuzzy but powerful constructs" (Murphy & Alexander, 2000; Pintrich, 1994, p. 139). This statement illustrates how self-regulation research uses terminology that is important and relevant in explaining self-regulation within the context of the learning environment, but that it is often labelled inconsistently among researchers, thus making it somewhat confusing to follow and comprehend. Perhaps, as self-regulation research continues to evolve, the variety of overlapping jargon and terminology unique to each theoretical origin will be consolidated to create greater conceptual clarity. On the other hand, it may be impossible to have just one model to capture the complexity of the self-regulation of learning. In the meantime, the dominant self-regulatory models within achievement motivation are described as clearly as the current literature in the area makes possible.

Cognitive self-regulatory models. There are a variety of self-regulatory models that exemplify both unique and overlapping beliefs about self-regulation. One set of models can be categorized as cognitive. Researchers with a cognitive view of self-regulation place a greater emphasis on understanding students' covert learning processes than they do on any social, motivational, or contextual influences on self-regulation (Bong, 1996). In essence, cognitive-based self-regulatory models are more metacognitive in actuality. For example, Winne (1995) has focused primarily on the metacognitive and cognitive strategies of self-regulation such as the acquisition, maintenance, and transfer of self-regulation during individual study, irrespective of any moderating influences of emotion or motivationally related cognition. In addition, when proponents of a cognitive perspective have discussed motivation in relation to self-regulation, it has also been conceptualized in terms of the principles of cognitive psychology (Eccles & Wigfield, 2002).

Achievement motivation self-regulatory models. In contrast to cognitive models of self-regulation are the achievement motivation models of self-regulation. While researchers using cognitive models are focused on the learning strategies that students use to achieve academically, researchers using achievement motivation models are focused on the self-beliefs that students possess to promote their use of metacognitive and cognitive strategies. One particular view of motivation that has been instrumental to the inception of achievement motivation models is Weiner's (1985) attribution theory. Weiner's attribution theory is similar to Winne's cognitive perspective of self-regulation in that it is cognitive-based; however, it differs from Winne's characterization of self-regulation in that its focus is on how cognitions and related emotions influence motivation (Bong, 1996). Weiner outlines his perspective in how learners' covert causal ascriptions influence cognitive, affective, and behavioural consequences. Ability, effort, task difficulty, and luck are identified as the most central achievement attributions. These ascriptions are further classified on controllable, unstable, and internal dimensions (Wade & Tavris, 2003). For example, students tend to be more motivated to learn when they believe (i.e., make covert attributions) that they have the ability to change certain situations or tasks, such as their class grades. Students' abilities to change or influence their grades are classified on controllable and internal dimensions. However, students' motivation to achieve is short-lived when they believe their achievement success is contingent on luck. Luck is classified on external and uncontrollable dimensions.

Another model that stemmed from Weiner's (1985) attribution model of motivation is Dweck's (1986) model of achievement motivation. Although this model is based on attribution theory and includes cognitive ascriptions, it also incorporates contextual or environmental influences. Dweck (1986) believes that the ability conceptions held by students (i.e., *implicit theories of intelligence*) influences their goal-oriented behaviour. For example, Dweck argues that incremental views of intelligence imply that ability is controllable, internal, and unstable. Therefore, students who have an incremental view of intelligence are motivated to learn and use learning strategies because they perceive their intelligence as malleable. Conversely, the entity view of intelligence implies that ability is uncontrollable, internal, and stable. Students who have an entity view of intelligence are less inclined to use learning strategies because they perceive their ability as fixed. Although ability attributions are primarily covert events, Dweck also believes that situational variables are important to the production of behaviour.

Social-cognitive self-regulatory models. Another set of self-regulation models that combines elements from cognitive and achievement motivation self-regulatory models is the social-cognitive approach (Linnenbrink & Pintrich, 2002b). Researchers using the social-cognitive approach tend to emphasize and test hypotheses regarding the influences of social and contextual variables on achievement motivation and cognitive strategy use. For example, Ames (1992) identified various classroom structures that contribute to different student goal orientations toward learning. Schunk's (1989), Zimmerman's (Zimmerman & Martinez-Pons, 1992), and Pintrich's (Pintrich & DeGroot, 1990) models of self-regulated learning have incorporated the reciprocality of personal, behavioural, and environmental factors. This line of research is predicated on the premise that motivation and strategy-use is influenced by contextual factors, such as academic content, classroom environment, and social factors.

Within the social-cognitive approach to self-regulation are two other prominent theories: goal theory (Ames, 1992; Dweck, 1986; Dweck & Leggett, 1988; Nicholls, 1984) and expectancy-value theory (MacIver, Stipek, & Daniels, 1991; Wigfield & Eccles, 2000). The currently popular goal theory of self-regulation originated from Dweck's beliefs of intelligence attributions. Researchers of goal theory have focused primarily on the motivational components of achievement, the purpose and meaning that students ascribe to achievement behaviour (Ryan & Pintrich, 1997). Researchers with the traditional belief of goal theory state that students with a learning orientation (Dweck, 1986), a task-involved orientation (Nicholls, 1984), or a mastery orientation (Ames, 1992) tend to be more motivated to use metacognitive and cognitive strategies and to achieve, than students with a performance orientation (Ames, 1992; Dweck, 1986) or ego-involved goal orientation (Nicholls, 1984). Mastery-oriented students generally want to learn for intrinsic reasons (e.g., to improve), whereas performance-oriented students generally want to learn for extrinsic reasons (e.g., to "look good").

The issue of which goal orientation is more adaptive for learning and achievement is currently being debated among goal theory researchers (Eccles & Wigfield, 2002; Elliot, 1999; Pintrich, 2003). Results of empirical studies are mixed as to which orientation is more adaptive for learning; perhaps a performance goal orientation is not always maladaptive as once believed (Midgley, Kaplan, & Middleton, 2001). Subsequently, it has been suggested that dichotomizing goals into either mastery or a performance orientation may be too simplistic and not accurately represent students' goals in achievement motivation.

Recently, goal theorists have further divided performance goal orientation into approach and avoidance motivation (Elliot, 1999; Midgley et al., 2001; Pintrich, 2000; Radosevich, Vaidyanathan, Yeo, & Radosevich, 2004). It is believed that students who are focused on approach performance goals are motivated to perform better than others and to demonstrate their ability and competence. Alternatively, it is believed that students who are focused on avoidance performance goals want to avoid looking incompetent, which leads them to avoid the learning task. Interestingly, researchers assessing the trichotomy of goal orientation have also shown mixed results. For instance, Pintrich (2000) found that approach performance goals when coupled with mastery goals were just as adaptive for earning high grades as mastery goals; these results contradict traditional beliefs of performance goal orientation. Midgley and colleagues (2001) argued that approach performance goals (when coupled with mastery goals) may be adaptive in achieving high grades but that they are not associated with deep learning strategies or the intrinsic motivation of learning, which are beneficial for learning over a longer period of time. Thus, whether the normative belief that a mastery-goal orientation or an approach performance-goal orientation is more adaptive for learning and achievement is still unresolved. Although researchers are attempting to move beyond the dichotomy of goal orientation by showing the utility of a more complex, multiple goal model (i.e., a trichotomy), empirical validity is still being investigated.

Another social-cognitive approach to self-regulation is the expectancy-value theory. Expectancy-value theorists have argued that students' choice, persistence, and performance are explained by the interaction of their beliefs about how well they believe they will do on an activity and the extent to which they value the activity (Eccles & Wigfield, 2002; MacIver et al., 1991; Wigfield & Eccles, 1994, 2000). Students' are motivated to perform their best when they believe it is possible to do well and if they value the task at hand. Further, if students have an intrinsic interest in an activity, they will value the activity and will have the incentive to achieve.

Finally, another theoretical perspective of self-regulation that includes both covert and contextual influences is volition theory (Schunk & Pintrich, 1996). The central idea of volition theory is the management and implementation of goals (Corno, 1993, 2004; Corno & Mandinach, 1983). Volitional theorists state that wanting to self-regulate is not enough; students must also be able to protect their intentions from other distracting or competing intentions. Distractions can be either cognitive or environmental. Although metacognitive researchers have discussed this personal control of performance in terms of self-monitoring, volitional researchers have discussed personal control in terms of action control.

In summary, the different theoretical orientations of the self-regulation of learning have resulted in researchers emphasizing different aspects of self-regulation. Some researchers have focused their work on the cognitive components of self-regulation, such as metacognitive strategies, while other researchers have focused their work on the motivational components of self-regulation, such as student self-beliefs or contextual influences on motivation. There is not one unified model of self-regulation, but many overlapping models of self-regulation. As a matter of emphasis, the present study used predominantly a social-cognitive perspective in attempting to answer this study's overarching question, what is the developmental trajectory of students' self-regulated learning over the middle-school years?

Social-Cognitive Processes in Self-Regulation

The present study used a self-regulatory model based on a general social-cognitive view of motivation (Garcia & Pintrich, 1996; Pintrich & DeGroot, 1990; Wigfield & Eccles, 2000). This current self-regulatory model was the original model used in the development of the prominent and widely used self-regulatory measure, the *Motivated Strategies for Learning Questionnaire* (MSLQ; Pintrich & DeGroot, 1990; Pintrich et al., 1993).

The self-regulatory model used in the present study has both achievement motivational and cognitive components (Garcia & Pintrich, 1996; Pintrich & DeGroot, 1990). There are three achievement motivation components based on the general social-cognitive model that were used in the present study's model: expectancy, value, and affect (Pintrich & DeGroot, 1990). Achievement motivation components tend to vary from model to model, more so than the cognitive components of self-regulatory models. However, the expectancy, value, and affect components are typically the main motivation categories used in other self-regulatory models, although they may be described using different terminology. As well, some models that use these three motivational components have further divided them into subcomponents. For instance, other achievement motivation models have subdivided the value construct into task-value and goal orientation (Garcia & Pintrich, 1996).

The first achievement motivation component described is expectancy. The expectancy component involves students' self-beliefs of their ability to perform a learning task, as well as their responsibility for their own performance (Pintrich & DeGroot, 1990; Wigfield & Eccles, 2000). Expectancy is similar to other conceptualizations in the motivation literature such as perceived competence, control beliefs, and self-efficacy. Students' expectancy is determined by questions such as, "Can I do this task?" or "Will I be able to this task well?" Research shows that self-efficacy (expectancy) is the strongest predictor (compared with other achievement motivation constructs) of students' use of metacognitive and cognitive strategies, persistence at a learning task, and receiving high grades (Pajares, 1996; Wolters & Pintrich, 1998; Zimmerman, Bandura, & Martinez-Pons, 1992).

The second achievement motivation component described is value. The value component involves students' learning goals and interest in the learning task, such as the reason why a student works on a learning task (Pintrich & DeGroot, 1990). The value component is similar to other achievement motivation conceptualizations such as task-value, mastery and performance goal orientations, and intrinsic and extrinsic orientations. Students who have an intrinsic value or mastery goal orientation of learning are usually found to engage in more metacognitive and cognitive strategies, value effort and improvement, and persist at learning tasks (Wolters & Pintrich, 1998). Subsequently, students with an intrinsic value or mastery goal orientation often receive higher grades in school than students who have an extrinsic value or performance goal orientation of learning. Interestingly, some research shows that students' perceptions of task value are related to taking subsequent courses in a subject area, but that it is students' perceptions of efficacy that predict actual achievement (Wolters & Pintrich, 1998). Therefore, perhaps students' perceptions of task value are typically found to be associated with higher grades because of its relation with self-efficacy.

The third achievement motivation component that is described is affect. The affect component involves students' emotional reactions to learning tasks, in particular their anxiety toward tests (Pintrich & DeGroot, 1990; Schunk & Zimmerman, 1994). Test anxiety is related to students' expectancy and self-efficacy beliefs, such that students who feel anxious regarding their performance at school also feel less able to succeed. Typically, there is an inverse relationship between anxiety and cognitive and metacognitive strategy use and school performance (Pintrich & DeGroot, 1990). Students who are anxious do not perform as well as non-anxious students. However, some research suggests that anxious students may actually use more cognitive strategies in an attempt to compensate for low self-efficacy, but that they make little use of metacognitive or regulatory strategies also needed to achieve the better grades (Pintrich & Schunk, 1996; Wolters & Pintrich, 1998). Within the present study the achievement motivation factors, expectancy, value, and affect, were measured with the MSLQ under the labels self-efficacy, intrinsic value, and test anxiety, respectively. These latter terms will be used for the remainder of this discussion.

There are two cognitive factors that are based on the general cognitive model of learning and information processing: cognitive-strategy use and metacognition (Pintrich et al., 1993). Cognitive-strategy use refers to the strategies students use to help them learn class material, such as the rehearsal, elaboration, organization, and critical thinking of information. Metacognitive strategies consist of planning, skimming, and comprehension monitoring. Effort management skills, such as persistence at difficult or boring tasks, are also included as metacognitive strategies. Students who use cognitive and metacognitive strategies are engaged in their classes, they process information at deeper levels and achieve higher grades than if they were not using these strategies (Pintrich, Roeser, & DeGroot, 1994; VanderStoep et al., 1996; Wolters, Yu, & Pintrich, 1996). Within the present study the cognitive factors, cognitive-strategy use and metacognition, are measured with the MSLQ under the labels cognitive-strategy use and self-regulation, respectively. These latter terms will be used for the remainder of this discussion to keep the terminology consistent with other studies using the MSLQ.

The developmental trajectory of students' self-regulation during the middle-school years was depicted using the achievement motivation and cognitive components just described. Before the research questions regarding the developmental trajectories are outlined, there is a brief discussion of related research on the factors that may influence these developmental trajectories.

Factors Influencing Self-Regulated Learning

Since the early 1990s, research has revealed many dynamics of self-regulated learning, some of which may play a part in its developmental change within students (Pintrich & Schunk, 1996; Schunk & Zimmerman, 1994). It appears that some variables, such as a typical student's natural ability to learn over time, have been shown to influence the cognitive and metacognitive components of self-regulated learning, while other variables, such as the classroom environment, have been shown to affect the achievement motivational components (Pajares & Valiante, 2002; Ryan & Pintrich, 1997; Wolters & Pintrich, 1998). Interestingly, these influencing variables appear to work in opposition with each other during adolescence, which makes the developmental trajectory of self-regulated learning uncertain. The intention of presenting the following research is to illustrate the influences that student learning over time and the classroom environment have on student self-regulated learning. This research is then used to discuss the possible developmental pattern of self-regulated learning over the adolescent years.

The development of self-regulated learning. Research from longitudinal studies on the development of self-regulated learning spanning the middle-school years is limited (Pintrich, 2003; Wolters, 2003). However, there is some developmental research indicating that students' use and acquisition of cognitive strategies and self-regulatory skills increases with age and that students' achievement motivation fluctuates throughout the school years, with a marked decrease at the start of middle school (Ryan & Pintirch, 1997). Interestingly, the most punctuated changes in self-regulated learning appear to occur during the middle-school years.

The increase in students' cognitive strategies and self-regulatory skills into adolescence has been attributed to physiological brain changes and learning (Wade & Tavris, 2003). The use of multidimensional thinking, metamemory, and working memory has been associated with frontal lobe activity. It has been suggested that adolescents' pre-frontal cortex and its neurons mature during this developmental stage (Brynes, 2003). The connections between the pre-frontal cortex and multiple cortical and subcortical structures of the brain may provide a mechanism for increased processing speed. Interestingly, it has also been suggested that the neural changes during adolescence may be a consequence of other developmental changes and exposure to educational factors, such as learning strategies (Brynes, 2003).

One notable point that research has demonstrated is that the cognitive components of self-regulated learning can be learned (Paris & Paris, 2001). Over time adolescent learners can gain and build on previously learned skills to increase their cognitive self-regulatory skills. Studies have shown that students are able to learn greater expertise in managing their time (Weinstein & Mayer, 1986), goal setting, and self-monitoring (Graham & Harris, 1989). It may be advantageous for students to learn cognitive self-regulatory strategies because the cognitive components of self-regulated learning, in addition to the motivational components (i.e., self-efficacy, goal orientation, and task-value) have been shown to predict greater academic achievement (Linnenbrink, Ryan, & Pintrich, 1999; Patrick et al., 1999; Wolters et al., 1996).

Students' ability to learn and use cognitive strategies and self-regulatory skills in the middle-school years may be attributed, in part, to an increasing cognitive capacity to understand the purpose and application of these strategies, which is based on underlying neural changes (Pajares & Valiante, 2002). As students enter adolescence they are typically beginning a new stage of thinking. Based on Piaget's cognitive developmental perspective, adolescents are beginning to think beyond the concrete operations stage and into the formal operations stage (Dweck, 1999). This means that middle-school students are able to think more similarly to adults: more logically and systematically in analyzing ideas.

In contrast to the developmental patterns of the cognitive components of self-regulated learning, research has demonstrated that students' achievement motivation components typically decrease, at least when they enter middle school from elementary school. The research on achievement motivation has generally been from transition studies that have usually looked at the first year of middle school only (Anderman et al., 1999; Ryan & Patrick, 2001). This decrease in achievement motivation is often attributed to contextual factors such as the change in school environment, rather than individual developmental factors. The influence of the classroom environment on self-regulated learning will be discussed in the following two sections. Although developmental explanations for the decrease in students' achievement motivation are rarely mentioned, it is possible that students' interest in school changes as they become adolescents. Physiological and social changes both influence adolescents' sense of self (Dweck, 1999). According to Erikson, adolescents are going through a notable psycho-social change, where significant interest is focused on developing their sense of identity (Dweck, 1999). It could be that students' development of self predominates over school interests, which in turn may affect their motivation in school.

The classroom environment and self-regulated learning. There is much research showing the influence of the classroom environment on students' use of cognitive strategies and self-regulatory skills, as well as achievement motivation (Ames, 1992; Bong, 2001; Wolters & Pintrich, 1998). However, of particular relevance to the present study, is that the majority of research that looks at the influence of the classroom environment on the development of middle-school students' self-regulated learning tends to be cross-sectional rather than longitudinal.

The classroom environment can pertain to subject matter, teacher characteristics, and instructional variables. Research indicates that motivational and cognitive self-regulatory factors vary by subject area (Wolters & Pintrich, 1998). For instance, Wolters and Pintrich (1998) showed that students perceived the highest importance and value in math, had the highest self-efficacy in English, and had the most anxiety (e.g., writing tests and performance) and cognitive-strategy use (e.g., rehearsal and elaboration) in social studies when comparing math, social studies, and English subject areas. There was no difference across subject area in self-regulatory strategy use (e.g., monitoring) or classroom performance.

A similar study to Wolters and Pintrich (1998) also found achievement motivation differences across subject area (Bong, 2001). Bong measured Korean middle-school students' achievement motivation levels in Korean, English, math, and science subject areas. The results of the study showed that students had significantly higher self-efficacy in Korean and higher task-value in English compared with the other subject areas.

These two studies illustrate how classroom environment variables, such as subject area, are related to differences in students' self-regulatory components. It is speculated that there were differences in achievement motivation and cognitive strategy-use factors across subject areas because of the varying instructional styles that are associated with these subject areas (Wolters & Pintrich, 1998). For instance, Stodolsky's and Grossman's (1995) research showed that different subject areas have different instructional styles. They found that social studies classrooms typically offer more diverse and engaging tasks than math classrooms. Perhaps the varying instructional styles and contextual factors of different subject areas, contributed to the differences in students' use of self-regulatory components, not the subject content themselves.

Instructional styles, in general, have been shown to influence students' motivation levels and cognitive-strategy use. Pintrich, Roesser and DeGroot (1994) found that seventh-grade students are more likely to have a mastery learning orientation, lower levels of anxiety, higher levels of self-efficacy, and higher levels of interest and value for the course material when their classes provided them with some choice of tasks, allowed them to work with others, and when the teacher made the work interesting and provided good explanations. In addition, students reported greater use of cognitive and self-regulative strategies for learning when classrooms had these positive features.

Another study also showed a relationship of positive classroom variables with achievement motivation constructs (Roeser & Eccles, 1998). Roeser and Eccles found that middle school students' (grades seven and eight) higher levels of academic self-efficacy and task-value were predicted by their perceptions of teacher positive regard ($r^2 = .37, .39$), student autonomy ($r^2 = .20, .22$), and their teachers' emphasis on individual effort and improvement ($r^2 = .19, .29$). Overall, student perceptions of the class environment accounted for 26% of the variance in their educational values and 29% of the variance in their academic self-efficacy.

In general, it is widely theorized that the classroom structures and teacher practices influence student motivation, which in turn are believed to influence metacognitive and cognitive-strategy use (Ames, 1992; Brookhart, 1997; Pintrich, 2003). Pintrich (2003) discusses the importance of various classroom variables in strengthening students' achievement motivation. For example, Pintrich highlights the value of cooperative learning to facilitate students' goal direction, student evaluation practices that minimize social comparison and competition to build student efficacy, teachers' interest in their subject area to promote students' intrinsic motivation, and the building of supporting and caring relationships to bolster all aspects of student achievement motivation.

The influence of the classroom structure and teacher practices on student motivation and cognitive strategies can also be conceptualized through a goal orientation perspective. The goal orientation of the classroom has been shown to influence students' motivation (Ames, 1992; Anderman, Eccles, Yoon, Roeser, Wigfield, & Blumenfeld, 2001). Ames (1992) proposes that classrooms that promote mastery learning positively influence student motivation. In particular, task, evaluation and recognition, and authority dimensions of classrooms can be used to promote a mastery-learning environment. For example, a mastery-learning environment would not emphasize social comparative standards in assessment but would encourage individual standards to focus on for individual improvement. As well, a mastery-learning environment would encourage students to be autonomous and take control of their own learning rather than always having students follow the teacher's lead mechanistically without thought. Subsequently, this would show trust and respect toward the students and would encourage students to be managers of their learning. Other researchers emphasized supportive and trusting student-teacher relationships and social interaction with peers to motivate students toward learning (Eccles et al., 1993a). In general, a mastery-learning environment fosters intrinsic interest in learning and promotes the use of the cognitive and motivational components of self-regulation by emphasizing effort and improvement and deemphasizing competition (Roeser & Eccles, 1998). The influence of the goal orientation of the classroom has been demonstrated by Anderman and colleagues (2001) who show that students in performance-oriented instruction-based classrooms experienced decrements in achievement values in reading and math.

More recent research within goal theory has suggested that a classroom that promotes both mastery and performance-approach goals may be just as beneficial as a mastery-oriented classroom (Elliot, 1999). Research typically has shown that mastery goals are more beneficial toward learning, but other recent research has shown that performance-approach goals are also beneficial toward learning, when paired with mastery goals. For example, Pintrich (2000) found that performance-approach goals coupled with mastery goals were more adaptive for high school learning than mastery goals alone in terms of student self-efficacy, task value, positive affect, metacognitive strategies, and actual performance. However, the role of performance-approach goals on their own (without being paired with mastery goals) is not clear. Of particular interest to the present study is the goal orientation of the classroom. This study looked at the dichotomy, rather than the trichotomy, of goal orientation within the classroom environment to assess the contextual influences on student self-regulated learning because research on the dichotomy of goal orientation is more consistent and parsimonious at this point in time.

The interaction of development and classroom environment on self-regulated learning. As was discussed earlier, adolescent development can influence students' ability to learn and use cognitive self-regulatory strategies and that the classroom environment, in particular the goal orientation of the classroom, can influence students' achievement motivation. However, when growth and classroom environmental influences are examined simultaneously, research has revealed interesting findings. These findings usually pertain to the achievement motivation components of self-regulation rather than cognitive self-regulatory components. In general, it appears that achievement motivation is researched more frequently than are the cognitive components in relation to the development of self-regulated learning across the middle-school years.

During the specific years of middle school students' achievement motivation typically plummets, as do their class grades (Eccles, Lord, & Midgley, 1991; Eccles et al., 1993a, b). For example, Eccles et al.'s (1983) study found that children's beliefs and values regarding math and English were lowest after the transition into middle school. Simmons' and Blyth's (1987) study that looked at students moving from sixth to seventh grade showed significant declines in self-esteem after the middle-school transition. Similarly, Wigfield et al.'s (1991) study showed declines in students' self-esteem, and interest and value in math, English, and social activities after their transition into middle school.

The explanation for the decrease in student achievement motivation upon entering middle school has often been attributed to the change in the environment. Interestingly, it is not just the environment that is believed to influence students' change in achievement motivation, but their developmental age as well. This interaction between the change in environment and age has been termed the *stage-environment fit hypothesis*, which states that when there is a mismatch between what adolescent students need developmentally and what their environment offers there are negative motivational consequences (Eccles et al., 1991; Eccles et al., 1993; Feldlaufer, Midgley, & Eccles, 1988). Developmentally adolescents need autonomy, emotional support, social interaction with their peers, and cognitive stimulation to promote development. Unfortunately, the middle-school classroom does not typically provide these developmental needs. This is ironic because the creation of the middle school was intended to deal with the developmental period of early adolescence by creating a smaller school within a school. The middle-school classroom generally provides fewer opportunities for student input, interaction and cooperation, while having more social comparison, and less supportive student-teacher relationships (Feldlaufer et al., 1988).

Based on the stage-environment fit hypothesis, a middle-school classroom would be best suited for adolescents if it were a mastery-oriented classroom (Ames, 1992; Eccles et al., 1991; Eccles et al., 1993). Unfortunately, it appears that many middle-school classrooms do not employ mastery-oriented goal concepts. Ryan and Patrick

(2001) showed that positive changes in students' motivation and levels of engagement across the middle-school years were related to their perceptions of the class social environment. Although Ryan and Patrick did not discuss their study's social environment in terms of goal orientation, the social environment factors that were related to student motivation and engagement were representative of a mastery-learning class: teacher support and the teacher promoting interaction and mutual respect.

Another study also looked at the influence that the class environment has on students' motivational beliefs after students transitioned from elementary to middle school (Anderman, Maehr, & Midgley, 1999). In this study, one group of students went to a more performance-oriented middle school, where teachers emphasized competition, ability grouping, and students' relative ability. The other group of students went to a more mastery-oriented middle school, where teachers emphasized learning components, heterogeneous grouping, and friendly relationships between students and teachers. Students who transitioned to the more performance-oriented school had higher levels of personal performance goals and extrinsic goals than students who attended the more mastery-oriented school. This study also illustrated the influence that a classroom's goal orientation might have on students' achievement motivation, as well as their cognitive learning strategies. Research has typically indicated with some empirical evidence that mastery-oriented classrooms may be better for the middle-school transition and students' motivation and cognitive engagement than a performance-oriented classroom. However, other research has suggested that a classroom that is both performance- and mastery-oriented may be just as beneficial as the mastery-oriented classroom (Pintrich, 2003).

Sex differences of self-regulated learning. The differential development of self-regulated learning across the middle-school years in terms of students' sex is uncertain.

The self-regulated learning trajectories for boys and girls are not clear because research has shown mixed results. Research has documented some sex differences in the level of achievement motivation during the middle-school years. Studies have found higher competence beliefs in boys than girls in sports and math, whereas, girls have higher competence beliefs than boys in English and social studies (Eccles et al., 1993a; Wolters & Pintrich, 1998). Freedman-Doan and colleagues (2000) also found gender stereotypic differences regarding ability beliefs with elementary school children. Boys tended to believe they were best able at sports and math and girls tended to believe they were best able at reading, dance, and singing.

Two of the few longitudinal studies of students' competence beliefs, albeit with elementary students, found similar sex differences as the previous studies: boys had greater competence beliefs in math and sports and girls had greater competence beliefs in reading and music (Anderman, Eccles, Yoon, Roeser, Wigfield, & Blumenfeld, 2001; Wigfield et al., 1997). However, both of these studies found no sex differences in competence belief changes over the elementary school years as they had predicted. Pajares and Valiante (2002) investigated the relationship between gender differences and the perception of gender with changes in self-efficacy from elementary to high school. They found that gender differences in self-efficacy were rendered insignificant when gender orientation beliefs were controlled. These findings suggest that perceptions of gender may be more influential on a student's self-efficacy than the gender per se.

Sex differences in cognitive self-regulation strategies tend to indicate that female students use cognitive self-regulated learning strategies more than boys from elementary school to high school age (Pajares & Valiante, 2002). Zimmerman and Martinez-Pons (1990) showed that girls across all grades displayed more goal-setting and planning strategies, and self-monitored more frequently than did boys in English. Alternatively, Pintrich and DeGroot (1990) did not find sex differences in metacognitive and cognitive-strategy use.

In general, it appears that most sex differences are related with self-efficacy, feelings of competence, and success attributions. Unlike boys, girls often attribute success to external causes and attribute failure to internal causes and have lower expectations of success (Stipek & Gralinski, 1991). Girls' negative attributions to academic achievement generally hold across the school years (i.e., elementary to high school).

It is speculated that there may be sex differences in self-regulated learning because of what research shows in the sex differences of achievement attributions and self-efficacy (Freedman-Doan et al., 2000; Stipek & Gralinski, 1991; Wigfield et al., 1997). If girls have feelings of low self-efficacy and have negative attributions toward achievement, then it is possible that their achievement motivation is lower than boys as well. However, sex differences in the development of all the various self-regulated learning components across the middle-school years have not been examined. It is important to note any sex differences because of the potential implications in students' future expectancies and avoidance desires. For example, if girls have low self-efficacy and negative success attributions at school then they may be less motivated or avoid taking courses where these feelings are present (e.g., gender stereotypic courses such as math).

Summary of factors influencing self-regulated learning. In summary, research appears to support two potential developmental trajectories of self-regulated learning. One potential developmental trajectory is for self-regulated learning to increase during adolescence. Research on cognitive and metacognitive strategy use shows that students' ability to develop these strategies increases during adolescence (Pajares & Valiante, 2002; Schunk & Zimmerman, 1994; Weinstein & Mayer, 1986). Another potential developmental trajectory is for self-regulated learning to decrease during adolescence. Research shows that students' achievement motivation decreases at the elementary to middle school transition (Eccles et al., 1993a; Roeser & Eccles, 1998; Ryan & Patrick, 2001). The discrepant research findings of student self-regulated learning at the middle-school and adolescent years indicate that the cognitive components increase but the achievement motivation components decrease. Influencing, but likely not exhaustive, factors on students' cognitive and achievement motivation self-regulatory components are growth, classroom environment, and an interaction between the two. The intent of this study was to disentangle the influences of growth, classroom environment, and the interaction of the two on the development of students' self-regulated learning.

No known research has assessed the developmental change of both cognitive and motivation self-regulatory components at the same time during the middle-school years. Further, no known research has simultaneously assessed the influence of the classroom environment and its goal orientation on both the cognitive and motivation self-regulatory components across the middle-school years. Therefore, it was uncertain how the two self-regulatory components would interact with the influence of the classroom environment over time.

Research Questions

1. What is the influence of development over the middle-school years on students' self-regulated learning components (i.e., achievement motivation components: intrinsic value, self-efficacy, test anxiety and cognitive

components: cognitive-strategy use and self-regulatory skills)? That is, does adolescent development influence student self-regulated learning over the middle-school years?

2. What is the influence of the classroom environment, specifically the goal orientation of the classroom environment, on students' self-regulated learning components over the middle-school years?
3. What is the interaction between adolescent development and classroom goal orientation on the components of self-regulated learning across the middle-school years?
4. Is there a difference in the developmental trajectories of the self-regulated learning components between boys and girls during the middle-school years?

Chapter III

Method

Participants

Participants for this study were drawn from a larger longitudinal study examining middle-school students' self-regulated learning and achievement. They were recruited from two suburban middle schools outside of Victoria, British Columbia, Canada for each of the five waves of data collection over three years. The participants were predominantly from middle-class families and their ethnicity was representative of the Victoria area. The population of Victoria is approximately 78% Caucasian, 14% Asian, and 8% other (Census Data 1996, Statistics Canada). Students from grade six to eight participated in the study voluntarily, with the consent of a guardian. The participants were from a range of subject areas including mathematics, social studies, language arts, food science, technical education, skills for living, and core (i.e., homeroom). Approximately 80% of the students from each class took part in the study, and were representative of every achievement level.

The total students-by-occasion measured was 699. This means that there were 699 cases within the data, where some students were measured at more than one time point. There were five waves of data collection, with 127 cases at Wave 1, 130 cases at Wave 2, 128 cases at Wave 3, 118 cases at Wave 4, and 196 cases at Wave 5. The total number of students who participated across the five waves of data collection was 475 (see Table 1 for a breakdown in student numbers). Of these 475 students, data were collected once from 305 students, twice from 127 students, three times from 36 students, four times from three students, and five times from four students for a total of 699 cases. Even though there were few students measured more than two occasions the data were still able to be modelled longitudinally by using hierarchical linear modelling (HLM) analyses (Bryk & Raudenbush, 1992). HLM manages missing data by weighing existing data to impute the missing data (Wu, 1996). The nature of HLM analyses is discussed in more detailed in the results and discussion chapters.

Table 1

Number of Students by Grade and Sex (N = 699)

	Grade 6	*Grade 7*	*Grade 8*
Girls	106	128	92
Boys	118	156	99

Measures

Participating students in each class were administered two questionnaires.

Motivated Strategies for Learning Questionnaire (MSLQ). The MSLQ is a self-report instrument designed to assess students' perceptions of their achievement motivation and of their use of cognitive and metacognitive strategies (Pintrich & DeGroot, 1990). The development of the MSLQ began in 1982, with a variety of instruments containing anywhere from 50 to 140 items (Pintrich, Smith, Garcia, & McKeachie, 1993). Initial instruments were tested for three years on over 1000 university students to assess item reliability and validity and to conduct factor analysis (see Garcia & Pintrich, 1996 for factor analyses report). Garcia and Pintrich (1996) mentioned that the MSLQ could also be used on children as young as grade five, not just university students. The MSLQ used in the present study is based on Pintrich's and DeGroot's (1990) work.

The MSLQ used in the present study has 44 items that students responded to on a 7-point Likert scale (*1=not at all true of me* to *7=very true of me*; see Appendix A for full test). The five scales were constructed using factor analysis (Pintrich & DeGroot, 1990). There are three achievement motivation scales: intrinsic value, self-efficacy, and test anxiety. The Intrinsic Value scale ($\alpha = .87$, Pintrich & DeGroot, 1990) consisted of nine items concerning students' intrinsic interest in and perceived importance of their course work (e.g., "I prefer classwork that is challenging so I can learn new things," "I think that what I am learning in this class is useful for me to know"). The Self-Efficacy scale ($\alpha = .89$, Pintrich & DeGroot, 1990) consists of nine items regarding students' perceived competence and confidence in their performance of class work (e.g., "Compared with other students in this class I expect to do well," "I think I will receive a good grade in this class"). The Test Anxiety scale ($\alpha = .75$, Pintrich & DeGroot, 1990) consisted of four items concerning worry about and cognitive interference on tests (e.g., "I have an uneasy, upset feeling when I take a test").

In addition to the three motivational scales are two cognitive scales: cognitive-strategy use and self-regulation. The Cognitive-Strategy Use scale ($\alpha = .83$, Pintrich & DeGroot, 1990) consists of 14 items pertaining to the use of rehearsal strategies, elaboration strategies such as summarizing and paraphrasing, and organizational strategies (e.g., "It is hard for me to decide what the main ideas are in what I read," "When studying, I copy my notes over to help me remember material"). The Self-Regulation scale ($\alpha = .74$, Pintrich & DeGroot, 1990) was based on eight metacognitive and effort management items (e.g., "When work is hard I either give up or study only the easy parts," "Before I begin studying I think about the things I will need to do to learn").

Student Classroom Environment Measure (SCEM). The SCEM assesses students' perceptions of the class environment (Feldlaufer et al., 1988). The SCEM was developed in 1988 for the Michigan Adolescent Study, which was a 2-year study that assessed the influence of changes in classroom environments on students' motivation (Eccles et al., 1993). The SCEM was developed in conjunction with the Teacher Classroom Environment Measure (TCEM) and the Observer Classroom Environment Measure (OCEM). However, the later two measures were not used in the current study. The SCEM questionnaire, in particular, measures students' perceptions of their teacher's fairness and friendliness, competition, and social comparison among students, the opportunity for cooperative learning among students, and their teacher's interest in the subject. These five dimensions were confirmed using a principal components analysis. All items loaded at > .30 (see Feldlaufer et al., 1988 for further detail of factor loadings).

The SCEM was extensively tested through pilot studies using upper-elementary and junior high school classrooms (Eccles et al., 1993). The result of the pilot testing was 18 items, which are responded to on a 4-point Likert scale (*1=not very often* to *4=very often*; see Appendix B for full test). The SCEM used in the current study had an additional nine items, resulting in either one or two more items per factor. These similar additional items were added to the original SCEM to increase factor reliability.

Research on the original SCEM (Eccles et al., 1993) used five items assessing cooperation and interaction within the class ($\alpha = .51$, Year 1 and $\alpha = .65$, Year 2; e.g., "We get to work with each other in small groups when we do class work"); two items assessing competition within the class ($\alpha = .58$, Year 1 and $\alpha = .68$, Year 2; e.g., "Some kids try to be the first ones done in classwork"); two items assessing social comparison ($\alpha = .52$, Year 1 and $\alpha = .59$, Year 2; e.g., " When report cards come out, we tell each other what we got in this class"); six items measuring teacher friendliness ($\alpha = .70$, Year 1 and $\alpha = .75$, Year 2; e.g., "The teacher cares about how we feel"); and three items assessing the teacher's interest in the subject ($\alpha = .51$, Year 1 and $\alpha = .56$, Year 2; e.g., "The teacher tells us why this subject is important").

For the purpose of the current study, one factor representing the goal orientation of the classroom was created, based on Ames (1992) depiction of components in a classroom environment that could foster mastery learning within students. This goal orientation factor was created by taking the mean score from the five dimensions of the SCEM. Prior to the mean score calculation, the social comparison and competition subtests scores were reversed to coincide with the direction of goal orientation of the other subtests. High scores on this factor represented a more mastery-oriented classroom and low scores represented a more performance-oriented classroom. The possible range of scores was 1 (*not very often*) to 4 (*very often*).

Procedure

The teaching staff from the two participating schools were informed that the study would be examining student motivation and self-regulated learning skills, as well as the classroom environment. Students were similarly informed and were given participation consent forms, which required dual signatures, by a parent or guardian and themselves. They were instructed to return the signed consent forms within one week.

Participating students completed the two questionnaires over each of the three school years, during October or November and April or May. The intervals between the two data collection occasions varied somewhat. However, there were not always the same students at each time of measurement. The students were instructed to answer honestly and were assured that their answers would not be shown to anyone at their school, including their teachers. Each of the three questionnaires was administered during the same class period, and was distributed in random order across different classes. The procedure took close to the entire class period of approximately 45 minutes. In classes where teachers instructed two subjects to the same students, questionnaires were administered twice, with a two-week time span between each administration session. Two coders then scored the questionnaires.

Chapter IV

Results

The results chapter is organized into three sections. The first section discusses the statistical analyses used. The second section reports a series of preliminary analyses, which include the reliability estimates of the measures, an examination of descriptive statistics across grades and sex, and a canonical correlation among the subtests of the two measures. Finally, the third section addresses the main research questions using hierarchical linear modeling (HLM).

Analytic Approach

Hierarchical linear modeling (HLM) was used to examine this study's longitudinal data (Bryk & Raudenbush, 1992). HLM is an advantageous statistical tool to use with longitudinal data because it is more flexible in terms of its data requirements and does not compromise statistical accuracy when compared to other statistical analyses, such as repeated measures. Unlike repeated measures analyses both the number of observations per person and the spacing among the observations may vary when using HLM (Snijders, 1996). HLM can compensate for appropriate amounts of missing data by differentially weighing existing data to impute missing data (Wu, 1996). Participants who have complete data are given greater weight in the analyses, which allows participants who have missing data to borrow from the existing data, rather than having to exclude these participants from the analyses. By including all participants, even those with some missing data, there can be a larger sample size, which lends to greater statistical power and a potentially more representative sample of original participants (Maggs & Schulenberg, 1998; Snijders, 1996). For instance, in the present study, a linear trajectory was calculated for each student. These trajectories were calculated by using the individual student's data and if there were missing data, then the remaining information were borrowed from other students.

Another advantage to using HLM is that intraindividual and interindividual change can be assessed (Maggs & Schulenberg, 1998). A difficulty in analyzing longitudinal research is trying to tease apart what change is the result of differences between individuals in a given behaviour at one point in time (interindividual differences) and what change is the result of within-person differences in the same behaviour across time (intraindividual change; Baltes, Reese, & Nesselroade, 1988). For instance, if two students completed a questionnaire at the same time there would likely be some differences in their questionnaire answers. However, this difference would not be considered development. Similarly, if the same students completed the same questionnaire a year later, there also would likely be some differences in the questionnaire answers compared to their first responses. This amount of change present is the result of both the developmental change of each student and the difference between the two students at a given point in time, in addition to measurement unreliability. The challenge then for developmental researchers is to disentangle these two types of change.

HLM assesses how much of the construct of change is the result of intra- or interindividual change by representing intra- and interindividual change on two separate levels with their own variance estimates. Intraindividual change is represented at Level 1, which is each individual's pattern of growth over time. Interindividual change is represented in Level 2 where variables (e.g., stable/personal) are used as predictors of individuals' patterns of growth at Level 1. In this study, change over time (growth), the perceptions of the classroom environment, and an interaction between the two were used as Level-1 predictors of students' self-regulation (Level 1) and sex was used as a Level-2 predictor of Level-1 predictors.

Preliminary Analyses

Reliability analyses. Alpha coefficients for the two measures' subtests are presented in Table 2. All cases ($N = 699$) were included for the Cronbach's alpha calculations. The Cronbach's alphas for the MSLQ and SCEM subtests are reported as the median alphas across the five waves of measurement. The Cronbach's alpha coefficients for the MSLQ subtests are as follows: .90 for self-efficacy, .88 for intrinsic value, .85 for test anxiety, .87 for cognitive strategy use, and .76 for self-regulation. The MSLQ alphas are strong, with the exception of the self-regulation subtest which was moderately strong. The Cronbach's alpha coefficients for the SCEM subtests are as follows: .65 for cooperation and interaction, .55 for competition, .53 for social comparison, .80 for teacher friendliness, and .65 for teacher's interest. These alphas are moderate.

Coefficients of stability (i.e., test-retest reliability) were calculated to assess how stable the measures were over time. These results are also presented in Table 2. Due to the fact that this study was longitudinal, it was of interest and importance that the measures used were reliable over time. The coefficients of stability were determined by using separate data that were collected specifically for this reason on two separate occasions, three months apart. These data are believed to have similar demographics as the larger data set. There were fewer cases included in this particular reliability analysis ($N = 150$) because only students who were measured three months apart and who were in the same classroom were included. Students who were measured three months apart in different classrooms were not included in the analyses because of the possibility of

Table 2

Cronbach's Alpha and Stability Coefficients for the Motivated Strategies for Learning Questionnaire (MSLQ) and the Student Classroom Environment Measure (SCEM) Subtests

Measures	Cronbach's α (*N*=699)	Stability Coefficient (*N*=150)
MSLQ		
Intrinsic Value	.88	.64
Self-Efficacy	.90	.70
Test Anxiety	.85	.75
Cognitive Strategy Use	.87	.69
Self-Regulation	.76	.71
SCEM		
Cooperation & Student Interaction	.65	.56
Competition	.55	.57
Social Comparison	.53	.54
Teacher Friendliness	.80	.69
Teacher Interest	.62	.57

varying classroom confounds. The coefficients of stability for the MSLQ subtests are as follows: .70 for self-efficacy, .64 for intrinsic value, .75 for test anxiety, .69 for cognitive strategy use, and .71 for self-regulation. The coefficients of stability for the SCEM subtests are as follows: .56 for cooperation and interaction, .57 for competition, .54 for social comparison, .69 for teacher friendliness, and .59 for teacher's interest.

Descriptive analyses. Table 3 presents the average mean scores and standard deviations across the fall and spring measurements in grades 6, 7, and 8 for the MSLQ subtests. The mean scores in grades 6, 7, and 8 on the Intrinsic Value, Self-efficacy, Self-regulation, and Cognitive-Strategy Use subtests indicate that students' intrinsic value in their learning, sense of self-efficacy, and use of self-regulatory skills and cognitive strategies were present at least *half of the time* in class. This translates to mean subtest scores ranging from 4.14 to 5.07. The potential range of scores on the MSLQ subtests was from 1 to 7. The mean item scores of test anxiety were lower than other subtests means, indicating that students felt test anxiety only *sometimes* in class (e.g., less than half of the time). This translates to mean item subtest scores for test anxiety ranging from 2.62 to 3.32. There was little directional difference in students' scores in self-efficacy and cognitive-strategy use from grade six to grade eight, which suggests that these two subtests were stable over the middle-school years. However, there appeared to be a decrease in students' scores in intrinsic value and self-regulation, and an increase in students' scores of test anxiety in students from grade six to grade eight. This suggests that over the middle-school years students had less intrinsic value in their learning, used fewer self-regulation strategies, and were more anxious when it came to writing tests.

Table 3

Item Means[a] and Standard Deviations: Motivated Strategies for Learning Questionnaire (MSLQ) by Grade (N = 699)

Factors		IV[b]	SE[c]	TA[d]	SR[e]	CSU[f]
		M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
Grade 6						
	Fall	5.07 (1.65)	4.84 (1.74)	2.81 (1.51)	4.55 (1.57)	4.68 (1.65)
	Spring	4.76 (1.23)	5.10 (1.37)	2.62 (1.26)	4.77 (1.38)	5.04 (0.99)
Grade 7						
	Fall	4.99 (1.18)	4.94 (1.38)	3.32 (1.59)	4.35 (1.37)	4.40 (1.53)
	Spring	4.34 (1.36)	4.75 (1.54)	3.18 (1.80)	4.41 (1.21)	4.58 (1.17)
Grade 8						
	Fall	4.70 (1.28)	4.78 (1.57)	3.30 (1.62)	4.14 (1.28)	4.32 (1.49)
	Spring	4.79 (1.35)	4.96 (1.20)	3.32 (1.72)	4.22 (1.15)	4.60 (1.09)

Note. [a] Range is 1 (*not at all true of me*) to 7 (*very true of me*).

[b] Intrinsic Value.

[c] Self-Efficacy.

[d] Test Anxiety.

[e] Self-Regulation.

[f] Cognitive-Strategy Use.

Figure 1 further illustrates the standardized cumulative mean score changes of the MSLQ subtests from grade six to eight.

Correlations among the MSLQ subtests are presented in Table 4. Intrinsic value, self-efficacy, self-regulation, and cognitive-strategy use were all moderately correlated with one another; a range of 0.39 to 0.65 with a mean of 0.50. Test anxiety had weaker relationships with the other subtests; a range of -0.10 to -0.27, with a mean of 0.16. The correlations among the MSLQ subtests in the present study are similar to the MSLQ subtest correlations reported by Pintrich and DeGroot (1990). However, Pintrich's and DeGroot's correlations were slightly stronger.

Table 5 presents the average mean scores and standard deviations across the fall and spring measurements in grades six, seven, and eight for the SCEM subtests. The mean scores from all SCEM subtests (i.e., cooperation and interaction, competition, social comparison, teacher friendliness, and teacher interest) indicate that students *sometimes* to *usually* perceived the presence of these five subtests in the classroom. The mean item scores on these subtests ranged from 2.24 to 3.06. The potential range of scores was 1 to 4. There appears to be a decrease in students' perceptions of competition within the classroom and in teacher friendliness, yet an increase in perceptions of social comparison from grade six to grade eight. There was little difference in cooperation and interaction and teacher interest subtest scores from grade six to grade eight. Correlations among the subtests used in the present study are presented in Table 4. The strength of relationship among the subtests ranged from 0.11 to 0.53 with a mean of 0.27.

A canonical correlation was performed between the MSLQ subtests and the SCEM subtests to determine the nature of the relationship between students' self-

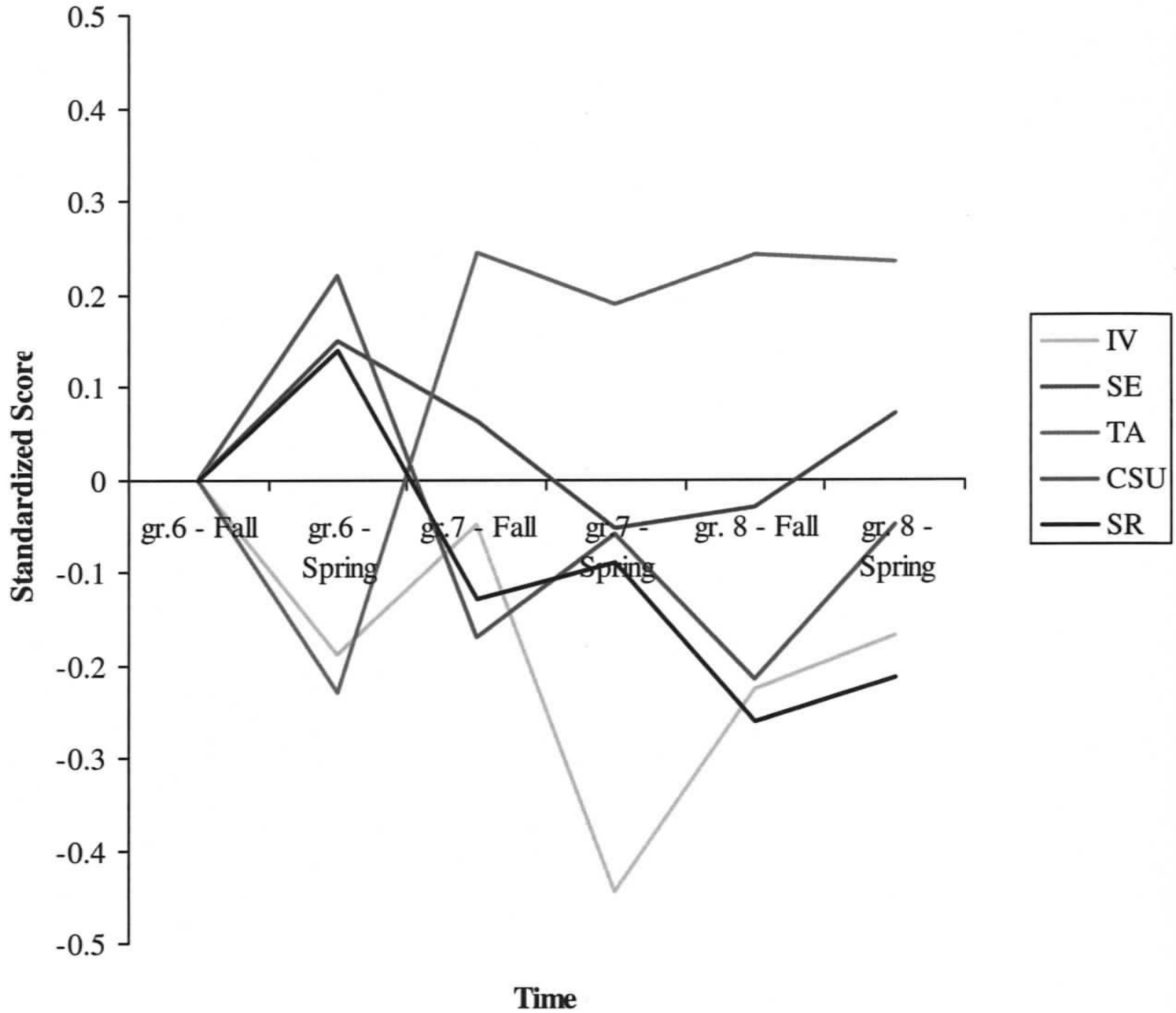

Figure 1. Standardized Cumulative Mean Score Change during the Middle-School Years - Motivated Strategies for Learning Questionnaire (Mean = 0, SD = 1).

Table 4

Pearson Correlations among Motivated Strategies for Learning Questionnaire (MSLQ) and Student Classroom Environment Measure (SCEM) Subtests (N = 699)

Factors	1	2	3	4	5	6	7	8	9	10
SCEM										
1. Coop/Inter.[a]		-								
2. Competition[b]	0.14^{**}	-								
3. Social Com.[c]	0.26^{**}	0.35^{**}	-							
4. Teach. Fr.[d]	0.20^{**}	-0.09^{*}	-0.30^{**}	-						
5. Teach. Int.[e]	0.22^{**}	0.06	-0.09^{*}	0.52^{**}	-					
MSLQ										
6. Intrinsic Val.[f]	0.19^{**}	0.06	-0.11^{*}	0.39^{**}	0.43^{**}	-	0.54^{**}	-0.10^{**}	0.48^{**}	0.51^{**}
7. Self-Effic.[g]	0.14^{**}	-0.02	0.05	0.22^{**}	0.23^{**}		-	-0.27^{**}	0.39^{**}	0.42^{**}
8. Test Anx.[h]	0.03	0.09^{*}	0.05	-0.05	0.00			-	-0.10^{*}	-0.15^{**}
9. Cog. Strat.[i]	0.17^{**}	0.08^{*}	0.04	0.17^{**}	0.23^{**}				-	0.65^{**}
10. Self-Reg.[j]	0.14^{**}	0.08^{*}	-0.04	0.24^{**}	0.26^{**}					-

Note. * $p < 0.05$. ** $p < 0.001$.

[a] Cooperation/Student Interaction

[b] Competition

[c] Social Comparison

[d] Teacher Friendliness

[e] Teacher Interest

[f] Intrinsic Value

[g] Self Efficacy

[h] Test Anxiety

[i] Cognitive-Strategy Use

[j] Self-Regulation

Table 5

Item Means[a] and Standard Deviations: Student Classroom Environment Measure (SCEM) by Grade (N = 699)

Factors		CI[b]	CO[c]	SC[d]	TF[e]	TI[f]
		M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
Grade 6						
	Fall	2.37 (0.51)	2.67 (0.65)	2.49 (0.59)	3.24 (0.53)	3.19 (0.65)
	Spring	2.44 (0.49)	2.57 (0.70)	2.68 (0.59)	3.19 (0.47)	3.12 (0.57)
Grade 7						
	Fall	2.30 (0.54)	2.58 (0.70)	2.62 (0.65)	2.88 (0.65)	2.89 (0.66)
	Spring	2.49 (0.52)	2.47 (0.78)	2.85 (0.64)	2.70 (0.78)	2.77 (0.82)
Grade 8						
	Fall	2.46 (0.61)	2.36 (0.75)	2.84 (0.58)	2.96 (0.64)	3.02 (0.71)
	Spring	2.51 (0.54)	2.26 (0.62)	2.69 (0.55)	3.05 (0.64)	3.23 (0.55)

Note. [a] Range is 1 (*not very often*) to 4 (*very often*).

[b] Cooperation and Student Interaction.

[c] Competition.

[d] Social Comparison.

[e] Teacher Friendliness.

[f] Teacher Interest.

regulation and their perception of their classroom environment. Results showed that the two variable sets were related, $F(25, 2561) = 5.575$, $p < .05$ and 43% of the variance was accounted for by the two sets. The relationship among the individual components of the MSLQ and SCEM is reported in Table 4.

Table 6 presents the average mean scores and standard deviations across the fall and spring measurements in grades six, seven, and eight for the goal orientation of the classroom environment. Recall that this goal orientation factor was created by taking the mean score from the five dimensions of the SCEM. The range of scores was 1.5 to 3.48, with a standard deviation of 0.36. High scores were indicative of a more mastery-oriented classroom and low scores were indicative of a more performance-oriented classroom. This table shows a decrease in mastery-orientation from grade six to grade seven and an increase from grade seven to grade eight. Figure 2 further illustrates the standardized cumulative mean score changes of the goal orientation of the classroom from grade six to eight.

HLM Analyses

Various models were assessed in the HLM analyses. All of the models consisted of two levels, with occasions (Level 1) nested within individuals (Level 2). Some models had one or two predictors at level 1, and some models had predictors at both level 1 and level 2. At level 1, each student's development of self-regulation was represented by an individual growth trajectory. Preliminary analyses indicated that a linear growth model was sufficient for capturing self-regulation growth patterns; there were no differences between linear and quadratic growth patterns. The level-1 predictors that were used in different models were change over time (growth), the goal orientation of the classroom environment, and an interaction variable between classroom environment and growth.

Table 6

Means[a] and Standard Deviations: Goal Orientation of Classroom Environment by Grade (N = 699)

		M (SD)
Grade 6		
	Fall	2.73 (0.31)
	Spring	2.72 (0.30)
Grade 7		
	Fall	2.57 (0.37)
	Spring	2.53 (0.40)
Grade 8		
	Fall	2.66 (0.36)
	Spring	2.77 (0.32)

Note. [a] Range is 1 (*not very often*) to 4 (*very often*).

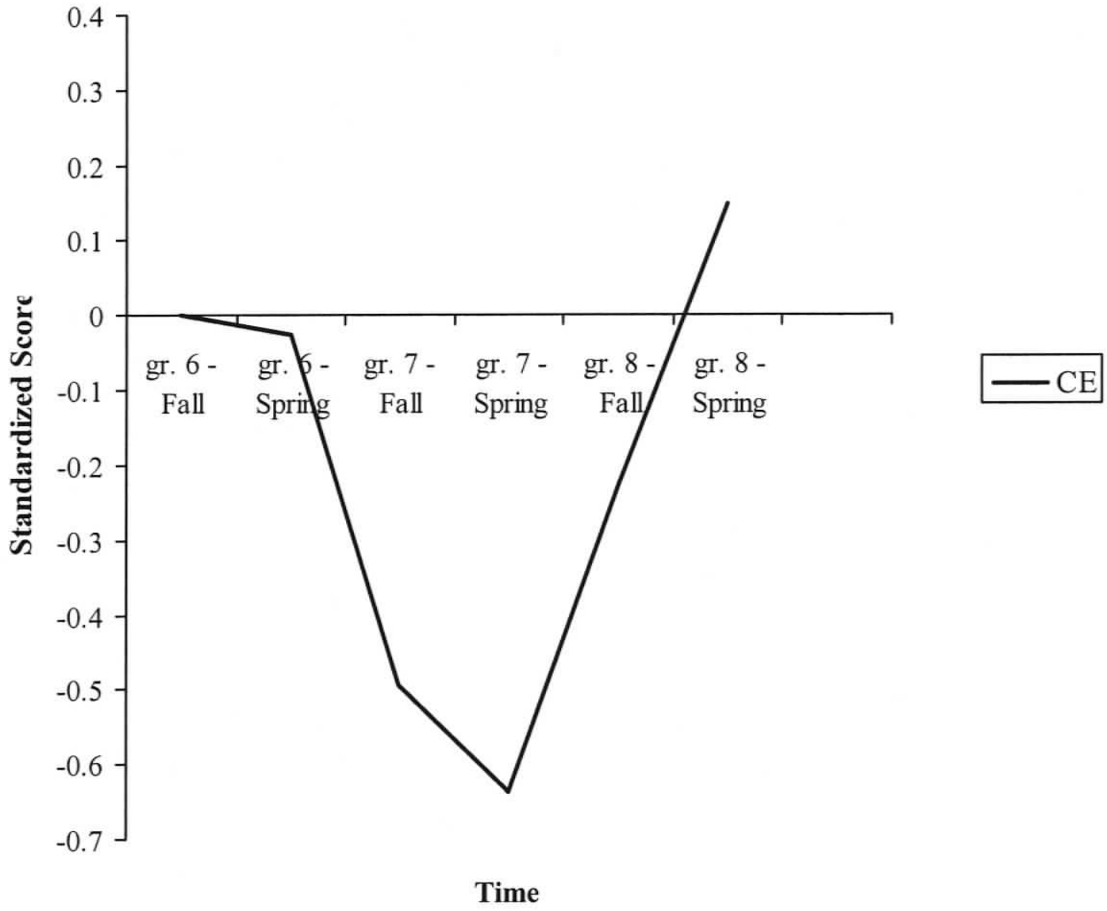

Figure 2. Standardized Cumulative Mean Score Change during the Middle-School Years - Goal Orientation of the Classroom Environment (Mean = 0, SD = 1).

The goal orientation of the classroom environment was included as a level-1 predictor because it was not a fixed variable; rather students' perceptions of their classroom environment were measured at each time point which implied that they could change across time and vary among students. Models that examined sex differences used level 2, person-level (i.e., sex) characteristics, to predict the individual growth parameters and the perceptions of classroom environment. Hence, an example of the level 1 model was

$$Y_{ti} = B_{0i} + B_{1i}\, a_{ti} + e_{ti}$$

where $i = 1, \ldots, n$ students, where a_{ti} is the grade at time t for person i, each person was observed on ti occasions, with error e_{ti}. B_{1i} is the growth rate (slope) for person i over the data collection period and represents the average change during a fixed unit of time. The fixed intercept parameter, B_{0i}, was the self-regulation of person i at $a_{ti} = 0$. I.e.,

Y_{ti} (MSLQ development) = B_{0i} (MSLQ at grade 6) + B_{1i} (MSLQ growth rate) + error

The level 2 model is

$$B_{0i} = G_{00} + u_{0i}$$

$$B_{1i} = G_{10} + u_{1i}$$

where G_{00} and G_{10} represent the intercepts, and u_{0i} and u_{1i} represent random error in the equations. I.e.,

$$B_{0i} = G_{00} + u_{0i}$$

$$B_{1i} = G_{10} + G_{11}(\text{sex}) + u_{1i}$$

In order to address the four research questions, four sets of HLM models were tested. There were five similar models for each of the self-regulation subtests (i.e., intrinsic value, self-efficacy, test anxiety, cognitive-strategy use, and self-regulation) within each set. The subtests were analyzed in multiple separate models instead of one larger model for several reasons. First, separate models would allow for more power to uncover the effects of the independent variables on the self-regulation subtests. Second, individual analyses would allow for a less ambiguous interpretation of the results. Third, and most importantly, it was of a greater interest to examine the individual components of self-regulated learning than the overall construct of self-regulated learning itself. Although the subtests are correlated to some extent, they are conceptually different from one another. This argument was also used by Huberty and Morris (1989) in their discussion challenging the use of multivariate analysis of variance (MANOVA) over multiple analysis of variance (ANOVA s) to control for Type I error.

The first set of models was unconditional. The succeeding two sets of models introduced level-1 predictors individually (i.e., growth and classroom environment) to answer the first two research questions. The final set of models encompassed all level-1 (i.e., growth, classroom environment, and an interaction variable for growth and classroom environment) and level-2 (i.e., sex) predictors to answer the last two research questions.

Unconditional models. The first set of models represented the simplest of HLM models. It is termed the unconditional model. The model is considered unconditional because there are no level 1 or 2 predictors; instead the model focuses on the mean-level differences, which in this study are the middle-school students' self-regulatory subtests. Separate models were computed for each of the five dependent variables from the MSLQ's subtests. E.g.,

Unconditional model. Level-1: $Y_{ti}\ (MSLQ) = B_{0i} + e_{ti}$

Level-2: $B_{0i} = G_{00} + u_{0i}$

The results of the unconditional HLM analyses showed mean student level differences for all five self-regulation subtests (see Table 7) and statistically significant

Table 7

HLM Unconditional Model Estimates for Motivated for Learning Strategies Questionnaire (MSLQ) Subtests (N = 475)

Components	Coefficient	SE	t
Intrinsic Value			
Intercept	4.83	0.06	85.84**
Self-Efficacy			
Intercept	4.89	0.06	79.17**
Test Anxiety			
Intercept	3.13	0.07	44.18**
Cognitive-Strategy Use			
Intercept	4.51	0.06	73.96**
Self-Regulation			
Intercept	4.34	0.06	76.44**

Note. $^{*}p < .05$. $^{**}p < .001$.

variations among their scores. The total variations in the self-regulation subtests are partitioned into variation within and between students. The amount of variance that the unconditional models accounted for represents the total amount of variance possible in ensuing models. The variances calculated in subsequent models would be proportionate to the corresponding unconditional model variance. All variances were found by first reviewing the homogeneity of variance that showed if there was true variation in the self-regulatory subtests. A chi-square statistic was used to decide if the null hypotheses that there were no individual differences among students' self-regulation could be held. If the chi-square statistic was statistically significant, then the null hypothesis was rejected, indicating that the remaining variation needed to be explained.

The results for the unconditional models for the achievement motivation self-regulatory components were as follows: the mean intrinsic value score among students was 4.83 with a standard error of 0.06 and 28% of the variance in intrinsic value was between students [χ^2 (474) = 744.23, $p < .001$]. The mean self-efficacy score among students was 4.89 with a standard error of 0.06 and 33% of the variance in self-efficacy was between students [χ^2 (474) = 809.60, $p < .001$]. The mean test anxiety score among students was 3.13 with a standard error of 0.07 and 63% of the variance in test anxiety was between students [χ^2 (474) = 1654.57, $p < .001$]. For the cognitive self-regulatory components the unconditional model results were as follows: the mean cognitive-strategy use score among students was 4.51 with a standard error of 0.06 and 44% of the variance in cognitive-strategy use was between students [χ^2 (474) = 1007.66, $p < .001$]. The mean self-regulation score among students was 4.34 with a standard error of 0.06 and 35% of the variance in self-regulation was between students [χ^2 (474) = 842.52, $p < .001$].

In summary, the unconditional models showed that all five self-regulatory subtests varied among students and the amount of variation between students ranged from 28% to 63%. With the exception of test anxiety, most of the variation in the outcomes was at level 1, meaning within time or occasions. However, there was also a substantial proportion of variation between students. Both amounts of within and between student variation suggested that additional models were necessary to determine what other variables accounted for this variability.

Growth models. The next set of HLM models included a single level-1 predictor. To address the first research question regarding the influence of the development on students' self-regulation during the middle-school years, the variable growth was used to predict change in students' self-regulation subtests from grades six to eight. The growth of students' self-regulation was of interest in the present study because it represented the pure developmental view of student self-regulatory change over the middle-school years. If growth was a statistically significant predictor, then it would suggest that students' self-regulated learning changed as students became older and entered higher grades. The growth variable was coded to reflect the time of year and grade that the data were measured since the first possible time and grade measurement. Each grade had two time points, fall and spring. The first time point was the fall of grade six. Therefore, the intercepts in each equation can be interpreted as the difference from the time point measured from the first possible time point (i.e., fall of grade six). Models were computed separately for each of the five self-regulation subtests. E.g.,

Growth model. Level-1: $Y_{ti}\,(MSLQ) = B_{0i} + B_{1i}\,(\text{Time}_{ti}) + e_{ti}$

Level-2: $B_{0i} = G_{00} + u_{0i}$

$B_{1i} = G_{10} + u_{1i}$

Results are presented in Table 8. Growth (grade and age change) predicted change in students' intrinsic value, test anxiety, and self-regulation subtests. There was no change in the self-efficacy [i.e., $\beta_{1i} = 0.00$; $t\ (474) = 0.06, p = 0.95$] and cognitive-strategy use subtests [i.e., $\beta_{1i} = -0.04$; $t\ (474) = -1.19, p = 0.24$]. There was a linear decrease of 0.09 on average per half year in students' intrinsic value score from grades six to eight [i.e., $\beta_{1i} = -0.09$; $t\ (474) = -2.53, p < 0.01$], whereas, there was a linear increase of 0.11 on average per half year for students' test anxiety from grades six to eight [i.e., $\beta_{1i} = 0.11$; $t\ (474) = 3.43, p < 0.001$]. Students' scores in the self-regulation subtest had a linear decrease of 0.08 on average per half year [i.e., $\beta_{1i} = -0.08$; $t\ (474) = -2.40, p < 0.05$]. These results indicate that students' sense of intrinsic value and use of self-regulation strategies decreased over the middle-school years, while their test anxiety increased. Students' self-efficacy and cognitive-strategy use remained stable in the study. The effect sizes, as measured by Cohen's *d*, were small (see Table 8).

An analysis of the residual variance of the purely developmental models examined above indicated that a significant variation among students' self-regulated learning remained to be explained. The null hypothesis that no residual variance remains to be explained was rejected for intrinsic value [$\chi^2\ (168) = 251.95$, p < .001], self-efficacy [$\chi^2\ (168) = 274.99$, p < .001], test anxiety [$\chi^2\ (168) = 247.66$, p < .001], cognitive-strategy use [$\chi^2\ (168) = 313.19$, p < .001] and self-regulation [$\chi^2\ (168) = 336.30$, p < .001]. The amounts of between-student variance accounted for by developmental growth for the self-regulation subtests were: 51% for intrinsic value, 40% for self-efficacy, 29% for test anxiety, 36% for cognitive-strategy use, and 57% for self-regulation. These amounts of variances were the percentages of their corresponding initial, unconditional

Table 8

HLM Conditional Estimates and Effect Sizes of Growth Effects on Motivated for Learning Strategies Questionnaire (MSLQ) Subtests (N = 475)

Components	Coefficient	SE	*t*	Cohen's *d*
Intrinsic Value				
Intercept	5.02	0.10	51.63**	
Growth Linear Slope	-0.09	0.03	-2.53*	0.23
Self-Efficacy				
Intercept	4.88	0.10	42.28**	
Growth Linear Slope	0.00	0.03	0.06	0.01
Test Anxiety				
Intercept	2.90	0.09	32.23**	
Growth Linear Slope	0.11	0.03	3.43**	0.32
Cognitive-Strategy Use				
Intercept	4.60	0.10	46.05**	
Growth Linear Slope	-0.04	0.03	-1.19	0.11
Self-Regulation				
Intercept	4.55	0.10	45.17**	
Growth Linear Slope	-0.08	0.03	-2.40*	0.22

Note. $*p < .05$. $**p < .001$.

model variances. For example, 51% of the between-student variance in intrinsic value was accounted for by growth, of the original 28% of between-student variance reported from the intrinsic value in the unconditional model. These results encourage a further search for student-level variables that may account for the remaining variation in the intercepts.

Classroom environment models. The third set of models included the second single level-1 predictor. In order to test the influence of the classroom environment on students' self-regulation, the goal orientation of classroom environment, as measured by the SCEM, was added as a predictor. These models were able to demonstrate the influence that a mastery-goal oriented classroom had on students' self-regulation over the middle-school years. Separate models were created for each of the five self-regulation subtests. E.g.,

Classroom environment model. Level-1: $Y_{ti}\ (MSLQ) = B_{0i} + B_{1i}\ (SCEM) + e_{ti}$

Level 2: $B_{0i} = G_{00} + u_{0i}$

$B_{1i} = G_{10} + u_{1i}$

The results showed that student self-regulation as assessed across all subtests of the MSLQ were influenced by the goal orientation of the classroom environment when controlling for student development (see Table 9). A more mastery-oriented classroom environment predicted a linear increase of 0.96 on average per half year for intrinsic value [i.e., $\beta_{1i} = 0.96$; $t\ (474) = 7.733$, $p < 0.001$], 0.57 on average per half year for self-efficacy [i.e., $\beta_{1i} = 0.57$; $t\ (474) = 4.10$, $p < 0.001$], 0.36 on average per half year for cognitive strategy use [i.e., $\beta_{1i} = 0.36$; $t\ (474) = 2.67$, $p < 0.01$], and 0.49 on average per

Table 9

HLM Conditional Estimates and Effect Sizes of the Goal Orientation of the Classroom Environment (CE) Effects on Motivated for Learning Strategies Questionnaire (MSLQ) Subtests (N = 475)

Components	Coefficient	SE	*t*	Cohen's *d*
Intrinsic Value				
Intercept	2.71	0.30	9.04**	
CE Linear Slope	0.96	0.13	7.43**	0.68
Self-Efficacy				
Intercept	3.64	0.32	11.25**	
CE Linear Slope	0.57	0.14	4.10**	0.38
Test Anxiety				
Intercept	3.77	0.31	12.28**	
CE Linear Slope	-0.29	0.13	-2.15*	0.20
Cognitive-Strategy Use				
Intercept	3.72	0.31	12.15**	
CE Linear Slope	0.49	0.13	2.67**	0.25
Self-Regulation				
Intercept	3.29	0.29	11.18**	
CE Linear Slope	-0.08	0.03	3.82**	0.35

Note. $^{*}p < .05$. $^{**}p < .001$.

half year for self-regulation [i.e., $\beta_{1i} = 0.49$; $t(474) = 3.82, p < 0.001$]. Conversely, a more mastery-oriented classroom environment predicted a linear decrease of 0.29 on average per half year for test anxiety [i.e., $\beta_{1i} = -0.29$; $t(474) = -2.15, p < 0.05$] in students. The effect sizes, as measured by Cohen's *d*, were small to medium. These results imply that the friendlier the teacher was to the students, the more interested the teacher had in his or her teaching, the less competitive and socially comparative the classroom was, and the more opportunity for cooperative learning, the less test anxiety students had and the more intrinsic value and self-efficacy students had in their learning, and the more they used cognitive strategies and self-regulatory skills.

Intrinsic value was the only subtest where the between-student variation of classroom environment needed to be further explained. The null hypothesis that no residual variance remains to be explained was rejected for intrinsic value [$\chi^2(165) = 198.57$, $p < .05$]. The amount of between-student variance that was accounted for by classroom environment for intrinsic value was 85%. There was no residual variance to be explained for self-efficacy value [$\chi^2(165) = 193.51$, $p = .06$], test anxiety value [$\chi^2(165) = 169.02$, $p = .40$], cognitive-strategy use value [$\chi^2(165) = 174.13$, $p = .30$], and self-regulation value [$\chi^2(165) = 158.60$, $p = .50$].

Growth, classroom environment, growth x classroom environment interaction, and sex models. The fourth and final set of models included all variables of interest in this study to address the third and fourth research questions. To help illustrate the rationale for the fourth set of models, the results are summarized. Up to this point, the analyses revealed the following findings. The first set of models was unconditional. These models showed that the self-regulation subtests differed from student to student.

The models also provided an estimate of the maximum between student variation that could be accounted for in each subtest, which were used in subsequent variation calculations for other models. The second set of models included growth as a predictor. These models showed that students' intrinsic value, test anxiety, and self-regulation subtests were predicted by developmental, linear growth, which suggests that these variables changed from grade six to grade eight. The third set of models added the goal structure of the classroom environment as a predictor. These models showed that all of the self-regulation subtests were predicted by the goal orientation of the classroom environment when developmental growth was controlled. This suggests that the goal orientation of the classroom influenced students' self-regulation across the middle-school years.

For the fourth set of models, it was of interest to include the growth and classroom environment variables and their interaction term in one model to get a sense how they predicted student self-regulation. The final set of models looked at all predictors together. Since there was no residual variance left in any of the MSLQ subtests, with the exception of intrinsic value, the fourth set of models focused particularly on intrinsic value. E.g.,

Growth, classroom environment, and sex model:

Level-1: $Y_{ti}\,(MSLQ) = B_{0i} + B_{1i}\,(\text{Time}) + B_{2i}\,(\text{SCEM}) +$

$B_{3i}\,(\text{Time x SCEM}) + e_{ti}$

Level-2: $B_{0i} = G_{00} + u_{0i}$

$B_{1i} = G_{10} + G_{11}\,(\text{sex}) + u_{1i}$

$B_{2i} = G_{20} + G_{21}\,(\text{sex}) + u_{1i}$

$B_{3i} = G_{30} + G_{31}\,(\text{sex}) + u_{1i}$

The results showed that growth predicted students' intrinsic value (see Table 10). In particular, students' intrinsic value decreased from grade six to grade eight [i.e., β_{1i} = -0.49; t (473) = -2.26, $p < 0.05$]. Unlike the set-2 models, test anxiety [i.e., β_{1i} = -0.09; t (473) = -0.54, $p = 0.59$] and self-regulation [i.e., β_{1i} = 0.21; t (473) = 1.00, $p = 0.32$] subtests did not change from grades six to eight. Self-efficacy [i.e., β_{1i} = -0.26; t (473) = -1.07, $p = 0.29$] and cognitive-strategy use [i.e., β_{1i} = 0.08; t (473) = 0.38, $p = 0.70$] remained unchanged over the middle-school years. This was expected as there was no residual variance to be explained in any of the MSLQ subtests from the previous third set of models, with the exception of intrinsic value. All of the effect sizes, as measured by Cohen's *d*, were small.

The goal orientation of the classroom environment predicted students' intrinsic value, test anxiety, and self-regulation subtests. The more mastery oriented students' classrooms were, the higher were students' intrinsic value [i.e., β_{1i} = 0.64; t (473) = 2.96, $p < 0.01$] and self-regulation [i.e., β_{1i} = 0.61; t (473) = 2.79, $p < 0.01$] subtest scores, and the lower was students' test anxiety [i.e., β_{1i} = -0.51; t (473) = -2.61, $p < 0.01$]. Unlike the set-3 models, self-efficacy [i.e., β_{1i} = 0.39; t (473) = 1.64, $p = 0.10$] and cognitive-strategy use [i.e., β_{1i} = 0.37; t (473) = 1.87, $p = 0.06$] were not predicted by the goal structure of the classroom environment.

The interaction between growth and the classroom environment was related to only students' intrinsic value [i.e., β_{1i} = 0.18; t (473) = 2.06, $p < 0.05$]. This meant that as students went from grade six to seven to eight, and with increased mastery oriented classrooms, intrinsic value also tended to increase. Growth alone in the HLM models from the second and fourth set of models showed a decrease in students' intrinsic value.

Table 10

HLM Conditional Estimates and Effect Sizes of Growth, Classroom Environment (CE), Growth x CE, and Sex Effects on Motivated for Learning Strategies Questionnaire (MSLQ) Subtests (N = 475)

Components	Coefficient	SE	*t*	Cohen's *d*
Intrinsic Value				
Intercept	3.62	0.50	7.24**	
Growth Linear Slope	-0.48	0.21	-2.26*	0.21
Sex	0.10	0.22	0.47	0.04
CE Linear Slope	0.64	0.22	2.96*	0.27
Sex	0.07	0.08	0.77	0.07
Growth x CE Slope	0.18	0.09	2.06*	0.19
Sex	-0.70	0.09	-0.74	0.07
Self-Efficacy				
Intercept	4.02	0.56	7.17**	
Growth Linear Slope	-0.26	0.24	-1.07	0.10
Sex	0.20	0.23	0.88	0.08
CE Linear Slope	0.39	0.24	1.64	0.15
Sex	0.04	0.09	0.45	0.04
Growth x CE Slope	0.11	0.10	1.05	0.10
Sex	-0.08	0.09	-0.82	0.08
Test Anxiety				
Intercept	4.18	0.43	9.60**	
Growth Linear Slope	-0.09	0.17	-0.54	0.05
Sex	-0.04	0.20	-0.20	0.02
CE Linear Slope	-0.51	0.20	-2.61*	0.24
Sex	-0.14	0.08	-1.87	0.17
Growth x CE Slope	0.09	0.07	1.30	0.12
Sex	0.01	0.09	0.11	0.01
Cognitive-Strategy Use				
Intercept	3.73	0.45	8.26**	
Growth Linear Slope	0.08	0.20	0.38	0.04
Sex	-0.19	0.22	-0.87	0.08
CE Linear Slope	0.37	0.20	1.87	0.17
Sex	0.07	0.09	0.75	0.07
Growth x CE Slope	-0.04	0.08	-0.44	0.04
Sex	0.05	0.10	0.52	0.05
Self-Regulation				
Intercept	3.13	0.51	6.14**	
Growth Linear Slope	0.21	0.21	1.00	0.09
Sex	-0.25	0.20	-1.25	0.12
CE Linear Slope	0.61	0.22	2.79*	0.26
Sex	0.08	0.09	0.86	0.08
Growth x CE Slope	-0.10	0.08	-1.19	0.11
Sex	0.05	0.09	0.60	0.06

However, it appeared that the classroom environment was important in counteracting this decrease, because the interaction between growth and classroom environment showed an increase in intrinsic value. This finding was important because it illustrates that the interaction between growth and classroom environment is of particular influence to intrinsic value. The interaction between growth and classroom environment did not predict the other subtests: self-efficacy [i.e., $\beta_{1i} = 0.11$; $t\ (473) = 1.05$, $p = 0.29$], test anxiety [i.e., $\beta_{1i} = 0.09$; $t\ (473) = 1.30$, $p = 0.20$], cognitive-strategy use [i.e., $\beta_{1i} = -0.04$; $t\ (473) = -0.44$, $p = 0.66$], and self-regulation [i.e., $\beta_{1i} = -0.10$; $t\ (473) = -1.19$, $p = 0.24$]. The effect sizes, as measured by Cohen's *d*, were small.

Finally, the students' self-regulation subtests did not differ among sex for any of the predictors (i.e., growth, classroom environment, and growth by classroom environment interaction).

There was no residual variance to be explained for any of the self-regulation subtests, intrinsic value, self-efficacy value, test anxiety, cognitive-strategy use value, and self-regulation value from the fourth set of models.

Chapter V

Discussion

Self-regulated learning is a key component in achieving student academic success. There are three significant findings from past research on self-regulated learning that provided the impetus for the present study. First, research has shown the many benefits of students engaging in self-regulated learning by using metacognitive and cognitive learning strategies to remember information and in motivating themselves to keep trying in the face of task difficulty (Pintrich & Schunk, 1996; Schunk & Zimmerman, 1994; Wolters, 2003). Second, research has shown that the achievement motivation of student self-regulated learning does not always remain stable across grades, particularly from the transition from elementary to middle school where it declines (Eccles et al, 1991; 1993a). This finding has left researchers wondering how this flagging achievement motivation progresses throughout the rest of the middle-school years. Third, research has shown the positive relationship between having a mastery goal orientation and using self-regulated learning, and students' learning environment (Ames, 1992; Eccles et al., 1993b; Wigfield & Eccles, 1994).

The present study has built upon these three significant conclusions of self-regulated learning. The primary focus of this study was to gain a better understanding of students' self-regulated learning trajectories over the middle-school years. Knowing that self-regulated learning is important for school achievement and that achievement motivation declines upon entry to middle school, it was of interest to find out what happens to students' self-regulated learning trajectories across the remainder of the middle-school years. Further, it was of interest to determine if the goal orientation of the classroom environment would influence students' growth of self-regulated learning. In line with the study's research questions, HLM analyses examined the changes in self-regulated learning and whether these changes were due to sex, developmental change, classroom influences, or an interaction between the latter two variables.

Self-Regulated Learning Development

Results from the second set of HLM models showed the developmental change of self-regulated learning across the middle-school years. These analyses revealed both expected and unexpected findings.

Achievement motivation components. Students' intrinsic value decreased from grade six to grade eight and students' test anxiety increased. Self-efficacy did not change over the middle-school years. The developmental change evident on the MSLQ's achievement motivation components, intrinsic value and test anxiety, were expected as they have been demonstrated in other research examining earlier developmental periods. Research typically has shown a decrease in students' task value and an increase in test anxiety across the elementary school years (Eccles et al., 1993; Wigfield et al., 1997) and even more so after the transition into middle-school years (Anderman et al., 1999; Eccles et al., 1991; Wigfield et al., 1991). In other words, students' interest in a learning task and their perceived importance and utility of school learning flags distinctively during the transition into the middle-school years, yet their test anxiety rises.

One explanation for this occurrence, from a developmental perspective, is that students' self-concept and ability ratings change during the middle-school years compared to earlier school years, which inadvertently affects their interest in their learning task (Stipek & MacIver, 1989). Generally speaking, when students feel they are competent and skilled in a learning task they will value what they are learning and feel little anxiety when evaluated (Eccles et al., 1983; Eccles & Wigfield, 1995). Conversely, when they do not feel competent in a learning task, it is as if they justify their lower competency by devaluing the learning task. Students also feel anxious upon evaluation. The positive relation between perceived competency and task value helps students maintain their self-esteem and diminish feelings of frustration (Eccles & Wigfield, 1995).

As students move from preschool to elementary to middle school their criteria for assessing their ability changes, and so do the results of their assessments (Stipek & MacIver, 1989). When students are in elementary school they base their ability on judgements received from social reinforcement and on task mastery. Task mastery in elementary school can be represented by Erikson's psychosocial stage of industry versus inferiority, where children concern themselves with their ability to complete their work to develop a sense of competence (Dweck, 1999). Students feel that they are given social reinforcement for their efforts that in turn are indicative of their ability. This is similar to Dweck's theory on person's beliefs about intelligence (i.e., incremental intelligence), where ability is perceived as being changeable with practice and effort (Dweck, 1986; Dweck & Leggett, 1988). Interestingly, social reinforcement is often in abundance in the early school years and beliefs of failure are kept at a minimum so as to not thwart the desire to learn and achieve (Stipek & MacIver, 1989). Further, elementary school children are in between Piaget's cognitive developmental preoperational and concrete operational stages where they may be unable to distinguish between their own point of view and another's (egocentrism) and as such, they make intraindividual comparisons (Dweck, 1999). Therefore, they are often unaware that the majority of other children are also receiving similar social reinforcement. Not surprisingly, children report high ratings for their ability.

When students reach middle school they do not take social reinforcement at face value as they once had, rather they interpret it as a function of task difficulty or other factors (Stipek & MacIver, 1989). Middle-school students are cognitively able to understand others' points of view and are making social comparisons with their peers; they have noticed that effort is not always representative of ability. This is similar to Dweck's theory of incremental intelligence, where ability is perceived as a stable trait (Dweck, 1986; Dweck & Leggett, 1988). Subsequently, some middle-school students may perceive their ability as lower compared to elementary students' self-evaluations and may also then, devalue what they are learning and feel more anxiety when being tested. The combination of a lower perception of ability and the heightened awareness of other students' performances often results in more individual pressure, and hence, anxiety.

Another developmental explanation for the change in intrinsic value and test anxiety among middle-school students is that they are going through a significant developmental period where they are just beginning a sense of identity. Erikson's psychosocial theory states that adolescents (middle-school students) go through an identity versus role confusion stage where their attention is focused on having others perceive them as they perceive themselves (Dweck, 1999). It is possible that students' interest in learning and school shifts to their identity formation at this developmental period.

In summary, the decrease in students' intrinsic value of their learning and their increase in test anxiety over the middle-school years from a developmental perspective may be explained by the changes in students' perceptions of their ability and self, and interpretation of evaluative feedback given their school environment (Stipek & MacIver, 1989; Wigfield & Eccles, 2000). At adolescence, children become more cognitively adept at understanding and interpreting evaluative feedback they receive at school and engage in more social comparison with their peers. In turn, children become more realistic and negative in their self-perceptions which relates to their interest and value in their learning task and test anxiety. In addition, middle-school students are at a developmental period where they expend more energy on developing an individualistic sense of self that may interfere with their interest in learning (Dweck, 1999).

Detecting no change in self-efficacy over the middle-school years was unexpected. It was believed that the self-efficacy and intrinsic value components would change in similar ways across the middle-school years because often when students devalue an activity they do so because they also have low efficacy beliefs about it (Eccles et al., 1983). Past research generally has reported decreases in students' self-efficacy across elementary school, during the middle school transition, and into the high school years (Eccles et al., 1993b; Wigfield & Eccles, 2000; Wigfield et al., 1997). Wigfield, Eccles, and colleagues provided two explanations for this decrease in self-efficacy. First, as students develop into adolescence they become more realistic and accurate in their self-assessments compared with younger children who are more optimistic; hence, their self-beliefs become relatively more negative. Second, the school environment changes in ways that makes self-evaluation and competition more salient, causing some students to become more self-critical. However, there is other research that has looked at the development of self-efficacy and found that self-efficacy for middle-school students was higher than in elementary students (Shell, Colvin, & Bruning, 1995). These researchers surmised that it was possible for students' efficacy beliefs to increase, even if their sense of ability compared to their peers decreased.

In contrast to other research findings, the present study showed that students' intrinsic value decreased and their self-efficacy beliefs remained the same over the middle-school years. Even though students did not value what they were learning they might have felt that they were capable to complete and understand their school work. There could be a discrepancy among students' value of learning and efficacy beliefs because of these students' attribution styles, which would influence how they explain their academic successes and failures. Self-efficacy beliefs are based on the attributions of past performances (Linnenbrink & Pintrich, 2002b). It is speculated that this study's middle-school students had stable efficacy beliefs because they appropriately internalized their past academic successes and externalized their failures. If students attributed their academic successes to internal, stable factors such as ability or skill then they would still have these factors to experience future successes (Linnenbrink & Pintrich, 2002b; Weiner, 1985). As well, if students attributed their academic failures to external, unstable factors such as lack of effort, then they would protect their self-worth and believe that failure may not happen again in the future. The stability in students' self-efficacy beliefs can be explained by the possibility that they made adaptive past attributions to account for their academic successes and failures. If students made adaptive attributions then their self-efficacy beliefs should not decrease over the middle-school years because they would feel capable to succeed, not frustrated. Future studies would need to measure students' attributions and self-efficacy beliefs to ascertain the relationship between the two over the middle-school years.

Cognitive learning strategies. The results for the two cognitive self-regulatory components showed that self-regulation decreased in students from grade six to grade eight. Cognitive-strategy use did not change over the middle-school years. The decrease in students' self-regulation and stability in cognitive-strategy use contradicts what research would support. Research on cognitive learning and self-regulatory strategies generally shows that students increase their repertoire of strategies as they mature (Pajares & Valiante, 2002). In Piaget's stages of cognitive development once children become 12 years of age they reach the formal operations stage (Dweck, 1999; Wade & Tavris, 2003). At this stage, pre-adolescents begin to think like adults by engaging in abstract reasoning, planning, and comparing and contrasting ideas. This cognitive development stage corresponds with the age of middle-school students. Piaget mentioned that cognitive development is not just maturational but is also contingent on direct learning and social transmission. It is possible that students' cognitive-strategy use and self-regulation did not increase across the middle-school years because they did not have the opportunity to learn these strategies. Middle-school students may be at the developmental age where they are cognitively able to understand, process, and implement a greater variety of learning strategies but without the instruction of the various strategies, it may take students more time to learn them.

Research reports that despite the utility and power of mnemonic strategies and metacognition (cognitive- and self-regulatory strategy use), they are often not consistently taught and assessed within the classroom (Borkowski & Muthukrishna, 1995; Levin; 1993). Some reasons why mnemonics have not found their way into the classroom are because of the difficulty in teaching students to use and generalize cognitive strategies, teachers not understanding mnemonic strategies themselves, time, and a lack of enthusiasm. Perhaps if cognitive-learning and self-regulatory strategies were built into the curriculum teachers would have the time, the expectation to teach the strategies, and a better understanding of the various strategies to incorporate them into their students' learning. Further, students may be more interested and motivated to use cognitive learning strategies if they were already integrated in with course content and assessment (Borkowski & Muthukrishna, 1995). A couple of mnemonic strategies that have been shown to perform well for students are the *keyword method* and *pegword method* when used for remembering factual information (i.e., unfamiliar names or terms and sequencing terms, respectively; Levin, 1993). Further, research has also shown the utility of classroom-wide programs that instil and promote the use of cognitive strategies within content areas (Borkowski & Muthukrishna, 1995; Wolters, 2003). For instance, some researchers are using computer-based programs, using the concepts of apprenticeship learning and situated cognition, which are designed to motivate students and help them use cognitive strategies (Borkowski & Muthukrishna, 1995).

Contextual Influences on Self-Regulated Learning: Goal Orientation of the Classroom Environment

The analyses from the third set of HLM models showed that the goal orientation of the classroom environment is related to self-regulated learning. These results were expected.

Students' changes in self-regulated learning over the middle-school years may not only be attributed to developmental change within the student, but to classroom influences as well. There are numerous studies that have examined and discussed the differences in the classroom environment between elementary and middle schools, and how these differences impact students' learning and motivation (Anderman et al., 1999; Midgley et al., 1995; Wigfield et al., 1991). Some important differences found between elementary and middle-school classrooms are that middle-school classrooms typically stress ability, social comparison and evaluation, while providing less personalized support through less teacher contact (the result of frequent class changes; Midgley et al., 1995). The present study extended this line of investigation by looking at the influence of the goal structure of the classroom environment on students' self-regulated learning across the middle-school years. Results showed that the more mastery oriented the classroom the greater the change in students' levels of all components of self-regulated learning. Specifically, the more mastery oriented the classroom the more intrinsic value students placed on classroom learning and the more efficacious they felt. The use of cognitive strategies and self-regulatory skills was also positively associated with more mastery-oriented learning environments. Finally, the more mastery oriented the classroom the less test anxiety students felt over the middle-school years. This means that the more the students perceived their classroom as employing cooperative learning methods and not being competitive and their teachers' being interested and fair in the class, the more they intrinsically valued their class, felt a sense of efficacy, used cognitive strategies and self-regulatory skills, and felt less test anxiety.

These results parallel and extend other research. For example, Pintrich and colleagues (1995) in their study of grade seven students showed that the classroom context influenced the motivational and self-regulated learning over the span of a year. Students reported that they had higher levels of interest, less test anxiety, and were more likely to use cognitive strategies for learning and to regulate their own thinking when their classrooms provided them with choice, interesting work, and cooperative learning. Anderman and colleagues (2001) showed decrements in elementary (grades three and four) and middle school (grade six) students' value for math and reading over the span of a year when in a more performance-oriented classroom. The performance-oriented classroom was defined as using social comparison, focusing on ability differences, and using competitive instructional methods.

Interaction between Development and Contextual Factors: A Stage-Environment Fit Approach

The fourth and final HLM model included all predictors on level-1 (i.e., developmental change and classroom environment) and level-2 (i.e., sex), as well as an interaction term (i.e., developmental change x classroom environment). The reasoning behind including all variables in one model was to further explain the changes in student self-regulation over the middle-school years. It was of interest to include both developmental change and classroom environment (i.e., classroom goal structure) together in one model to see if the results would still hold as when these variables were examined in separate models.

Development and the classroom context. The results from this larger model helped clarify the predictive role that developmental change and classroom environment had on students' self-regulated learning. As demonstrated in the second and third models, students' intrinsic value, test anxiety, and self-regulation changed over time and all of the self-regulatory components were influenced by the goal orientation of the classroom environment. However, in the final model that included all predictors and an interaction term, intrinsic value was the single component that remained as changing over time and intrinsic value, test anxiety, and self-regulatory skills were the only components that were influenced by the classroom goal structure. Only intrinsic value was predicted by the interaction term. This suggests that change in students' test anxiety and self-regulatory skills was influenced predominantly by the goal orientation of the classroom environment, rather than developmental change per se; whereas, change in intrinsic value was influenced by the interaction of a student's development and the goal orientation of the classroom environment.

In summary, the results imply that student self-regulated learning is generally more contingent on classroom factors than individual developmental change. Intrinsic value was the only component of self-regulated learning that was influenced by developmental change as much as by contextual factors. It appears that the stage-environment fit theory (Eccles et al., 1993a) applies exclusively to the intrinsic value component of self-regulation. As students develop into adolescence their value and interest in learning decreases. Based on Erikson's psychosocial developmental theory, middle-school aged students are entering the fifth critical developmental stage of life (identity versus role confusion) where they are focused on having others see them as they see themselves (Dweck, 1999). Students' interest and focus on learning may be somewhat sidetracked by the need to develop a sense of self. It is also possible that students' lose interest and value in their learning because they perceive their abilities more critically and realistically as they become more cognitively adept in adolescence (Stipek & MacIver, 1989). Subsequently, when students perceive themselves as less able they are less interested in what they are learning. Yet, as the interaction term suggested, a mastery-oriented classroom may act as buffer for this deteriorating interest. The results support that a classroom that encourages mastery over social comparison and competition helps students from losing interest and value in their learning altogether. This is further supported by research showing that mastery goals are more motivating for students than are performance goals (Ames, 1992; Anderman et al., 1999).

The influence of a mastery-oriented classroom is also significant in decreasing students' test anxiety and increasing students' use of self-regulatory skills. The results from the fourth set of models that included all level-1 predictors showed that the goal structure of the classroom environment, and not development (or change over time), predicted the change in middle-school students' test anxiety and self-regulation. This implies that the social comparison in evaluation and competition within the middle-school classroom exacerbates students' anxiety around testing. It also implies that a classroom that focuses on mastery rather than just performance increases students' use of self-regulatory skills. It is possible that classes that highlight the mastery of learning simultaneously promote the use of cognitive strategies, such as self-regulatory skills, by encouraging the understanding of how one reaches an answer, rather than merely the answer itself. In addition, it is believed that a mastery-oriented classroom would be more conducive to the instruction and incorporation of cognitive and self-regulatory skills. However, future research would need to look at the relationship between the goal-orientation of a classroom and instruction of cognitive and self-regulatory skills to determine if a mastery-oriented classroom would in fact be a more ideal environment to include cognitive and self-regulatory skills.

The results from the fourth set of models have important implications for practice. The results showed that irrespective of any developmental changes, the classroom goal structure was the dominant influence in self-regulatory learning for middle-school students, which suggests that self-regulatory learning can be improved with modifications to the classroom. Rather than attributing poor self-regulation in school to individual factors, such as low achievement motivation, and putting the onus of change on the student, the focus of change should be in environmental factors. Educators have the potential to help students become better self-regulated learners by making adjustments within the classroom (Linnenbrink & Pintrich, 2002b). Some suggested modifications that could be done to make middle-school classrooms more mastery-oriented are to increase teacher interest in the content areas that they are teaching, to provide more opportunity for positive interactions between the student and teacher, to have more cooperative learning, and to decrease the social evaluation and comparison among students. For instance, schools could have policies on how to evaluate, recognize, and group students that would capture students' achievement or mastery goals (i.e., improvement or effort). In addition, changes to the curriculum could be made to include cognitive strategy instruction and evaluation within course content to increase the use of cognitive and self-regulatory strategies.

Sex. Sex was included as a student-level predictor to determine whether student change in self-regulated learning differed between boys and girls and whether the perceptions of the classroom environment differed between boys and girls. Interestingly, sex was not a significant predictor in students' self-regulated learning over time or in their perceptions of the classroom environment and its influence on their self-regulated learning strategies. This means that boys and girls experience similar change (or no change) in self-regulated learning (i.e., intrinsic value, self-efficacy, test anxiety, self-regulation, and cognitive strategy use) and in the influence of their perceived classroom environment on these self-regulated learning components over the middle-school years.

While research has shown varying trends in the sex differences of self-regulated learning strategies (i.e., the metacognitive and cognitive strategies), research on self-efficacy has generally shown a consistent picture in terms of sex differences. For instance, results have shown boys as being more efficacious in math and science subject areas and girls as having more self-efficacy in language studies (Eccles et al., 1993a; Wolters & Pintrich, 1998). It was felt that girls' self-efficacy would decrease at a greater rate than boys over the middle-school years because of girls' poorer self-perceptions during adolescence (Simmons & Blyth, 1987). However, other studies have also found similar results to the present study. Ryan and Patrick (2001) showed no difference between boys' and girls' change in motivation and engagement from grade seven to grade eight. Anderman and colleagues (2001) found that sex was unrelated to any changes in students' valuing of reading and mathematics. Wigfield and colleagues (1997) also showed no sex differences in children's competence beliefs and subjective task values over three years. In summary, it is possible that there were no sex differences in self-regulated learning over the middle-school years because students did not hold the traditional gender stereotypes. Pajares and Valiante (2002) found in their study that there were no sex differences in self-efficacy when gender orientation beliefs were controlled, that is how strongly students identified with characteristics stereotypically associated with males or females in American society. This implies that sex differences in self-regulated learning may actually be a function of the stereotypical beliefs of gender roles that students hold.

Limitations

The present study had three notable limitations that require discussion. They are missing data concerns, the measurement of self-regulated learning, and the dichotomy of the goal orientation of the classroom.

Missing data. Missing data can be a significant problem for many social and behavioural science researchers, particularly those conducting longitudinal studies (Schafer & Graham, 2002). In longitudinal studies, participants may move away, die, lose interest in the study, or not complete all questions in a questionnaire. These circumstances and others result in missing variables and cases at one or more collection periods. The major problem with having missing data is that nearly all statistical methods presume that every case is complete. This means that when conventional statistical methods are used, missing data is typically treated with listwise or casewise deletion strategies or by substituting the missing data with plausible means or regression-estimated values (Allison, 2002). Often when these methods are used, additional problems arise. For instance, removing items from a dataset can result in discarding an unacceptably high proportion of subjects leaving few participants with complete data for all items. Subsequently, once the data is removed from the analyses the sample size decreases, which may significantly affect the statistical power and the accuracy of parameter estimates. Substitution methods for imputing missing data also have problems. Mean substitution can dampen relationships among variables and regression predicted substitutions can inflate correlations (Schafer & Graham, 2002). In a perfect study, if the sample size was in the thousands and random, missing data would be of little concern. Time, expense, and practicality do not usually permit such a situation.

Fortunately, within the past three decades, there have been substantial advancements made in developing and implementing statistical procedures for missing data (Dempster, Laird, & Rubin, 1977; Schafer & Graham, 2002). In their seminal paper, Dempster, Laird, and Rubin, (1977) formalized the Expectation-Maximization (EM) algorithm, and outlined how this method could compute an efficient Maximum Likelihood (ML) estimation using incomplete data. The EM algorithm is related to other ad hoc approaches to estimating missing data, where the parameters are estimated after filling in initial values for the missing data (McLachlan & Krishnan, 1997). Simply put, the EM algorithm consists of two steps: an expectation (E) step and a maximization (M) step (Allison, 2002). These two steps are repeated multiple times in an iterative process that eventually converges to the ML estimates. The E-step imputes the missing values through regression using maximum likelihood criteria. In other words, the E-step is manufacturing data for the complete-data problem (the M-step). Once the missing data have been imputed, the M-step calculates new values for the means and the covariance matrixes using both the imputed and nonmissing data. After the M-step is complete, the E-step starts over again until there is no change from one iteration to the next; that is, the estimates have converged. In rare occurrences when there may be an excessive amount of missing data or a bad model, the estimates will not converge (Hox, 2002). For a more detailed account of the statistical computation of the EM algorithm, please refer to Dempster, Laird, and Rubin, (1977) and McLachlan and Krishnan (1997).

One of the few multilevel statistical programs that manages incomplete data using the EM algorithm is HLM (Bryk & Radenbush, 1992). The present study used the HLM statistical program not only because of the nested effect of time within individuals but also because there were missing data that were believed to be too valuable to exclude from the analyses. The HLM statistical program can accommodate for large amounts of missing data by using the EM algorithm for computing ML estimations. Other estimation methods (i.e., Bayesian method) can also be used with incomplete datasets in HLM, if specified by the user.

The EM algorithm operates on the assumption that those participants who have missing data are no different from those with observed measurements (Allison, 2002; Schafer & Graham, 2002). This means that the probability of missingness depends on the observed data and not on the missing data; the data are assumed to be either missing completely at random (MCAR) or missing at random (MAR). Missing data can impact the randomness of the sample if it is considered to be missing not at random (MNAR).

Analyses using MNAR data would likely have biased results (Allison, 2002). Alternatively, data that are MCAR imply that the probability of missing data on *Y* is unrelated to the value of *Y* itself or to any other variables in the data set; there are no systematic differences between the fully observed data and the missing data (Allison, 2002). An example of a study's data that are MCAR is having planned missing values. However, missing data are rarely considered MCAR, they are more likely to be MAR. Data that are MAR signify that the probability of missing data on Y is unrelated to the value of Y, after controlling for other variables in the analysis (Allison, 2002). Research has shown that longitudinal data that are MAR lead to unbiased estimates when using HLM analyses (Hox, 2002). An example of a study's data that are MAR is missing data that are the result of panel attrition (Hox, 2002). Some of the missing data in the present study are believed to fall under the category of panel attrition, which means that this data are MAR. Some students with missing data may have moved away, were absent on the day of testing, or changed classes to those that were not measured. The other missing data may be considered MCAR because of the nature of the data collection methods. As described below, many students did not have the opportunity to participate at all data collection periods because of the timing of their grade level and when the data were collected. In summary, the more complete the data set the better; however, research has shown that data with incomplete cases or items can be used in analyses if the data are missing at random or completely at random, which they are believed to be in the present study (Schafer & Graham, 2002).

The final question pertaining to missing data is how much missing data can one have? The quantity of missing data that is acceptable to conduct HLM analyses is not exact. Several books on HLM mention that a significant advantage of using HLM is that it can accommodate large or appropriate amounts of missing data (Bryk & Raudenbush, 1992; Hox, 2002; Snijders, 1996). However, the amount of "appropriate" and "large" is not specified. In fact, the lack of discussion of missing data in the research literature as being a concern when using HLM can leave the reader to infer that having missing data when using HLM is not a problematic issue. There are several simulation studies that have demonstrated the robustness of the EM algorithm with varying amounts of missing data. One study by Weinberg (1999), used simulations to demonstrate that statistical power could be recaptured by using the EM algorithm with incomplete data when compared with complete data. Weinberg simulated 1000 studies with 100 case-parent triads to model for genetic data from triads composed of affected probands and their parents. The results of the simulations showed that the power was close to that of the full-data analysis when 50% of the data was missing. When the data had only 25% complete triads (i.e., mother, father, and child data) the estimated power was still above 0.5 compared with 0.75 of the full-data analyses. The author stated that the power was reasonably good even when no triad was complete. Another set of simulation studies by Schafer and Graham (2002), illustrated the properties of the EM algorithm (representing the maximum likelihood [ML] method) and Bayesian multiple imputation (MI) using 1000 samples of blood pressure cases. The most relevant finding for the present study was that no biases in the analyses were found when there was as much as 80% missing values, under conditions of a study with N of 250. The authors concluded that the results from MI and ML were indistinguishable from each other when larger sample sizes were used ($N > 50$). However, when smaller sample sizes were used ($N = 50$), MI showed fewer biases in the results than ML.

In the current study, 34% of the cases were considered to have complete data, with N of 699. Each case was labelled as either complete or incomplete (e.g., missing data) to tabulate the percentage of missing cases. Cases were considered complete if they had data from all possible data collection points. There were five waves where data were collected, however, not all students could have data from all five wave points. Students could be at any grade at any wave; students did not all begin the study at the first wave in grade 6. This meant that if a student began in wave 3 (Fall) when in grade 6 then it would be impossible for this student to have data for waves 1 and 2, although it would be expected that this student would have data for waves 4 and 5. Another example could be that if a student began in wave 1 (Fall) while in grade 8, then it would be expected that the student would have data for wave 2 (Spring; still in grade 8), but not for waves 3, 4, and 5 because the student would no longer be attending middle school. Based on the research on the EM algorithm and its application in simulation studies, it is believed that the amount of missing data in the present study is acceptable (Dempster et al., 1977; Hox, 2002; McLachlan & Krishnan, 1997). Studies have shown unbiased and powerful results using the EM algorithm with up to 80% of missing data (Schafer & Graham, 2002; Weinberg, 1999). Further, all models used in the present study converged after the E-step and M-step iteration process which indicates that the models used were good and the amount of missing data was not excessive.

Measuring self-regulated learning. Another issue that arises from the present study pertains to the measurement of this study's primary construct, self-regulated learning. How self-regulated learning should be measured is debated within research (Garcia & Pintrich, 1996; Winne, Jamieson-Noel, & Muis, 2002; Winne & Perry, 2000; Wolters, 2003). Adequate and accurate measurement of any construct is never a straightforward endeavour. Before measurement can begin the construct must be defined within a theoretical framework. Once the construct's parameters are outlined, the next step is to determine how it will be measured. The issues around measuring self-regulated learning in this study also pertain to how it is conceptualized and how it is measured.

Some of the main concerns of measuring self-regulated learning are related to how it is conceived: as an event or an aptitude (Winne & Perry, 2000). Each conceptualization of self-regulated learning has its own merits and limitations. Even though the conceptualization of self-regulated learning as an event and aptitude are discussed separately, they are not mutually exclusive; events can be seen as the building blocks of an aptitude. When self-regulated learning is posited as an aptitude, it is generally assessed in a single measurement that is aggregated over multiple self-regulated learning events (Winne & Perry, 2000; Winne et al., 2002). It is seen as an enduring attribute that predicts future behaviour. For instance, a student may reflect upon his or her use of metacognitive strategies used when studying for tests. This student abstracts over several studying events to characterize his or her metacognitive strategy use. Various forms of measurement can be used when self-regulated learning is characterized as an aptitude, such as questionnaires or interviews. An alternative conception of self-regulated learning is as an event, where self-regulated learning occupies a briefer span of time and is marked by a prior and a subsequent event (Winne & Perry, 2000; Winne et al., 2002). For instance, a student may report his or her thinking processes when working on a task. Measurements of self-regulated learning as an event can be done with think-aloud protocols, observations, or survey questions to measure self-regulation in a given moment as learners navigate through components of a task.

Another related concern with the measurement of self-regulated learning is the grain size or unit of measurement (Winne et al., 2002). Existing self-regulated learning measures have various units of measurement. Some measures look at the finer grained events of self-regulated learning such as the tactics used (e.g., making a note on a text where it is difficult to comprehend) and other measures focus on the larger grained aspects such as the strategies used (e.g., metacognitive monitoring; Winne et al., 2002). The unit of measurement is an issue when measuring self-regulated learning because it reflects one's theoretical view of self-regulated learning and it differentially relates self-regulated learning with other variables. At the present there are few widely used fine grain measures of self-regulated learning.

The definition and measurement of self-regulated learning in the present study follows from Pintrich and colleagues (1993). This definition of self-regulated learning includes both motivational and cognitive components and is measured using the Motivated Strategies for Learning Questionnaire (MSLQ). It is perceived as an aptitude and is a self-report measure. Self-regulated learning in this study is seen as enduring and large grained. Furthermore, it relies on the memory and interpretation of self-regulated learning episodes by the individual and assumes similar task conditions in which self-regulated learning was used among the questionnaire responders. Other perspectives of self-regulated learning have argued that self-regulated learning cannot be depicted accurately through a questionnaire that aggregates self-regulated learning over time. Instead, other perspectives propose that it should be measured at a minute grain size and, *in the moment,* as the student is actively using a self-regulation component (Winne & Perry, 2000). In summary, there is not one dominant measurement protocol that encompasses all aspects of self-regulated learning. Both questionnaires and think-aloud protocols are commonly used in research; information is gained and lost with both. The MSLQ was chosen for the present study because it is empirically sound and commonly used within research (Pintrich et al., 1993). In addition, the MSLQ is a feasible and reliable method in measuring self-regulation longitudinally.

How many goal orientations? The final limitation of this study pertains to the goal orientation of the classroom environment and how it was conceptualized. The goal orientation of the classroom environment was conceptualized as a dichotomy (i.e., mastery vs. performance). Research has argued that the goal orientation of the classroom environment should influence students' use of self-regulated learning (Ames, 1992). In particular, the more mastery oriented the classroom, the greater students' use of self-regulation. There have been only a handful of studies that have demonstrated the value of a mastery goal-oriented learning environment on students' achievement motivation (Anderman et al., 1999; Midgley et al., 1995; Ryan & Patrick, 2001). These studies tended to describe the goal structure of the learning environment as either performance or mastery oriented. Within the present study, the goal orientation of the classroom environment was also measured as a dichotomy because of its theoretical parsimony and normative use within research. However, it is for these very reasons why the current research of goal orientation, in general, has been magnified. Whether goal orientation should be conceptualized as a dichotomy (i.e., mastery and performance goals), or a trichotomy (i.e., mastery, performance-approach, and performance-avoid goals), or as a multiple-goal model (i.e., mastery-approach, mastery-avoid, performance-approach, and performance-avoid goals) is an ongoing debate among goal theory researchers.

Normative goal orientation is described as a dichotomy. Students are classified as being performance or mastery goal-oriented. Students who are mastery goal-oriented focus on developing competency and understanding the task at hand, whereas, students who are performance goal-oriented focus on how they would be judged relative to others (Midgley et al., 2001). Recently within goal theory research, some theorists have challenged the dichotomy and have described performance goals in terms of approach (an orientation to demonstrate ability) and avoidance (an orientation to avoid the demonstration of lack of ability; Elliot, 1999; Pintrich, 2000c). There is much research that provides support for this trichotomy, showing that performance-approach goals are associated with adaptive patterns of learning (Elliot, 1999; Pintrich, 2000c; Radosevich et al., 2004). For instance, research has shown performance-approach goals as being related to more cognitive strategy use and higher course grades (Wolters et al., 1996). However, there is also research that is less consistent and more controversial showing that performance-approach goals are good only under specific circumstances and for certain students (Midgley et al., 2001). For instance, research has shown that performance-approach goals are more facilitative for boys and older students and in competitive learning environments where mastery goals are also encouraged (Midgley et al., 2001). Mastery goals have also been split into approach and avoid, although this addition of an avoid mastery construct is relatively new and is not as clear in function as are performance avoid goals (Elliot, 1999; Linnenbrink & Pintrich, 2002a; Pintrich 2000c). Students with mastery approach goals are focused on learning and understanding, whereas, students with mastery avoid goals are concerned with not being perfect or falling short of their own standards of mastery. Because the perspectives of a trichotomy and multiple goal orientations are controversial and not fully understood at this point in time, this study used the normative view of goal orientation where research has predominantly shown the effectiveness of a mastery goal-orientation over a performance goal-orientation on a student's learning achievement (Ames, 1992; Dweck & Leggett, 1988).

However, even though the research on the approach and avoidance distinction regarding performance-oriented goals is not consistent across all settings and individuals, it appears that the idea of multiple achievement goals is advocated by some goal theory researchers (Elliot, 1999; Pintrich, 2003). Proponents of the multiple goal perspective has questioned the utility and validity of the normative dichotomous goal model and has suggested that students' goals may actually motivate them to approach or avoid their goals, suggesting that mastery and performance goals may not be exclusive from one another. There are likely multiple goals, outcomes, and pathways to learning and achievement in multiple environments. Future research on goal orientation is expected to focus on better understanding the dynamics of multiple goals across multiple contexts.

Summary and Future Directions

The present study provided evidence showing that some of the components of student self-regulated learning change for the worse throughout the middle-school years. Students' intrinsic value and self-regulation decreased and their test anxiety increased from grades six to eight. In addition, this study showed that the goal structure of the classroom environment influenced all of the components of students' self-regulated learning, such that the more mastery oriented the classroom the greater the students' intrinsic value, self-efficacy, cognitive strategy use, and self-regulation, and the less test anxiety. Furthermore, the influence of the goal structure of the classroom environment was robust enough to minimize students' decrease in intrinsic value over the middle-school years.

These findings have important implications on teaching practice. The results showed that the decline previously found in achievement motivation from elementary to middle school (Eccles et al., 1991; Eccles et al., 1993) continues on throughout the middle-school years because of both developmental and contextual factors. Schools can have a positive influence on students' self-regulated learning by adopting a mastery-oriented instructional approach (Anderman et al., 2001). Teachers who are interested in what they are teaching, who are interested in and get to know their students, who promote cooperative group work, and who encourage self-development rather than social comparison have a greater influence in fostering student self-regulated learning during a time of developmental change. This is in line with what Paris and Paris (2001) summarized in their review on the impact of the classroom environment on self-regulated learning: teachers need to structure group work, minimize objective tests and competition, and they need to be able to describe and incorporate self-regulation strategies in with the curriculum.

In terms of future research on self-regulated learning, there are two proposed areas: self-regulation failure and the role of affect in self-regulation. The present study looked at the developmental trajectories of students' self-regulated learning but did not specifically address students who misregulated or experienced self-regulatory failure. It may give researchers a better understanding of middle school students' declining use of self-regulated learning if an alternative view of self-regulated learning, such as self-regulatory failure, was also assessed. For instance, the strength model of self-regulation states that students' use of self-regulation is a limited resource that is affected by stress and self-control (Baumeister & Heatherton, 1996). When stress depletes a student's strength or self-control is weakened then self-regulatory failures become more likely. It is possible that the transition from elementary to middle school and the inherent new expectations, as well as developmental changes may create stress on some students, to the point where self-regulation failure could occur. Further research looking into the perceived stress experienced by students may help explain why self-regulated learning tends to decline during the middle-school years.

Another variable that may shed some light as to why students' self-regulated learning declines during the middle-school years is their affect. Linnenbrink and Pintrich (2002a) discussed the research on the relations among achievement goals and emotions. They concluded that affect and goals are reciprocally related to one another. This means that the goal structure of the classroom, students' goal orientation, and students' affect all influence one another. For instance, students in a positive mood are more likely to perceive their class as being more mastery-oriented in structure and adopt a mastery orientation. In turn, students who are mastery-oriented tend to use more self-regulatory strategies. Students in a negative mood are believed to be focused on their mood state rather than the classroom goal structure and students who adopt a performance goal orientation are more likely to have a negative affect. In the present study, test anxiety was the only affect measured. Results showed that a more mastery structured classroom predicted less test anxiety. However, how students' test anxiety influenced their perception of the classroom goal structure was not examined. It is likely that students' affect does influence their use of self-regulated learning and their perception of the classroom goal structure. Future studies will need to examine the relationship between student affect, self-regulated learning, and classroom goal structure over the middle-school years to better understand the role of affect and its influence on students' self-regulated learning.

References

Allison, P. (2002). Missing data [Part of Series]. *Quantitative Applications in the Social Sciences, 136.*

Ames, C. (1992). Classrooms: Goals, structures, and student motivation. *Journal of Educational Psychology, 84,* 261-271.

Anderman, E., Eccles, J., Yoon, K., Roeser, R., Wigfield, A., & Blumenfeld, P. (2001). Learning to value mathematics and reading: Relations to mastery and performance-oriented instructional practices. *Contemporary Educational Psychology, 26,* 76-95.

Anderman, E., & Maehr, M. (1994). Motivation and schooling in the middle grades. *Review of Educational Research, 64,* 287-309.

Anderman, E., Maehr, M., & Midgley, C. (1999). Declining motivation after the transition to middle school: Schools can make a difference. *Journal of Research and Development in Education, 32,* 131-147.

Anisef, P. (1994). *Learning and sociological profiles of Canadian high school students.* Toronto: Edwin Mellen Press.

Baltes, P., Reese, H., & Nesselroade, J. (1988). *Life-span developmental psychology: Introduction to research methods.* Hillsdale, NJ: Lawerence Erlbaum Associates.

Baumeister, R., & Heatherton, T. (1996). Self-regulation failure: An overview. *Psychological Inquiry, 7,* 1-15.

Boekaerts, M. (1991). Subjective competence, appraisals and self-assessment. *Learning and Instruction,1,* 1-17.

Bong, M. (1996). Problems in academic motivation research and advantages and disadvantages of their solutions. *Contemporary Educational Psychology, 21,* 149-165.

Bong, M. (2001). Between- and within-domain relations of academic motivation among middle and high school students: Self-efficacy, task-value, and achievement goals. *Journal of Educational Psychology, 93,* 23-24.

Borkowski, J., & Muthukrishna, N. (1995). Learning environments and skill generalization: How contexts facilitate regulatory processes. In F. Weinert & W. Schneider (Eds.), *Memory performance and competencies: Issues in growth and development* (pp.283-300). New Jersey: Lawrence Erlbaum Associates.

Brookhart, S. (1997). A theoretical framework for the role of classroom assessment in motivating student effort and achievement. *Applied Measurement in Education, 10,* 161-180.

Brynes, J. (2003). Cognitive development during adolescence. In G. Adams & M. Berzonsky (Eds.), *Blackwell handbook of adolescence* (pp. 227-246). MA, USA: Blackwell Publishing

Bryk, A., & Raudenbush, S. (1992). *Hierarchical linear models: Applications and data analysis methods.* London, UK: Sage Publications.

Christenson, S., & Thurlow, M. (2004). School dropouts: Prevention considerations, interventions, and challenges. *Current Directions in Psychological Science, 13,* 36-39.

Corno, L. (1993). Modern conceptions of volition and educational research. *Educational Researcher, 22,* 14-22.

Corno, L. (2004). Introduction to the special issue work habits and work styles: Volition in education. *Teachers College Record, 106,* 1669-1694.

Corno, L., & Mandinach, E. (1983). The role of cognitive engagement in classroom learning and motivation. *Educational Psychologist, 18,* 88-108.

Dempster, A., Laird, N., & Rubin, D. (1977). Maximum likelihood from incomplete data via the EM algorithm (with discussion). *Journal of the Royal Statistical Society, Series B, 39,* 1-38.

Dweck, C. (1986). Motivational process affecting learning. *American Psychologist, 41,* 1040-1048.

Dweck, C. (1999). *Self-Theories: Their role in motivation, personality, and development.* Philadelphia, PA: Psychology Press.

Dweck, C., & Leggett, E. (1988). A social-cognitive approach to motivation and personality. *Psychological Bulletin, 95,* 256-273.

Eccles, J., Adler, T., Futterman, R., Goff, S., Kaczala, C., Meece, J., & Midgley, C. (1983). Expectancies, values, and academic adolescent. In J.T. Spence (Ed.), *Achievement and achievement motivation* (pp. 75-146). San Francisco: W.H. Freeman.

Eccles, J., Lord, S., & Midgley, C. (1991). What are we doing to early adolescents? The impact of educational contexts on early adolescents. *American Journal of Education, 99,* 521-542.

Eccles, J., Midgley, C., Wigfield, A., Miller Buchanan, C., Reuman, D., Flanagan, C., & MacIver, D. (1993a). Development during adolescence: The impact of stage-environment fit on young adolescents' experiences in schools and in families. *American Psychologist, 48,* 90-101.

Eccles, J., & Wigfield, A. (1995). In the mind of the actor: The structure of adolescents' achievement task values and expectancy-related beliefs. *Personality and Social Psychology Bulletin, 21,* 215-225.

Eccles, J., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology, 53,* 109-132.

Eccles, J., Wigfield, A., Midgley, C., Reuman, D., Mac Iver, D., & Feldlaufer, H. (1993b). Negative effects of traditional middle schools on students' motivation. *The Elementary School Journal, 93,* 553-574.

Elliot, A. (1999). Approach and avoidance motivation and achievement goals. *Educational Psychologist, 34,* 169-189.

Feldlaufer, H., Midgley, C., & Eccles, J. (1988). Student, teacher, and observer perceptions of the classroom environment before and after the transition to junior high school. *Journal of Early Adolescence, 8,* 133-156.

Freedman-Doan, C., Wigfield, A., Eccles, J., Blumenfeld, P., Arbreton, A., & Harold, R. (2000). What am I best at? Grade and gender differences in children's beliefs about ability improvement. *Journal of Applied Developmental Psychology, 21,* 379-402.

Garcia, T., & Pintrich, P. (1996). Assessing students' motivation and learning strategies in the classroom context: The motivated strategies for learning questionnaire. In M. Birenbaum & F. Dochy (Eds.), *Alternatives in assessment achievements, learning processes and prior knowledge. Evaluation in education and human services* (pp. 319-339). Norwell, MA: Kluwer Academic Publishers.

Graham, S., & Harris, K. (1989). Components of cognitive strategy instruction: Effects on learning disabled students' compositions and self-efficacy. *Journal of Educational Psychology, 81,* 353-361.

Hox, J. (2002). *Multilevel analysis: Techniques and applications.* Mahwah, New Jersey: Lawrence Erlbaum Associates.

Huberty, C., & Morris, J. (1989). Multivariate analysis versus multiple univariate Analyses. *Psychological Bulletin, 105,* 302-308.

Levin, J. (1993). Mnemonic strategies and classroom learning: A twenty-year report card. *The Elementary School Journal, 94,* 235-244.

Linnenbrink, E., & Pintrich, P. (2002a). Achievement goal theory and affect: An asymmetrical bidirectional model. *Educational Psychologist, 37,* 69-78.

Linnenbrink, E., & Pintrich, P. (2002b). Motivation as an enabler for academic success. *School Psychology Review, 31,* 313-327.

Linnenbrink, E., Ryan, A., & Pintrich, P. (1999). The role of goals and affect in working memory functioning. *Learning and Individual Differences, 11,* 213-230.

Mac Iver, D., Stipek, D., & Daniels, D. (1991). Explaining within-semester changes in student effort in junior high school and senior high school courses. *Journal of Educational Psychology, 83,* 201-211.

Maggs, J., & Schulenberg, J. (1998). Reasons to drink and not to drink: Altering trajectories of drinking through an alcohol misuse prevention program. *Applied Developmental Science, 2,* 48-60.

McLachlan, G., & Krishnan, T. (1997). *The EM algorithm and extensions.* John Wiley & Sons, Inc.: New York, New York.

Midgley, C., Kaplan, A., & Middleton, M. (2001). Performance-approach goals: Good for what, for whom, under what circumstances, and at what cost? *Journal of Educational Psychology, 93,* 77-86.

Murphy, P., & Alexander, P. (2000). A motivated exploration of motivation terminology. *Contemporary Educational Psychology, 25,* 3-53.

Nicholls, J. (1978). The development of the conceptions of effort and ability, perceptions of academic attainment and the understanding that difficult task require more ability. *Child Development, 49,* 800-814.

Nicholls, J. (1984). Achievement motivation: conceptions of ability, subjective experience, task choice, and performance. *Psychological Review, 91,* 328-346.

Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research, 66,* 543-579.

Pajares, F., & Valiante, G. (2002). Students' self-efficacy in their self-regulated learning strategies: A developmental perspective. *Psychologia, 45,* 211-221.

Paris, S., & Paris, A. (2001). Classroom applications of research on self-regulated learning. *Educational Psychologist, 36,* 89-101.

Patrick, H., Ryan, A., & Pintrich, P. (1999). The differential impact of extrinsic and mastery goal orientations on males' and females' self-regulated learning. *Learning and Individual Differences, 11,* 153-171.

Pintrich, P. (2000). Issues in self-regulation theory and research. *The Journal of Mind and I, 21,* 213-220.

Pintrich, P. (2003). A motivational science perspective on the role of student motivation in learning and teaching contexts. *Journal of Educational Psychology, 95,* 667-686.

Pintrich, P., & DeGroot, E. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology, 82,* 33-40.

Pintrich, P., Roeser, R., & DeGroot, E. (1994). Classroom and individual differences in early adolescents' motivation and self-regulated learning. *Journal of Early Adolescence, 14,* 139-161.

Pintrich, P., & Schunk, D. (1996). *Motivation in education: Theory, research, and application.* Engelwood Cliffs, NJ: Prentice Hall.

Pintrich, P., Smith, D. Garcia, T., & McKeachie, W. (1993). Reliability and predictive validity of the motivated strategies for learning questionnaire (MSLQ). *Educational and Psychological Measurement, 53,* 801-813.

Radosevich, D., Vaidyanathan, V., Yeo, S., & Radosevich, D. (2004). Relating goal orientation to self-regulatory processes: A longitudinal field test. *Contemporary Educational Psychology, 29,* 207-229.

Ryan, A., & Patrick, H. (2001). The classroom social environment and changes in adolescents' motivation and engagement during middle school. *American Educational Research Journal, 38,* 437-460.

Ryan, A., & Pintrich, P. (1997). "Should I ask for help?" The role of motivation and attitudes in adolescents' help seeking in math class. *Journal of Educational Psychology, 89,* 329-341.

Roeser, R., & Eccles, J. (1998). Adolescents' perceptions of middle school: Relation to longitudinal changes in academic and psychological adjustment. *Journal of Research on Adolescence, 8,* 123-158.

Schafer, J., & Graham, J. (2002). Missing data: Our view of the state of the art. *Psychological Methods, 7,* 147-177.

Schunk, D. (1991). Self-efficacy and academic motivation. *Educational Psychologist, 26,* 207-231.

Schunk, D., & Zimmerman, B. (Eds.). (1994). *Self-regulation of learning and performance: Issues and educational applications.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Shell, D., Colvin, C., Bruning, R. (1995). Self-efficacy, attribution, and outcome expectancy mechanisms in reading and writing achievement: Grade-level and achievement-level differences. *Journal of Educational Psychology, 87,* 386-398.

Simmons, R., & Blyth, D. (1987). *Moving into adolescence: The impact of pubertal change and school context.* Hawthorn, NY: Aldine de Gruyter.

Slavin, R. (2000). *Educational psychology: Theory and practice* (6th Ed.). Needham Heights, MA: Allyn and Bacon.

Snijders, T. (1996). Analysis of longitudinal data using the hierarchical linear model. *Quality and Quantity, 30,* 405-426.

Stipek, D., & Gralinski, H. (1991). Gender differences in children's achievement-related beliefs and emotional responses to success and failure in mathematics. *Journal of Educational Psychology, 83,* 361-371.

Stipek, D., & MacIver, D. (1989). Developmental change in children's assessment of intellectual competence. *Child Development, 60,* 521-538.

Stodolsky, S., & Grossman, P. (1995). The impact of subject matter on curricular activity: An analysis of five academic subjects. *American Educational Research Journal, 32,* 227-249.

VanderStoep, S., Pintrich, P., & Fagerlin, A. (1996). Disciplinary differences in self-regulated learning in college students. *Contemporary Educational Psychology, 21,* 345-362.

Wade, C., & Tavris, C. (2003). *Psychology* (7th ed.). Upper Saddle River, NJ: Prentice Hall.

Weinberg, C. (1999). Allowing for missing parents in genetic studies of case-parent triads. *American Journal of Human Genetics, 64,* 1186-1193.

Weiner, B. (1985). An attributional theory of academic motivation and emotion. *Psychological Review, 92,* 548-573.

Weinstein, C., & Mayer, R. (1986). The teaching of learning strategies. In M. Wittrock (Ed.), *Handbook of research on teaching* (pp. 315-327). New York: Macmillan.

Wigfield, A., & Eccles, J. (1994). Children's competence beliefs, achievement values, and general self-esteem change across elementary and middle school. *Journal of Early Adolescence, 14,* 107-138.

Wigfield, A., & Eccles, J. (2000). Expectancy-value theory of achievement motivation. *Contemporary Educational Psychology, 25,* 68-81.

Wigfield, A., Eccles, J., MacIver, D., Reuman, D., & Midgley, C. (1991). Transitions at early adolescence: Changes in children's domain-specific self-perceptions and general self-esteem across the transition to junior high school. *Developmental Psychology, 27,* 552-565.

Wigfield, A., Eccles, J., Yoon, K., Harold, R., Arbreton, A., Fredman-Doan, C., & Blumenfeld, P. (1997). Change in children's competence beliefs and subjective task values across the elementary school years: A 3-year study. *Journal of Educational Psychology, 89,* 451-469.

Winne, P. (1995). Inherent details in self-regulated learning. *Educational Psychologist, 30,* 173-187.

Winne, P., Jamieson-Noel, D., & Muis, K. (2002). Methodological issues and advances in researching tactics, strategies, and self-regulated learning. In P.R. Pintrich & M.L. Maehr (Eds.), *Advances in motivation and achievement: New directions in measures and methods* (Vol. 12, pp. 121-155). Oxford, England: Elsevier Science.

Winne, P., & Perry, N. (2000). Measuring self-regulated learning. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 532-566). San Diego, CA: Academic Press.

Wolters, C. (2003). Regulation of motivation: Evaluating an underemphasized aspect of self-regulated learning. *Educational Psychologist, 38,* 189-205.

Wolters, C., & Pintrich, P. (1998). Contextual differences in student motivation and self-regulated learning in mathematics, English, and social studies classrooms. *Instructional Science, 26,* 211-238.

Wolters, C., Yu, S., & Pintrich, P. (1996). The relation between goal orientation and students' motivational beliefs and self-regulated learning. *Learning and Individual Differences, 8,* 211-238.

Wu, Y-W. (1996). An application of hierarchical linear models to longitudinal studies. *Research in Nursing and Health, 19,* 75-82.

Zeidner, M., Boekaerts, M., & Pintrich, P. (2000). Self-regulation: Directions and challenges for future research. In M. Boekaerts, P. Pintrich, & M. Zeidner (Eds.). *Handbook of Self-Regulation* (pp. 749-768). San Diego, CA: Academic Press.

Zimmerman, B., Bandura, A., & Martinez-Pons, M. (1992). Self-motivation for academic attainment: The role of self-efficacy beliefs and personal goal setting. *American Educational Research Journal, 29,* 663-676.

Zimmerman, B., & Martinez-Pons, M. (1992). Perceptions of efficacy and strategy use in the self-regulation on learning. In D. Schunk & J. Meece (Eds.), *Student perceptions in the classroom* (pp. 185-207). Hillsdale, NJ: Erlbaum.

Appendix A

(MSLQ)
MOTIVATED STRATEGIES FOR LEARNING QUESTIONNAIRE
Pintrich, P.R., & DeGroot, E.V. (1990)

Name____________________
Date____________________
Grade____________________
Subject____________________

Instructions to student:

For each statement below, please <u>circle</u> the number which best describes the situation in this class for you. Please remember that there are no right or wrong answers – we really want to know how you see the situation. Also, remember that your answers will be strictly confidential and will not be seen by your teachers or other school staff.

<u>PART#1 – Motivational Beliefs</u>

1. I prefer class work that is challenging so I can learn new things.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

2. Compared with other students in this class I expect to do well.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

3. I am so nervous during a test that cannot remember facts I have learned.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

4. It is important for me to learn what is being taught in this class.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

5. I like what I am learning in this class.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

6. I'm certain I can understand the ideas taught in this course.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

7. I think I will be able to use what I learn in this class in other classes.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

8. I expect to do very well in this class.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

9. Compared with others in this class, I think I'm a good student.

1 -------- 2 -------- 3 -------- 4 -------- 5 -------- 6 -------- 7

Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

10. I often choose topics for projects, books to read, etc. that I will learn something from, even if they require more work.

1 -------- 2 -------- 3 -------- 4 -------- 5 -------- 6 -------- 7

Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

11. I am sure I can do an excellent job on the problem and tasks assigned for this class.

1 -------- 2 -------- 3 -------- 4 -------- 5 -------- 6 -------- 7

Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

12. I have an uneasy, upset feeling when I take a test.

1 -------- 2 -------- 3 -------- 4 -------- 5 -------- 6 -------- 7

Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

13. I think I will receive a good grade in this class.

1 -------- 2 -------- 3 -------- 4 -------- 5 -------- 6 -------- 7

Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

14. Even when I do poorly on a test I try to learn from my mistakes.

1	2	3	4	5	6	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

15. I think that what I am learning in this class is useful for me to know.

1	2	3	4	5	6	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

16. My study skills are excellent compared with others in this class.

1	2	3	4	5	6	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

17. I think that what we are learning in this class is interesting.

1	2	3	4	5	6	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

18. Compared with other students in this class I think I know a great deal about the subject.

1	2	3	4	5	6	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

19. I know that I will be able to learn the material for this class.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

20. I worry a great deal about tests.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

21. Understanding this subject is important to me.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

22. When I take a test I think about how poorly I am doing.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

23. When I study for a test, I try to put together the information from class and from the book.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

24. When I do homework, I try to remember what the teacher said in class so I can answer the questions correctly.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

25. I ask myself questions to make sure I know the material I have been studying.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

26. It is hard for me to decide what the main ideas are in what I read.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

27. When work is hard I either give up or student only the easy parts.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

28. When I study I put important ideas into my own words.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

29. I always try to understand what the teacher is saying even if it doesn't make sense.

1 -------- 2 -------- 3 -------- 4 -------- 5 -------- 6 -------- 7

Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

30. When I study for a test I try to remember as many facts as I can.

1 -------- 2 -------- 3 -------- 4 -------- 5 -------- 6 -------- 7

Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

31. When studying, I copy my notes over to help me remember material.

1 -------- 2 -------- 3 -------- 4 -------- 5 -------- 6 -------- 7

Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

32. I work on practice exercises and answer end of chapter questions even when I don't have to.

1 -------- 2 -------- 3 -------- 4 -------- 5 -------- 6 -------- 7

Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

33. Even when study materials are dull and uninteresting, I keep working until I finish.

1 -------- 2 -------- 3 -------- 4 -------- 5 -------- 6 -------- 7

Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

34. When I study for a test I practice saying the important facts over and over to myself.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

35. Before I begin studying I think about the things I will need to do to learn.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

36. I use what I have learned from old homework assignments and the textbook to do new assignments.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

37. I often find that I have been reading for class but don't know what it is all about.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

38. I find that when the teacher is talking I think of other things and don't really listen to what is being said.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

39. When I am studying a topic, I try to make everything fit together.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

40. When I'm reading I stop once in a while and go over what I have read.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

41. When I read material for this class, I say the words over and over to myself to help me remember.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

42. I outline the chapters in my book to help me study.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

43. I work hard to get a good grade even when I don't like a class.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

44. When reading I try to connect the things I am reading about with what I already know.

1 --------	2 --------	3 --------	4 --------	5 --------	6 --------	7
Not at all true of me.	Very seldom of me.	Sometimes of me.	True of me about half the time.	Often true of me.	Almost always true of me.	Very true of me.

Appendix B

STUDENT CLASSROOM ENVIRONMENT MEASURE (SCEM)

Eccles, J.S., Wigfield, A., Midgley, C., Reuman, D., MacIver, D., & Feldlaufer, H. (1993)

Name____________________
Date_____________________
Grade____________________
Subject___________________

Instruction to Student:

Think about <u>this</u> classroom and circle whether you think the best answer is (1) NOT VERY OFTEN, (2) SOMETIMES, (3) USUALLY, OR (4) VERY OFTEN.

1. When papers are handed back, we show each other how we did.

---------- 1 -----------	---------- 2 -----------	---------- 3 -----------	----------- 4 ----------
Not very often	Sometimes	Usually	Very often

2. We get to work with each other in small groups when we do class work.

---------- 1 -----------	---------- 2 -----------	---------- 3 -----------	----------- 4 ----------
Not very often	Sometimes	Usually	Very often

3. During work time we can move around the classroom when we want to.

---------- 1 -----------	---------- 2 -----------	---------- 3 -----------	----------- 4 ----------
Not very often	Sometimes	Usually	Very often

4. In this class everyone knows who does the best work and who does the worst work.

---------- 1 -----------	---------- 2 -----------	---------- 3 -----------	----------- 4 ----------
Not very often	Sometimes	Usually	Very often

5. The teacher cares about how we feel.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often

6. We can work on projects that we think up on our own.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often

7. The teacher thinks that some of the students in this class can't do very good class work.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often

8. Some students in this class make fun of kids who answer questions wrong or make mistakes.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often

9. We get to pick which students we want to work with in class.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often

10. The teacher is friendly to us.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often

11. The teacher gives rewards to students who do the best work.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often

12. Some kids try to be the first ones to answer questions the teacher asks.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often

13. The teacher asks us what we want to learn about in this class.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often

14. The teacher treats boys and girls differently.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often

15. We can talk to each other during work time.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often

16. When report cards come out, we tell each other what we got in this class.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often

17. Some kids try to be the first ones done in classwork.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often

18. The teacher encourages us to do a problem ourselves before we ask for help.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often

19. The teacher grades our work fairly.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often

20. We help each other with class work.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often

21. The teacher encourages us to say what we think.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often

22. The teacher treats some kids better than other kids.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often

23. Almost everyone tries to make this subject interesting in this class.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often

24. The teacher tries to make this subject interesting in this class.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often

25. The teacher likes this subject.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often

26. The teacher tells us why this subject is important.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often

27. The teacher criticizes us when we do poor in class work.

---------- 1 ----------	---------- 2 ----------	---------- 3 ----------	---------- 4 ----------
Not very often	Sometimes	Usually	Very often