Self-Regulated Learning, Classroom Context, and Achievement:

A Dual-Method Investigation

A DISSERTATION

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Dedication

To my grandmother, who had to hide her school books from her father; and to my own parents, who always encouraged me to be proud of mine.

Abstract

The broad purpose of this study was to explore relationships between students' classroom environments, self-regulated learning, and achievement, using survey and microanalytic methodologies to measure motivation and self-regulation. Participants included students from all sections of a high school world history course in a suburban school district in the Upper Midwest, including 315 from AP and 758 from regular sections. The study employed correlational techniques including descriptive statistics, ANOVA, and multiple regression analyses. AP and regular section students did not differ on overall motivation or self-regulation, but AP students reported higher levels of interest in the subject, as well as higher perceived demand and cooperation in the classroom. Significant interaction effects indicated that self-regulatory strategy use had a stronger relationship with achievement for students in regular courses than AP courses and for students who perceived their course as more demanding. Overall perceptions of the classroom environment significantly predicted course achievement, with perceived demand as the strongest predictor. Microanalytic data produced the same conclusions as survey data regarding motivational variables, but results for self-regulatory variables differed. The findings suggest that perceived demand is a crucial classroom characteristic for promoting self-regulatory behavior and achievement. Findings also indicated that motivation to learn should be examined as a multidimensional construct. Future research should continue to develop microanalytic tasks and methods for use in research and practice settings.

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Chapter 1: Introduction

Purpose

The broad purpose of this study was to explore relationships between students' classroom environments, self-regulated learning, and achievement, using different methodologies to measure self-regulation. This study examined whether motivation and self-regulation differed between students in two different types of course environments (i.e., advanced and regular course levels) and whether self-regulation was important for success in each of these environments. Further, the researcher analyzed the extent to which classroom environment characteristics, including students' perceptions of the level of demand, autonomy support, quality feedback, and cooperative work with peers, predicted self-regulation in the classroom. A final purpose of this study was to compare the results using self-report data to measure self-regulation with results using microanalytic data, in order to determine whether the same inferences would be drawn using either data source.

Rationale

Taking responsibility for one's own learning is both a process that enables academic achievement and a desired outcome of education. De Corte, Verschaffel, and Op 'T Eynde (2000) have proposed that self-regulated learning is not just an important set of skills that help students reach achievement goals, but is "in itself, a main goal of a long-term learning process" (p. 688). In the last several decades, researchers have studied extensively what it means to be a self-regulated learner, its relationship with academic achievement, and how to teach and support students to become self-regulating. Self-regulated learning is a set of processes by which learners strategically control their cognition, affect, and behavior to meet achievement goals (Pintrich & DeGroot, 1990; Zimmerman, 2000). Several theoretical models inform the field's understanding of these processes. According to these models, self-regulated learning is strongly influenced by motivational variables, including perceptions of self-efficacy and control, task value and interest, and attributions for success and failure. Research evidence shows that motivated and high-achieving students use self-regulated learning strategies, and that lower achievers can be successfully taught to use these strategies to improve their performance as well. Although self-regulation emphasizes the role of the "self," in reality many environmental influences can support or hinder students' development and use of self-regulated learning strategies (Pintrich, Roeser, & DeGroot, 1994; Winne & Perry, 2000). These environmental and contextual influences can also impact the measurement of self-regulated learning, necessitating the use of instruments and techniques that are sensitive to the different contexts in which students learn and the shortcomings of self-report methods.

Correlational studies have demonstrated that high-achieving students use more self-regulatory strategies than low-achieving students, with effect sizes ranging from moderate to large (DiBenedetto & Zimmerman, 2010; Ruban & Reis, 2006; Zimmerman & Martinez-Pons, 1986). Research on the relationship between motivation and engagement has shown moderate to large effects of interest, self-efficacy, and task value on students' decisions to engage in cognitive and self-regulatory behavior (Cleary, 2006; Pajares, 1996; Pintrich & DeGroot, 1990; Pintrich et al., 1994; Schunk, 1991; Wolters & Pintrich, 1998). Further, studies of the relationship between self-regulatory strategy use and achievement have shown that strategy use predicts performance beyond the effects of motivation with small to moderate effects (Pintrich & DeGroot, 1990; Wigfield & Eccles, 1994). However, though these results are promising, they cannot demonstrate causality.

Based on these studies, teachers and researchers have created instructional programs to teach the planning, monitoring, and adjusting skills used by successful students to lower achievers (Butler, 1998; Cleary & Zimmerman, 2004; Graham & Harris, 2003). The positive effects of these controlled studies have been moderate to large in size, across demographic samples, age and grade level, and disability status, indicating that educators can successfully teach these skills to struggling students of all kinds to improve their academic achievement. This strategy instruction has been conducted by teachers in the contexts of their classrooms with beneficial effects on achievement and maintenance and generalization of skills. However, some studies have shown differential effects on students by achievement level, disability status, or course type (Cleary & Chen, 2009; Fuchs et al., 2003; Verschaffel et al., 1999). Understanding the differences between students in advanced and regular courses and the relationship between course level and self-regulated learning will help educators to better serve students in both contexts.

Although explicit strategy instruction has been demonstrated as effective, the use of specific teaching tactics that have been associated with student self-regulation may be a less time-intensive approach to promoting academic self-regulation. These techniques may complement strategy instruction and can be used as general practices that are not specific to any given content area. Techniques such as allowing autonomy for students to control their own learning, providing frequent, timely, relevant feedback, and fostering cooperative peer relationships all may increase students' motivation and self-regulation in the classroom and lead to increased achievement for students at all skill levels (Nicol & MacFarlane-Dick, 2006; Pintrich et al., 1994; Ryan & Deci, 2000).

Learning to self-regulate is important for achievement during the school years and beyond. Self-regulation is a promising area for intervention because research shows it can be successfully taught and learned, with positive impacts on achievement. Further, research also suggests that specifically structured classroom environments can support self-regulatory skill instruction, promote student agency, and allow students to select and use strategies to solve academic problems (Perry, VandeKamp, Mercer, & Nordby, 2002; Reeve, 2012; Ryan & Deci, 2000; Zimmerman, 2000). In the current study, the relationships between learning environments, motivation, and academic self-regulation among different subgroups of students were examined in an effort to inform the promotion of these attitudes and skills in the classroom.

Research Questions

This study examined four research questions. First, it examined the similarities and differences between the students in advanced and regular courses in their motivation, self-regulation, and perceptions of the classroom environment. The researcher hypothesized that self-regulation would not vary by course level. Second, the study sought to replicate the result found by Cleary and Chen (2009) that greater self-regulation is associated with higher achievement in advanced courses but not in regular courses, and to examine the hypothesis that this finding was related to perceived demand in the course. The researcher predicted that self-regulation would matter more for achievement in advanced than in regular courses and for students who perceived that their course was more demanding than for students who perceived that it was less demanding. Third, this study examined the value of classroom environment variables in predicting students' self-regulated learning. The researcher hypothesized that higher perceived levels of demand, autonomy support, feedback, and cooperation would be associated with greater self-regulation. Fourth, this study compared the results of these analyses using both self-report data and microanalytic data to determine whether both data sources would lead to the same conclusions.

- RQ1: Do motivation, self-regulatory strategy use, and perceptions of the classroom environment differ between students in advanced and regular courses?
- RQ2a: To what extent do the effects of motivation and self-regulatory strategy use on achievement differ between students in advanced and regular courses?
- RQ2b: To what extent do the effects of motivation and self-regulatory strategy use on achievement differ by students' perceptions of academic demand in their classrooms?
- RQ3: To what extent do students' perceptions of the classroom environment predict their academic self-regulation?
- RQ4: To what extent do conclusions about the questions above vary as a function of using self-report or microanalytic methods to measure self-regulation?

Chapter 2: Literature Review

Self-Regulated Learning Defined

As with many complex concepts in educational psychology, there are nearly as many definitions of self-regulated learning as there are researchers on the subject. Most researchers agree that self-regulated learning is the strategic, intentional process of metacognitive monitoring and control in order to achieve a personal goal (Hadwin, Winne, Stockley, Nesbit, & Woszczyna, 2001; Winne & Perry, 2000; Zimmerman, 2000). Most also agree that self-regulated learners enact these monitoring and control processes across the domains of behavior, motivation, cognition, and emotion (Cleary, 2006; DeCorte, Verschaffel, & Op'T Eynde, 2000; Pintrich, 2004; Zimmerman, 2000). Self-regulated learning requires metacognition for planning, monitoring, and modifying one's behaviors, cognitions, and motivation and for selecting strategies (Pintrich & DeGroot, 1990; Winne & Perry, 2000). Strategies are at the heart of self-regulation, with the most strategic learners constantly self-monitoring to update their knowledge of whether the tactics they are using are effective, and modifying them as appropriate (Pintrich & DeGroot, 1990; Hadwin et al., 2001; Winne & Perry, 2000). Self-regulated learners also monitor and control their effort, and they attribute their successes and failures to effort and strategy use (Pintrich & DeGroot, 1990; Winne & Perry, 2000). In addition to metacognition, strategy use, and effort, self-regulation involves personal beliefs, attitudes, and values (Zimmerman, 2000). In the context of the classroom, self-regulation is the student's attempt to meet academic goals while overcoming obstacles using a variety of resources and strategies (Randi & Corno, 2000). Self-regulated learning, then, is a complex set of active, intentional processes whereby learners plan, monitor, and modify their strategy use, effort, and motivation to overcome obstacles in meeting personal goals.

Theoretical Models of Self-Regulated Learning

Several researchers have developed models of self-regulated learning, most of which emphasize the cyclical nature of the planning, monitoring, and modifying processes involved (e.g., Butler & Winne, 1995; Pintrich, 2004; Winne & Perry, 2000; Zimmerman, 2000). The current work recognizes Zimmerman's (2000) cyclical feedback model as a parsimonious yet thorough representation of the components involved in self-regulation of learning, embedded within social-cognitive theory. Consistent with this theoretical backdrop, Zimmerman (2000) also upholds a triadic model of self-regulation, which emphasizes the relationships between the learner's covert cognitions, the learner's behaviors, and the contexts or environment (Bandura, 1986). Finally, self-determination theory is presented as a perspective that explains how environments can support or deter motivation and self-regulated learning.

Cyclical feedback loop. Zimmerman's (2000) feedback loop model of self-regulated learning represents planning, monitoring, and modifying with the three model stages of forethought, performance/volitional control, and self-reflection, respectively (see Figure 1). During the forethought phase, students set goals and plan the strategies they will use to accomplish the task, as well as assess their motivational beliefs. The performance/volitional control phase occurs while students are actively engaged in the task, and requires students to self-monitor their progress and control their attention, engagement, and strategy use. When students self-reflect in the third phase, they evaluate their progress against a standard and determine whether and how they will modify their strategies to improve their performance. A key characteristic of Zimmerman's model is its cyclical nature; students use motivational and strategy feedback from the self-evaluation phase to restart the loop as they continue to work on a task.

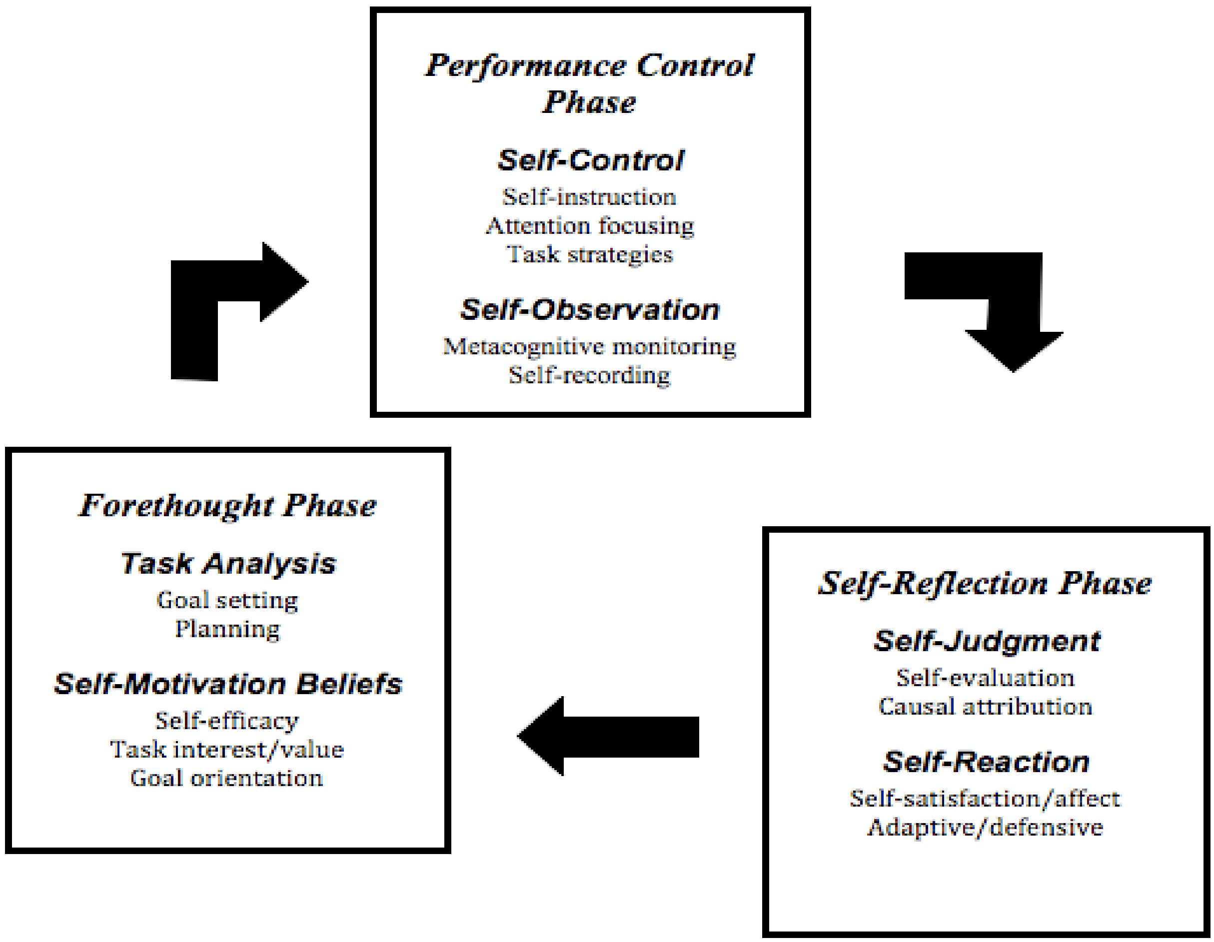

Figure 1. Zimmerman's (2000) self-regulated learning feedback loop.

Forethought phase. In the forethought phase, students approach a task by analyzing the problem and considering whether they want to pursue it by tapping into their motivational beliefs. During task analysis, students set goals for the task, plan out the strategies they think they will use, and organize their materials and study space. Strategies can include any cognitive, motivational, or behavioral tools that a student can apply to the metacognitive processes of self-regulated learning or directly to content area tasks. In addition to planning task strategies, students also consider their motivational beliefs during this phase, which include self-efficacy, perceptions of control over outcomes, intrinsic interest and task value, and achievement goal orientations. Self-efficacy perceptions are students' appraisals of whether they have adequate skills and control over outcomes to complete the task successfully (Schunk, 1991). Achievement goal orientations refer to the desired outcomes that motivate a student to engage in school work. Two common achievement goal orientations include mastery and performance goals (Meece, Anderman, & Anderman, 2006). Students with mastery goals are motivated to learn a new skill, understand new content, increase their ability, or accomplish a challenging task. Students with performance goals are motivated to demonstrate high ability, perform well relative to others, and achieve success with little effort. High self-efficacy, a sense of control over outcomes, intrinsic valuing and interest in the task or subject, and mastery achievement goals are all associated with choices to engage in more difficult tasks and greater effort, persistence, and self-regulation in the phases that follow (Ames, 1992; Dweck, 1985; Greene & Miller, 1996; Pintrich, Roeser, & DeGroot, 1994; Schunk, 1991). In sum, the forethought phase of Zimmerman's feedback loop involves setting goals, creating a strategic plan, and tapping into motivational beliefs.

There is some uncertainty in the field regarding the relationship between motivation and self-regulated learning. Some researchers (e.g., Boekaerts, 1997; DeCorte et al., 2000; Zimmerman, 2000) consider motivation to be an integrated component of the cyclical self-regulation feedback loop, while others consider it separately. The latter authors recognize that students can be motivated to act in ways that do not demonstrate positive self-discipline (Paris & Winograd, 1990). For example, a student may be motivated to avoid failing and consequently choose not to complete a homework assignment or skip school altogether. However, it could be argued that this behavior is self-regulatory, as the student is perhaps maladaptively controlling his negative emotions by preserving his pride. Both theoretical and empirical work suggest that motivation is an important precursor to cognitive engagement and self-regulation, or that the two operate reciprocally (e.g., Appleton, Christenson, Kim, & Reschly, 2006; Pintrich et al., 1994; Russell, Ainley, & Frydenberg, 2005; Zimmerman, 2000). Furthermore, research has shown that students self-regulate their motivation when they need to persist through a boring or challenging task (Wolters, 2003). For these reasons, it is assumed here that motivation is inseparable from the self-regulatory feedback cycle, and motivation will consequently be treated as a crucial component of academic self-regulation.

Performance/volitional control phase. According to Zimmerman's (2000) model, the performance and volitional control phase of self-regulation requires students to manage their strategy use and effort as they engage with a task. Students use self-control and self-observation in order to accomplish this. Self-control strategies include focusing attention on the task, controlling motivation and effort, and using the task-specific strategies planned during the forethought phase. Researchers recognize three types of knowledge that strategic learners have about the strategies they use: declarative, procedural, and conditional knowledge (Weinstein, Husman, & Dierking, 2000). Declarative knowledge is general awareness of a variety of strategies that could be applied to a task or situation. Procedural knowledge is knowing how to apply the strategy, and it requires hands-on practice. Finally, conditional strategy knowledge involves knowing when to use a strategy, how long it will take to implement, cost-benefit analyses of its use, and whether another strategy would be more suitable for that task; conditional strategy knowledge has been implicated in promoting transfer, which is a persistent problem in self-regulation training (Weinstein et al., 2000). Thus, strategy knowledge and use is a primary component of the performance control phase of the self-regulation cycle. In addition to self-control, as students engage with a task, they monitor their activities and progress, as well as their cognitive, emotional, and motivational states. Highly self-regulated students use frequent self-monitoring to generate internal feedback and update their knowledge of their progress (Butler & Winne, 1995). This feedback is important for self-reflection, the final phase of the feedback loop.

Self-reflection phase. After collecting both internal feedback from self-monitoring and external feedback from teachers, peers, and/or parents, students make self-judgments about their performance and react to these judgments. When self-regulated learners judge their performance, they evaluate it against a standard, such as whether they met a personal goal, teacher expectations, or their social and environmental norms, and determine whether they performed well or poorly (Hadwin & Jarvela, 2011; Nicol & MacFarlane-Dick, 2006; Zimmerman, 2000). They then make attributions for this success or failure; common attributions include intelligence or natural ability, luck, the difficulty of the task, effort, and strategy use (Dweck, 1986; Weiner, 1979). The level of control students perceive over their performance, related to these types of attributions, influences how they will react. Self-reaction includes an affective component, where learners determine how they feel about their results, and a behavioral component, whereby they react either adaptively or defensively. An adaptive reaction may include trying again, resubmitting work, or using a new strategy, while a defensive reaction seeks to preserve one's pride or image through choosing an easier task next time, self-handicapping by not studying, or avoiding the task or subject altogether in the future (Ames, 1992; Mueller & Dweck, 1998; Nicol & MacFarlane-Dick, 2006; Wolters, 2003). This reaction to self-evaluation of performance constitutes the restarting of the feedback loop cycle, and students begin the forethought phase again, this time armed with more knowledge to set goals and plan strategies, and information that influences their motivation to learn.

The three phases of the self-regulation feedback loop – forethought, performance/volition control, and self-reflection – together comprise the covert cognitive, metacognitive, motivational, and emotional as well as the overt behavioral activities that students engage in while self-regulating their learning. At certain moments during the cycle, such as when self-reflecting on external feedback, influences from the environment become more salient. The triadic forms of self-regulation expand upon the feedback loop model for a broader view of self-regulation, emphasizing the reciprocal relationship between person and environment consistent with a social-cognitive perspective.

Triadic model. According to social-cognitive theories, individuals gather information from their social and physical environments, process this information cognitively and self-reflectively, and react behaviorally (Bandura, 1986; see Figure 2). Bandura's triadic forms of self-regulation acknowledge these three processes of personal, behavioral, and environmental and represent several feedback loops (Zimmerman, 2000). At the personal level, individuals self-monitor and control covert processes such as cognition, motivation, and affect. They also monitor and adjust their behavior, as well as their environments, and obtain feedback from the environment to determine whether their attempts to control their environment are working. This bidirectional relationship between person and environment is a particularly important factor in social-cognitive perspectives on self-regulation. Through the social environment, students learn strategies and behaviors modeled by significant others like their teachers, parents, and peers. Furthermore, the environment may provide students with other affordances and resources that promote motivation to learn and facilitate self-regulatory strategy use. Self-determination theory is one perspective that can help explain how environments motivate students to engage with learning.

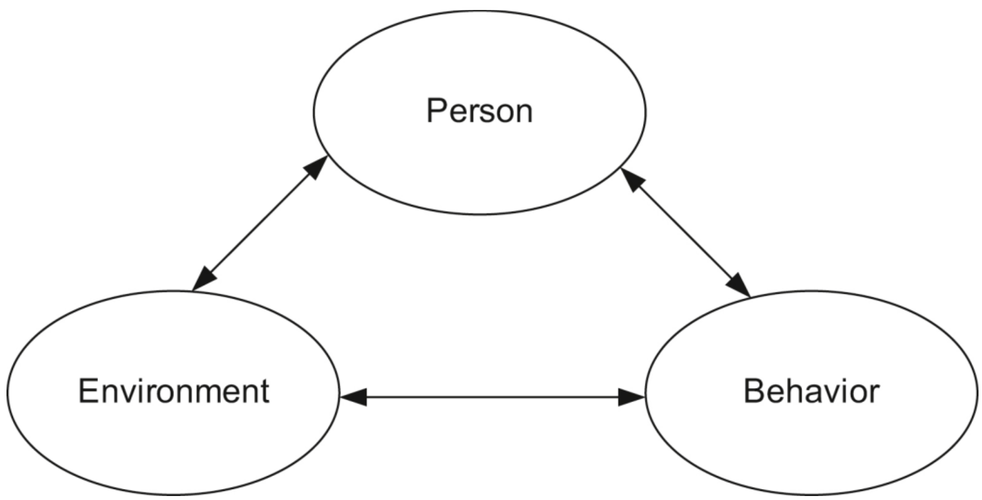

Figure 2. Bandura’s triadic model of social-cognitive influences.

Self-Determination Theory. Self-determination theory (SDT) posits that all individuals possess inherent characteristics that motivate them to engage and grow (Reeve, 2012). According to basic needs theory, one of five minitheories of SDT, students are driven to pursue classroom activities to satisfy their basic psychological needs. These needs include autonomy, competence, and relatedness, and the environment can either enhance or undermine this inherent motivation (Ryan & Deci, 2000). Environments that allow students some freedom to make their own decisions, develop their ability in a non-threatening atmosphere, and connect with a community of learners can help satisfy these inherent needs, while heavily controlling environments that emphasize comparison and competition can inhibit intrinsic motivation (Ryan & Deci, 2000). Similarly to the triadic forms of self-regulation (Bandura, 1986), SDT's student-teacher dialectical framework proposes a reciprocal relationship between student engagement and teachers' motivational styles (Reeve, 2012).When students become agents of their own learning, they ask questions and provide input that affects their teachers' responses. SDT outlines how schools and teachers can structure their environments to promote student motivation, which can ultimately lead to increased self-regulated learning.

This discussion of theoretical models of self-regulated learning has provided a framework for how strategic students monitor and control their thoughts and behavior as they work on a challenging task. Further, it has provided a theoretical basis for an argument that variables in the classroom environment have an influence on students' motivation and self-regulation. The remainder of this review provides some empirical evidence for the relationships between components of self-regulated learning, the links between self-regulated learning and achievement, and the power of classroom environments to promote or inhibit motivation and self-regulated learning.

Research on Self-Regulated Learning

From naturalistic to intervention studies, research on self-regulated learning has provided correlational evidence about the construct as well as demonstrated the effectiveness of self-regulatory training on academic outcomes. Researchers have repeatedly shown that high achieving students use self-regulated learning strategies and that measures of self-regulatory strategy use can differentiate effectively between high and low achievers. Furthermore, studies of the relationship between motivation and self-regulation have demonstrated that motivational variables influence students' decisions to engage cognitively, but it is the use of self-regulatory strategies that predicts achievement. Several studies have shown that self-regulated learning strategies and processes can be taught and learned, and that this learning improves academic outcomes for college students, students in advanced high school courses, and low achievers and students with learning disabilities alike. However, a subset of the literature suggests some differences between high and low achievers in the effectiveness of self-regulatory training and the value of strategy use in predicting achievement. This problem and others may best be addressed by refocusing the lens to include environmental context as an integral component of self-regulated learning.

Naturalistic studies. Much of the correlational research on self-regulated learning has focused on the strategies high-achieving students use and how this differentiates them from lower-achieving students. Structured interviews with high- and low-achieving students have revealed differences in the types, consistency, and settings of strategy use between the two groups (DiBenedetto & Zimmerman, 2010; Ruban & Reis, 2006; Zimmerman & Martinez-Pons, 1986; 1990). Gifted and high-achieving students have been shown to use more self-regulatory strategies than lower achieving students, including assessing task demands and strategic planning, organizing and transforming, structuring the environment, keeping records and monitoring, using a note-taking system, seeking information, seeking and offering peer assistance, self-evaluating, self-consequating, and reviewing notes (Cleary, 2006; DiBenedetto & Zimmerman, 2010; Ruban & Reis, 2006; Zimmerman & Martinez-Pons, 1986; 1990). Using ANOVA procedures on data from a microanalytic assessment, DiBenedetto and Zimmerman found large effects of achievement level (low, average, and high) on students' strategy use while reading ($\eta^2_{partial}$ = .18), strategy use while studying ($\eta^2_{partial}$ = .20), metacognitive monitoring during a test ($\eta^2_{partial}$ = .41), and self-evaluation during a test ($\eta^2_{partial}$ = .36). Further, high-achieving students reported using these strategies more often and across more settings in a structured interview (e.g., classroom work, studying, writing homework; Zimmerman & Martinez-Pons, 1986). In each interview, low achieving students reported using an average of 5.7 strategies, compared with 13.3 strategies on average for high achievers, which was a statistically significant difference ($p < .001$; Zimmerman & Martinez-Pons). Notably, these strategies span across each phase of Zimmerman's (2000) cyclical feedback loop.

In addition to differences in the use of self-regulatory strategies between achievement groups, researchers have found differences by non-self-regulatory strategies as well. Lower achievers used more strategies that let others take control or that focused solely on trying harder without any particular method for doing so (Zimmerman and Martinez-Pons, 1986) and more maladaptive strategies such as procrastination and work avoidance (Cleary, 2006). The former study found a canonical correlation of r = .15

between achievement group and non-self-regulatory strategy use, and the latter study found an effect size of $\eta^2 = 0.09$ using ANOVA procedures, indicating a small to moderate effect. Using 14 categories of self-regulatory strategy use, and one category of non-regulatory strategies, Zimmerman & Martinez-Pons (1986) were able to accurately classify 93% of students into the low- or high-achieving groups with discriminant function analysis. Other studies have shown that self-regulation is a significant predictor of academic performance (Pintrich & DeGroot, 1990; Wolters & Pintrich, 1998). Pintrich and DeGroot (1990) found that responses to a self-report self-regulation scale explained 5-13% of the variability in students' grades on different types of class assignments as well as their course grades in 7th-grade students. In Wolters and Pintrich's (1998) study, self-reported self-regulatory strategy use explained 5-9% of the variability in course grades, depending on the course (math, English, or social studies). This type of work has provided foundational evidence that students who use cognitive and self-regulatory strategies are more successful in school.

Correlational and longitudinal studies have also shown that higher levels of motivation are associated with more cognitive strategy and self-regulatory strategy use. Self-efficacy has received the most attention of the motivational variables; students with high levels of self-efficacy have been shown to choose more difficult tasks, work harder, and persist longer than students with lower self-efficacy beliefs (Pajares, 1996; Schunk, 1991). Further, students who have reported higher task value, interest in the subject, and self-efficacy beliefs reported more cognitive and metacognitive strategy use (Cleary, 2006; Pintrich & DeGroot, 1990; Pintrich et al., 1994; Wolters & Pintrich, 1998). Cleary (2006) used multiple regression procedures and found that task interest and value together accounted for 15% of the variation in students' reports of managing their behaviors and environments, and task interest alone accounted for 19% of the variability in responses regarding information- and help-seeking strategies. Using regression analyses, Wolters and Pintrich (1998) found that reported task value alone explained 13-24% of the variation in cognitive and self-regulatory strategy use, and self-efficacy alone explained 1-9%. Cleary's sample included high school students from mostly Hispanic and African-American, low-SES backgrounds, while the other researchers studied primarily European-American middle-school students from working- or middle-class backgrounds. The similar results across samples seem to indicate that the motivational variables of self-efficacy, interest, and task value have similar predictive value for cognitive and self-regulatory strategy use regardless of demographic differences.

In those studies that measured achievement as well, strategy use and self-regulation were significant predictors of academic achievement, but the motivational variables often were not (Pintrich & DeGroot, 1990; Wolters & Pintrich, 1998). For example, Pintrich and DeGroot found that self-efficacy and intrinsic value each predicted between 11-53% of the variability in cognitive strategy use and self-regulation. However, when all variables were included in regression equations to predict performance, the motivational characteristics were no longer statistically significant, but self-regulation alone still uniquely predicted 3-7% of the variation in performance, after controlling for the other variables. This indicates that motivational variables are important predictors of whether students will engage and self-regulate, but it is the actual cognitive engagement that is crucial for academic success (Wigfield & Eccles, 1994). This explanation is consistent with current views on the relationship between motivation and engagement, where motivation is the "why" and engagement is the "what," with motivation as a necessary but insufficient precursor to engagement (Appleton et al., 2006; Russell et al., 2005).

The literature on self-regulation in naturalistic settings provides evidence that self-regulation is associated with achievement, and that motivational variables such as task value and self-efficacy beliefs are associated with self-regulation. This foundation has prompted a growing body of intervention studies on student self-regulation training that have demonstrated its effectiveness across age groups, academic subjects, and achievement levels.

Intervention studies. The research suggests that interventions to promote self-regulated learning have been effective in increasing strategy use and improving academic achievement. Interventions to increase students' self-regulation have been successful in improving writing quality in the elementary and middle grades (Self Regulation Strategy Development; Graham & Harris, 2003), reading comprehension in elementary through high school (Haller, Child, & Walberg, 1988), science performance in advanced high school students (Self Regulation Empowerment Program; Cleary & Zimmerman, 2004; Cleary, Platten, & Nelson, 2008), achievement in computer programming (Bielaczyk, Pirolli, & Brown, 1995) and various other subjects in college students (Strategic Content Learning; Butler, 1998), and on-task behavior and subject area accuracy in students with disabilities (Cameron & Robinson, 1980; Shimabukuro, Prater, Jenkins, & Edelen-Smith, 1999).

These models and techniques have been studied to varying degrees with different levels of rigor. Self Regulation Strategy Development (SRSD) is among the most frequently and rigorously studied programs, with results demonstrating large effects of the program on writing quality for elementary and middle school students (Graham & Harris, 2003). One meta-analysis of 26 SRSD studies in writing conducted before 2003 showed a large average immediate posttest effect of SRSD on the quality, elements of writing, story grammar, and length of stories produced by students overall; the sizes of these overall effects were all greater than 1.4 using Cohen's *d*, and greater than 80% using percentage of non-overlapping data (PND; Graham & Harris, 2003). Students with and without disabilities in elementary and middle school have been shown to benefit from SRSD, whether taught by their teachers or researchers.

Other researchers have undertaken meta-analyses that included many different programs and interventions and demonstrated their effectiveness for increasing achievement. One such meta-analysis examined the effects of metacognitive strategy instruction on reading comprehension for students in grades two through twelve (Haller et al., 1988). Across 20 studies with 115 unique effect sizes, the authors found an overall effect of $d = 0.71$, which is considered moderate to large. The authors included studies that taught awareness, monitoring, and regulating strategies to improve reading comprehension. Another author used the 14 self-regulatory strategies identified by Zimmerman and Martinez-Pons (1986) and examined the effects of interventions to teach each of these skills on academic achievement (Lavery, 2008, as cited in Hattie, 2009). Using 89 study effects, Lavery found the largest overall effect for teaching organizing and transforming skills ($d = 0.85$). Self-consequating (75 effects; $d = 0.70$), self-instruction (124 effects; $d = 0.62$) and self-evaluation (156 effects; $d = 0.62$) also had moderate to large effects on achievement. The results of these meta-analyses show that interventions to promote metacognitive and self-regulatory skills are effective for increasing academic performance.

Other between-groups studies have shown promising effects of academic self-regulatory interventions in varying content domains, but used weaker research designs. Cleary and colleagues' (2008) pilot study of the SREP program with urban high school students showed that the intervention group increased its average classroom exam grades from 70.6 to 83.3, while the average of students who were not recommended for the intervention increased only from 77.6 to 80.6. Nevertheless, there was no randomization or attempt made to compare the intervention and control groups on demographic or pre-intervention achievement factors. Bielaczyk and her colleagues' (1995) work employed a controlled study to examine differences between implicit and explicit training in self-explanation and self-regulation strategies for college students in a computer programming course. Students who received explicit instruction in these skills decreased their errors by an average of 0.6 per problem, compared with the implicit (control) group which increased errors by an average of 1.0 error per problem from pre-post intervention. However, it is not clear whether the students were randomly assigned, and the total number of students was small (n = 24). Finally, Butler's (1998) pre-post study of the SCL approach for college students showed that 87% of students experienced performance gains, but each student worked on a different content domain and there was no control group. Notably, none of these studies provided (or were able to provide) between-groups effect sizes or the information necessary to calculate them.

Single-case design studies have also been somewhat popular in self-regulation intervention research, perhaps due to the individual service delivery that is so often seen in these interventions, especially for students in self-contained or resource-room settings. While self-regulatory strategy instruction programs such as SRSD, SREP, and SCL include comprehensive attention to all phases of Zimmerman's feedback loop, many interventions studied using single-case designs target only one or two processes of the loop. Nevertheless, these types of interventions have been shown to be effective with individual students, especially those with disabilities. In a multiple-baseline design study of three middle-school males with ADHD and LD, a self-monitoring and self-graphing intervention improved student accuracy scores in math, reading, and writing from 47-67% to 71-89% (Shimabukuro et al., 1999). Similar results were achieved in an intervention to teach self-instruction and self-management to three "hyperactive" elementary-aged students, where mean accuracy for each phase increased from 14-50% to 56-87% for math and 52-61% to 77-84% for on-task behavior, from the baseline to self-management phases (Cameron & Robinson, 1980). The field would benefit from replication of these interventions with different types of students under different circumstances (e.g., non-disabled, group vs. individual intervention setting, etc.)

Students with learning disabilities (LD) in particular have often been targeted with self-regulatory and strategy instruction interventions. In the content area of writing, students with LD tend to focus on content, and tend not to engage in a cycle of planning, writing, and revising without specific prompting to do so (Graham, 1990); they also seem to benefit from direct instruction (Graham & Harris, 2003), making them good candidates for training in the self-regulatory cycle. Studies of SRSD that have focused on teaching self-management and self-monitoring skills to students with LD have had positive results, with an average between-groups effect size of 1.37 across all outcomes studied in a meta-analysis (Graham & Harris, 2003).

However, there is some evidence that self-regulatory skills and processes may function differently depending on students' levels of academic skill. Despite the promising results found by some researchers who have worked with low achievers or students with LD, other evidence suggests that self-regulatory interventions with low-achieving students may be less effective. In an intervention study designed to promote transfer of math learning to new contexts, the self-regulatory components had a weaker effect on transfer over the transfer-only intervention for low- and average-achieving students (d = 0.35 and 0.55, respectively) than for high-achievers (d = 1.00; Fuchs et al., 2003). In another intervention study designed to provide students with self-regulatory strategies for solving math problems, although all students benefited, the intervention was more effective for high and average than for low achievers (Verschaffel et al., 1999).

In addition to these results for students with disabilities, other research indicates that motivational characteristics and self-regulation may function differently by varying course and skill levels. Cleary and Chen (2009) found that self-regulatory strategy use and motivational variables differentiated low and high achievers as expected in advanced math courses, but did not differentially predict achievement levels in regular math courses in the same school. In the advanced courses, high achievers reported significantly more use of self-regulation strategies ($\eta^2 = 0.04$), less use of maladaptive strategies ($\eta^2 = 0.07$), more task interest ($\eta^2 = 0.05$) and value ($\eta^2 = 0.02$), and higher self-set standards for performance ($\eta^2 = 0.17$) than lower achievers. In contrast, the only statistically significant differences between high and lower achievers in the regular math courses occurred for task interest ($\eta^2 = 0.09$) and self-set standards ($\eta^2 = 0.06$). This means that self-regulation was important for achievement in advanced courses, but not in regular courses. These conflicting results indicate a need for further study into the self-regulatory mechanisms and variables that predict achievement for students at different course and skill levels.

In addition to the need for clarification of the differences between low and high achievers, a persistent problem plaguing self-regulation training is the issue of transfer. Many researchers have recognized that even when interventions are effective in the short term, students are unlikely to make the connection to using their new strategies in different contexts without explicit prompting (Brown, 1994; Butler, 1998; Fuchs et al., 2003; Graham & Harris, 2003; Pressley, 1986). One reason for the transfer problem may be a tendency in the field to neglect the different contexts in which students learn. Most interventions to promote academic self-regulation are highly domain-specific, with strategy instruction embedded within a specific content area. However, research has shown that self-regulated learners do not use the same strategies across all subjects and settings (Hadwin et al., 2001; Zimmerman, 2000). Hadwin and her colleagues found that among college students, study context (reading for learning, writing a paper, and studying for an exam) accounted for between 26-80% of the variability in the tactics students reported using to complete the task. Pressley (1986) has suggested that teaching strategies paired with modeling and examples within different contexts can help to combat the transfer problem and encourage students to apply or even generate new strategies in different situations. Teaching techniques such as these that view self-regulated learning as framed within an environmental context might help to alleviate the transfer problem.

The literature on self-regulated learning interventions demonstrates that they can be effective for different kinds of students learning different subjects. Nevertheless, more research is needed to replicate these findings as well as to answer some of the persistent questions in the field. One perspective that may help in understanding both the unexplained differences between low and high achievers and the transfer problem is the impact of the learning environment on self-regulation.

Shifting views of the "self" in self-regulation. Whether examining students' natural inclinations toward self-regulation or the effects of training programs and interventions, most research has focused on the "self" in self-regulated learning. That is, most theory and empirical work in self-regulation seems to assume that students either do or do not choose to take responsibility for their own learning, independently of the people and contexts around them. Focusing on individual differences in self-regulated learning is important but neglects the crucial role of students' learning environments in influencing their self-regulatory beliefs and behaviors. Bandura's (1986) triadic forms of self-regulation serve as a reminder that self-regulation involves not just the covert and behavioral processes of the self, but also the environmental context in which the individual learns. Just as individuals control and regulate their environments, their environments control and regulate them. Social-cognitive theory emphasizes the role of modeling, but classroom environments affect students and how they learn in other ways as well. For example, empirical work has shown that environmental variables can predict student motivation and cognition more strongly than initial individual characteristics (Pintrich et al., 1994), and that well-established self-regulatory components do not predict achievement equally well in all environments (Cleary & Chen, 2009). Furthermore, researchers in recent years have begun to characterize self-regulated learning not just as an individual aptitude, but also as an event embedded within a specific context (Cleary, 2011; Hadwin et al., 2001; Winne & Perry, 2000). Therefore, it is important to consider how students' environments promote or inhibit their motivation, strategy use, and self-regulation. Understanding this may help educators to create classroom environments that will foster self-regulated learning in their students.

Influences of the Classroom Environment on Self-Regulated Learning

The various characteristics of students' environments can promote or inhibit their self-regulated learning. Researchers have examined the relationships between student self-regulation and a host of environmental variables, many of which can be controlled by adults in the classroom. Social influences, contextual characteristics of tasks and settings, teacher practices, and the fit between the developing individual and his or her environment have all been established as contributors to students' self-regulation of their learning.

Social, cultural, and peer influences. Of all the components of students' environments that impact their self-regulation, social influences may be under the least control of educators. Families, peers, community, and culture all play a role in defining the goals students set for themselves and the standards against which they measure whether they have met those goals (Jackson, Mackenzie, & Hobfoll, 2000). Students do not set goals in a vacuum, but use norms and feedback from their social environments to guide them. Further, some students take advantage of affordances in the environment to a greater extent than others. High-achieving students have reported seeking more social support from their parents, teachers, and peers than lower achievers, with achievement level explaining 5-7% of the variation in each of these behaviors (Zimmerman & Martinez-Pons, 1986; 1990). In situations where teachers give poor, unclear instructions, high achievers have been shown to suffer less harm than low achievers by more effectively filling in the missing information (Carroll, 1963). Similarly, more motivated students have been shown to evoke more supportive teacher behaviors than students who initially showed less motivation (Skinner & Belmont, 1993). These findings demonstrate the reciprocal relationship between students and their environment, as modeled in the triadic theory of self-regulation; environments act on students, but students act on their environments as well. Like other aspects of self-regulation, students can learn through instruction to use the social environment to their advantage (Cleary et al., 2008). This gives educators some control over students' social contexts by teaching them to strategically control their own environments.

Despite the role broader socio-cultural norms and expectations play in shaping students' self-regulated learning, each school and classroom also comprises its own social environment. Researchers who study social regulation of learning recognize that in addition to the traditional model of self-regulation, coregulation and shared regulation also occur regularly in classrooms (Hadwin & Jarvela, 2011). Coregulation is understood as a temporary phase during which teachers facilitate students' transition to more self-regulated forms of learning (Perry & Rahim, 2011). Teachers use coregulation when they help a student monitor his or her progress and provide prompts to encourage the student's own self-monitoring and strategy use. In addition to coregulating student learning, teachers can also create activities that promote shared regulation. Shared regulation refers to the ways in which students prompt each other as they work together, often to achieve a common group goal (Perry & Rahim, 2011). Students share regulation when they give reminders and make suggestions to each other while working together on a group project. This type of cooperative work in the classroom has several benefits for fostering more personal forms of self-regulation. When students perceived their classroom environments as more cooperative, they had higher levels of self-efficacy (R^2 = .10), valued tasks more (R^2 = .11), and used more cognitive (R^2 = .10) and metacognitive (R^2 = .06) strategies (Pintrich et al., 1994). Cooperation with peers may benefit students' self-regulation through activities that allow students to evaluate each other's work against a standard and provide feedback to their peers (Nicol & MacFarlane-Dick, 2006). These activities may help students learn to self-evaluate in an objective and non-critical context, gain alternative perspectives other than the teacher's, and stimulate a dialog to clarify teacher feedback (Nicol & MacFarlane-Dick, 2006).

Characteristics of tasks and settings. In addition to the influences of the social environment, characteristics of the contexts in which students work influence student self-regulation, such as the setting, academic subject, prompts embedded within tasks, and the tasks themselves. Self-regulated learning is thought to be most important for success when the setting is unstructured, such as when studying at home, which tends to occur more often during the secondary grades (Randi & Corno, 2000; Zimmerman & Martinez-Pons, 1986). Settings and tasks that require sustained attention or with which students have competing goals also demand increased self-regulation in order for students to succeed (Randi & Corno, 2000). Arguably, these are all characteristics of classroom settings in advanced courses, where self-regulated learning has been shown to predict achievement, as compared with regular courses where self-reported self-regulatory strategy use was not a significant predictor (Cleary & Chen, 2009). Cleary and Chen (2009) hypothesized that the reason for this difference was greater academic demand in the advanced course, which may have required students to engage more fully in self-regulatory processes in order to keep up with the more challenging work.

This hypothesis is supported by the engagement literature, which has identified *academic press*, or high levels of academic challenge combined with high teacher expectations for success, as a key characteristic of instructional environments that promote academic success, even for disengaged students (National Research Council, 2003). One study of academic press found that demanding curricula paired with high teacher expectations for student success was statistically significantly related to math achievement and school attendance, and found no link between social support, such as teacher-student relationships or democratic governance in the classroom, and achievement or attendance (Phillips, 1997). In contrast, another study of middle school students in Chicago found that although academic press was a prerequisite for achievement gains, these gains were not realized among students who did not feel supported (Lee & Smith, 1999). Another study that examined the impact of high teacher expectations found that it was a significant predictor of not only achievement, but important motivational characteristics such as having a mastery goal orientation and interest in the class (Wentzel, 2002). These studies suggest that the level of demand in the classroom may be a particularly important task and setting characteristic for promoting student motivation, engagement, and self-regulation.

In addition to these setting characteristics, the subject area of the course seems to impact the type and level of cognitive and self-regulatory strategies that students use.

Certain tasks have been shown to cue the use of particular strategies, with students reporting the use of different strategies by task (i.e., reading, writing an essay, and studying for a test) and subject area (Hadwin et al., 2001). Research has shown that some subjects, such as social studies, prompted the use of significantly more cognitive strategies than other subjects, such as math (d = 0.14; Wolters & Pintrich, 1998). Further, research in math in particular has shown that students do not tend to cyclically self-regulate, think real-world knowledge is relevant to solving problems, or effectively manage frustration when problems become difficult (DeCorte et al., 2000). This may be due to the perception among students that math is more "certain" than other subjects and therefore less conducive to applying higher-order thinking processes (DeCorte et al., 2000). Further, these findings are consistent with research suggesting that even when students know how to use a strategy, they may not do so unless explicitly prompted by the task or teacher (Brown, 1994). Thus, settings and tasks can have a strong impact on whether students choose to use self-regulatory and other cognitive strategies and the extent to which they predict academic success.

The research on settings, subjects, and tasks demonstrates how different courses and subject material may differentially require and subsequently prompt students to use cognitive and metacognitive strategies. As with broad cultural norms that guide students to set personal goals and standards, educators may not have much control over students' initial perceptions of the differences between academic subjects. Nevertheless, teachers can structure their classrooms to provide social environments and tasks that promote self-regulated learning and strategy use.

Teaching practices. Urdan and Shoenfelder (2006) have noted that viewing motivation as a result of both student and classroom characteristics, rather than solely as an individual difference variable, gives teachers the power to change their practices to promote student motivation. There is a growing evidence base to support this claim, which suggests that teachers actually do have a strong influence on their students' motivation and development of self-regulated learning. Secondary-level students' perceptions of their teachers' instructional efficacy and assignment of productive work have been shown to predict students' intrinsic valuing of the subject (R^2 = .36 and .67, respectively), self-efficacy (R^2 = .16 and .31), and subsequently cognitive (R^2 = .22 and .48) and metacognitive (R^2 = .17 and .36) strategy use (Pintrich et al., 1994). In that study, student perceptions that their assignments were useful, interesting, and allowed ample choice predicted end-of-year intrinsic value three times more strongly than did students' valuing of the subject area at the beginning of the year (Pintrich et al., 1994). This suggests that classroom environments may be more powerful than students' initial perceptions in motivating students to learn.

According to expectancy-value theory and empirical evidence, motivational variables such as intrinsic value and self-efficacy are important predictors of cognitive engagement and self-regulated learning (Pitnrich & DeGroot, 1990; Wolters & Pintrich, 1998). Thus, teachers and classrooms may play an important role in motivating students to enroll in a particular course, take on a challenging task, or engage deeply with subject material. However, teaching techniques that are traditionally considered best practice may not necessarily result in students becoming more self-regulated (Perry, 1998). Teaching practices have been identified that are associated specifically with facilitating motivation and self-regulation, including promoting student autonomy, creating effective systems of assessment and feedback, explicit strategy use instruction, and building supportive relationships with and between students.

Promoting autonomy. Having the autonomy to make some of their own instructional decisions has been implicated as crucial by many researchers in determining whether students will self-regulate their learning (e.g., Perry, VandeKamp, Mercer, & Nordby, 2002; Reeve, 2012; Ryan & Deci, 2000; Zimmerman, 2000). In order to self-regulate, students cannot be overly externally regulated by their environments. Strong external regulation prevents students from making their own decisions, limits their opportunities for reflection, and creates an environment where learning is regulated by the teacher instead of the learner. Self-regulation requires that students be able to set their own goals, control the level of challenge, and dictate which strategies they will use to complete their work, at least in part (Ames, 1992; Perry et al., 2002; Zimmerman, 2000). Teachers can further support student autonomy in the classroom by giving fewer directives and answers, listening and attending more to students' questions, taking student perspectives, and supporting their initiatives (Ryan & Deci, 2000). Supporting autonomy in the classroom may be the most important way teachers can promote engagement and self-regulated learning, and research shows that teachers can learn these skills through intervention (Reeve, 2012).

Autonomy has also been shown to increase motivation to learn. When students feel a sense of choice and control over their learning, they are more intrinsically motivated to engage with the material (Ames, 1992; Pintrich et al., 1994). Autonomy in the classroom further allows students to select material that is most interesting to them, which has been shown to be an important factor in determining students' levels of motivation (Siegle, Rubenstein, Pollard, & Romey, 2010). In Siegle and his colleagues' study of 14 different skill areas, interest explained from 12-53% of the variation in students' reports of their self-efficacy for each skill. Students who are interested in the material and feel a sense of choice and control over their learning are more likely to seek out new content, skills, and challenges; these students are said to have a mastery achievement goal orientation, which has been associated with deeper cognitive strategy use and self-regulation (Ames, 1992; Greene & Miller, 1996; Meece, Anderman, & Anderman, 2006). Greene and Miller's (1996) study of college students showed a stronger relationship between deep cognitive engagement and a mastery achievement goal orientation (R^2 = .45) than a performance goal orientation (R^2 = .05).Thus, autonomy allows students the freedom to self-regulate, while promoting the motivational features of choice, control, and interest that lead to a mastery achievement goal orientation and self-regulation of learning.

On the other hand, heavy external control can have a negative impact on students' motivational beliefs. Very controlling classrooms may shift the perceived locus of control from inside the student to the environment, limiting students' perceptions of the link between their efforts and outcomes (Young, 2005). Results of a meta-analysis of 128 experimental studies conducted in laboratory-like settings demonstrated that expected, tangible rewards have a small to moderate negative effect on students' free-choice behavior to engage in the activity for which they were rewarded (*d* = 0.36; Deci, Koestner, & Ryan, 1999). The negative effect was somewhat larger when rewards were contingent on completion (*d* = 0.44) than performance (*d* = 0.22). However, extrinsic, verbal rewards had a small to moderate positive effect (*d* = 0.33). Further, when verbal rewards or positive feedback were presented informationally rather than controllingly (e.g., “you did well, just as you should”), the size of the effect was moderate to large (*d* = 0.78). This suggests that extrinsic rewards are not necessarily detrimental to students’ motivation to learn. Ryan and Deci (2000) recognize a continuum of extrinsic motivation ranging from externally to internally regulated. According to the authors’ (2000) taxonomy of human motivation, so long as extrinsic motivators are integrated with the individual’s personal goals, they lead to a sense of congruence and an internal locus of control. When students have control over their goals, strategies, and outcomes, they are motivated to engage and persist.

However, all classrooms are externally regulating to some extent. Especially with younger learners who are just beginning to self-regulate, this is necessarily so, and skilled teachers have been shown to scaffold instruction to allow students greater autonomy and independence as their skills develop (Hadwin & Jarvela, 2011; Perry et al., 2002). Unfortunately, with the increased demands on teachers to individualize instruction for larger classes of more diverse students in a climate of high-stakes testing, teachers have less autonomy themselves to create autonomy-promoting environments for their students. Though not optimal, these circumstances allow for students to develop “adaptive learning” skills (Rohrkemper & Corno, 1988, as cited by Perry & Rahim, 2011). Struggling against obstacles and persisting despite challenge is a hallmark feature of self-regulated learning. When students face the stress of learning situations that do not meet their needs for instructional match, they develop strategies for modifying tasks, controlling their motivation and negative emotions, and seeking assistance from others that help them to recover and persist (Perry & Rahim, 2011). The concept of adaptive learning suggests that once students have a baseline level of self-regulatory skill, they can use these skills to control their own environments and overcome situations that are less than optimal. Autonomy is an important characteristic of environments that promote self-regulated learning, but as indicated in the triadic model, self-regulated learners know how to modify their environments to meet their needs.

Assessment and feedback. Assessment is one area of the classroom environment over which students traditionally have little to no control. Nicol and MacFarlane-Dick (2006) have posited that while many educators now involve students more in their own learning, prevailing views about student involvement in assessment have yet to catch up. These and other researchers recognize a need to increase formative assessment and mastery-oriented feedback to students (Nicol & MacFarlane-Dick, 2006; Perry et al., 2002). According to their recommendations, feedback is most helpful for promoting self-regulation when it focuses on a few action steps, emphasizes process as well as product, provides specific information requested by students, and most importantly, allows students the opportunity to revise and resubmit their work before it is graded (Nicol & MacFarlane-Dick, 2006). Sadler (1989) has gone so far as to say that feedback can only be considered as such if it is used to close the gap between actual and desired performance, and that grades can be counterproductive when they are assigned summatively without first allowing students to respond to formative feedback. Giving students a chance to edit their work according to external feedback allows them to close the feedback loop by self-evaluating against a standard and reacting adaptively. It also helps them to develop a sense of competence and control over their learning and performance. When students do not have this opportunity, they are more likely to focus on a poor grade and react defensively, resulting in the use of self-handicapping strategies (Ames, 1992; Wolters, 2003; Zimmerman, 2000). Opportunities for resubmission show students that making errors and subsequently correcting them is part of the learning process, opening the door to the understanding that effort is more important than ability in determining school success.

In addition to ensuring that formal feedback is mastery-oriented, educators can promote self-regulated learning by using effort-based praise. Students who are praised for their effort and strategy use, rather than natural ability, take on more challenging tasks and persist for longer when tasks become difficult. In a series of four studies, elementary-aged students who were praised for their effort rated their desire to persist (*d* ranged from 0.59-0.88) and their enjoyment of the activity (*d* ranged from 0.99-1.10) significantly higher than did students who were praised for their intelligence (Mueller & Dweck, 1998). These effects ranged from moderate to large in size. Furthermore, students who believe that achievement is the result of hard work, those who subscribe to an incremental theory of intelligence, have been shown to earn higher grades than students who believe success results only from natural ability, who are said to believe in an entity theory of intelligence (Henderson & Dweck, 1990). In this sample of 7th graders, students with incremental views outperformed the grades projected for them based on their 6th grade performance (mean difference = +0.9 grade points), while students with entity views underperformed compared to their projected grades (mean difference = -1.5 grade points). These results suggest that students' views about effort have a real impact on their achievement, and that adults can influence these views. Giving students feedback about their learning process sends the message that they have the control to change it in the future.

Another feedback technique that can promote self-regulated learning is providing students with explicit opportunities to reflect on their own and others' work. Drawing students' attention to their work can promote self-monitoring, which is integral for generating internal feedback, a key characteristic of self-regulated learning (Butler & Winne, 1995). The more students self-reflect, the better they become at correctly identifying attributions for success and failure, which also leads to increased self-efficacy (Paris & Paris, 2001). Further, adequate self-reflection may be the missing link necessary for students to gain adequate mindfulness to successfully transfer learning to new situations (Graham, Harris, & Troia, 1998). Teachers can provide exemplars or high-quality holistic rubrics as external standards, and then have students score their own and their peers' work against these standards (Nicol &MacFarlane-Dick, 2006). This process promotes self-evaluation at the same time as it helps students suspend self-judgment, detaching their personal sense of self from their work through the evaluation of others' work.

Peers can be helpful in the feedback process, but it is crucial that educators avoid social comparison in their assessment systems (Ames, 1992; Eccles et al., 1993; Zimmerman, 2000). Social comparison promotes the adoption of performance goals, rather than mastery goals, which drive the student to achieve in order to demonstrate high performance relative to others and preserve perceptions of their natural ability (Ames, 1992; Meece, Anderman, & Anderman, 2006). Social comparison can be especially damaging to self-efficacy in early adolescence, when students are already keenly aware of social differences, and when motivation to learn characteristically declines (Eccles et al., 1993). Consequently, using criterion-referenced (rather than norm-referenced) standards and keeping student grades private can protect mastery goals and encourage each student to compete only with him or herself (Ames, 1992; Zimmerman, 2000).

Strategy use instruction. In addition to creating classroom environments that allow for autonomy and provide useful feedback, teachers can integrate explicit strategy instruction into their lessons. Motivational characteristics of the environment are undoubtedly important predictors of student decisions to engage in school work, but it is this engagement itself that directly predicts improved academic performance (Pintrich & DeGroot, 1990; Wolters & Pintrich, 1998). Teachers can help students learn the strategies that will allow them to engage effectively with the material through direct instruction. There is some evidence that explicit instruction in strategies is more effective than exposure to strategy examples alone (Bielaczyk et al., 1995; Paris & Paris, 2001). Self-regulated learning researchers have created several instructional models with demonstrated effectiveness, such as Self Regulation Strategy Development (SRSD; Graham, Harris, & Troia, 1998), the Transactional Strategies Instructional Model (Pressley, El-Dinary, Wharton-McDonald, & Brown, 1998), and the Learning to Learn program for college students (Hofer, Yu, & Pintrich, 1998). These models are intended to be implemented by classroom teachers or college instructors and embedded into their regular content-area teaching. Each model is unique, but they all include explicit instruction in cognitive and/or motivational strategies, ongoing instruction and examples of when and how to use the strategies, modeling, guided practice, and finally independent practice (Zimmerman, 1998). This type of instruction can be successfully integrated into classroom instruction; in fact, when SRSD interventions were conducted by students' classroom teachers, the effects on maintenance of performance and strategy use were larger than when interventions were delivered by external researchers (0.82 versus 1.07 for story length; Graham & Harris, 2003). These findings suggest that direct instruction in strategy use is yet another way that teachers can promote self-regulated learning in their students.

Relationships with students. A final teaching practice that has been shown to promote self-regulated learning is building relationships with and between students. Teacher-student relationships seem to affect self-regulation by increasing students' motivation to learn. Several studies have shown that students who feel supported and respected by their teachers report higher levels of task value and expectations for success, the key components of motivation to learn (Eccles et al., 1993; Goodenow, 1993; Goodenow & Grady, 1993). In a study of working-class Hispanic and African American middle school students, Goodenow and Grady (1993) found that self-reported school belonging accounted for 19% of the variation in self reports of expectations for success and 30% of the value of school work. Further, teacher support seems to be even more important for students experiencing social difficulty at home or with peers (Darling, Hamilton, & Niego, 1994; Urdan & Schoenfelder, 2006). Teachers and other adults in the school can show support for students by learning their names, talking and listening to them, learning about their lives outside of school, communicating directly and honestly with students about their academic progress, asking if they need help or if something is wrong, being fair and trusting, and trying to make material interesting and relevant (National Research Council, 2004). In addition to relationships with teachers, perceptions of support and respect by peers have also been associated with motivation and engagement in the classroom (Goodenow, 1993; National Research Council, 2004; Pintrich et al., 1994). Teachers have some control over the climate of peer support in their classrooms, and can foster it further through reducing social comparison (Ames, 1992) and assigning projects that promote cooperation between students (Pintrich et al., 1994). Notably, student perceptions of teacher behaviors and levels of classroom support may be more important in assessing individuals' motivation and engagement than data from a third-party objective observer (Ames, 1992; Perry & Rahim, 2011; Pintrich et al., 1994). Therefore, it is important to consider that each learner experiences his or her own environment that may differ from the experiences of others in the same classroom.

In sum, the current state of the literature makes a strong case that supporting student autonomy with opportunities for choice of task and pace, assigning useful and interesting tasks, providing specific feedback with an opportunity for revision and resubmission, providing effort-based praise, encouraging self-reflection on strategy use, assigning cooperative tasks, and developing supportive relationships with students are associated primarily with increased student motivation, and subsequently self-regulation. Most of these techniques are fairly easy to incorporate into classroom instruction without altering the content of instruction or using much of teachers' limited time.

Measuring Self-Regulated Learning

Traditionally, much of the research on self-regulated learning and related constructs has been conducted through the use of self-report instruments. Appleton, Christenson, Kim, and Reschly (2008) argued that measuring cognitive and psychological processes through observation is too highly inferential, and that self-report tools provide a better understanding of the student's perspective. Self-report instruments can be administered to large numbers of students at the same time and can even be given online. They allow for a higher degree of confidentiality or even anonymity than microanalytic methods. Despite their convenience, there are some drawbacks to the use of self-report instruments. Research has shown that sometimes students report their behaviors inaccurately (Winne & Jamieson-Noel, 2002). Further, self-report instruments tend to address behaviors and characteristics of individuals as though they were invariant across settings, which has been shown not to be the case in the self-regulation literature (Hadwin, Winne, Stockley, Nesbit, & Woszczyna, 2001; Wolters & Pintrich, 1998). More recently, self-regulated learning researchers have called for a shift toward other types of measurement that rely less on students' self-report of their behaviors and assess student thoughts and behaviors in real time in specific contexts (Cleary, 2011).

One promising technique gaining prominence among those who measure self-regulated learning is microanalysis. Microanalysis is a highly specific think-aloud technique where researchers ask students brief, targeted questions about self-regulatory processes as students complete a cognitive task (Kitsantas & Zimmerman, 2002). Microanalysis has some of the benefits of both self-report surveys and traditional think-aloud procedures. As in a survey, students answer specific questions of interest to the observer, and as in a think-aloud procedure, students answer these questions in the immediate context of the task. Microanalytic data have been shown to be more sensitive and reliable than self-report data, so that even a single item can be used to measure a given variable of interest, allowing the researcher to ask about more processes in a shorter amount of time (Kitsantas & Zimmerman, 2002). Microanalytic data can be analyzed qualitatively or quantitatively; researchers can ask questions using scaling (e.g., "On a scale of 1-100, how important is volleyball serving skill in attaining your future goals?") code qualitative responses as 0 or 1 for yes/no questions, or count the number of strategies students name in the planning phase (DiBenedetto & Zimmerman, 2010; Kitsantas & Zimmerman, 2002).

Microanalysis is rooted in the sport psychology literature, where it has been used to identify differences in self-regulatory strategy use and motivational variables between expert, non-expert, and novice athletes (Cleary & Zimmerman, 2001; Kitsantas & Zimmerman, 2002). The technique has also been extended to the field of education and has been used to differentiate students by low, average, and high achievement levels on the basis of their self-regulatory skills (DiBenedetto & Zimmerman, 2010). Further, Kitsantas and Zimmerman (2002) found that differences in self-regulatory strategy use, as measured with microanalytic techniques, predicted volleyball expert or non-expert status better than did volleyball knowledge or years of volleyball experience. These few studies suggest that microanalysis may be a promising technique for assessing self-regulatory processes in the context of academic task completion.

Despite its promise, microanalysis has several limitations. The specificity of the technique requires one-on-one interaction with a trained observer and is consequently time intensive, limiting the number of participants in a study and reducing statistical power (Kitsantas & Zimmerman, 2002). DiBenedetto and Zimmerman (2010) noted that although the technique is context-specific, because it takes place within a contrived context, students may not be as motivated to perform as well as in a real classroom setting.

Chapter 3: Method

Participants and Setting

Participants in the survey phase of the study included 1095 world history course students in the third trimester of the academic year. Students were enrolled in three high schools in the same suburban school district in the Upper Midwest, and the vast majority of them were in the 10^{th} grade. The sample included 315 students from 13 sections of AP world history and 780 students from 32 sections of regular world history, instructed by a total 14 teachers (see Appendix A for the number of surveys from each class). Because 22 of the regular course level students had been enrolled in the AP level of the course during a previous trimester, they were removed from the analyses. This resulted in a final sample size of 1073, with 758 regular course level students (see Table 1).

In an attempt to investigate differences in grading practices between the two course levels, the researcher calculated the proportions of low and high achievers in each course group.. Achievement levels were calculated by dividing the total sample of students from both courses as closely as possible into thirds; the top third of all students earned an A (high achievers), and the bottom third of all students earned a C+ or lower (low achievers). For the purposes of this study, achievement levels were based on the normative level of achievement in the sample; although a C+ might not indicate low achievement on a criterion-referenced basis, this was the achievement level below which the bottom one-third of students in the sample fell. As presented in Table 1, both AP and regular courses had similar proportions of high achievers (approximately one third), but there were fewer low achievers in the AP sections of the course than the regular sections (21% versus 33%).

Due to the large size of the survey sample and the large number of analyses conducted in the current study, the researcher adjusted the probability level required for results to reach statistical significance. Each *p* value was attenuated from .05 by the number of analyses that were conducted to answer the question. The researcher ran *z* tests to determine whether there were any statistically significant demographic or achievement differences between the two groups. At an adjusted *p* value of $<.006$, the AP group had significantly fewer free-lunch eligible students, more Asian students, and fewer low achievers (those earning a grade of C+ or lower).

In the microanalysis phase, 9 AP and 6 regular students from the survey sample chose to participate, for a total of 15 participants. These 15 participants comprised only 10% of the 150 students randomly selected to receive recruitment letters for this phase of the study. Because of this low return rate, students in the sample might not be representative of all students in the world history course, especially in the regular sections. The average GPA for microanalysis participants was 3.5, compared to the average GPA in the total survey sample of 3.1. The microanalysis participants' average history grade was also higher at about B+, compared to the average world history student's grade just below a B. Microanalysis results should be interpreted cautiously because participation in this phase of the study may have been systematically biased toward higher-achieving students.

Table 1
Survey Participant Demographics by Course Level

Course Level	AP	Regular
N	315	758
% Female	50.2	48.4
% Eligible for Free or Reduced Price Lunch	10.5	16.4
Race		
% African-American	7.3	9.4
% Asian-American	16.2	7.5
% European-American	72.1	74.9
% Hispanic/Latino	4.1	7.5
Third Trimester History Grade		
% High achievers (top third)	33.3	29.9
% Low achievers (bottom third)	21.3	33.1

Through consultation with the principals of the three schools, world history was selected as the target course because nearly all students in the district took this course during their 10th grade year; this ensured that the sample size would be adequately large and that students from both advanced and regular levels of the course were represented. Although one of the schools offered International Baccalaureate (IB) courses as an additional advanced option, students did not have this opportunity until 11th grade, so this additional advanced course did not confound the findings.

In the school district studied, the policy on advanced placement courses allowed any interested student to enroll in an AP course. Students self-selected their world history course enrollment and determined for themselves whether the AP or regular course level would be the best personal fit. Although there were no official restrictions to AP course enrollment based on prior performance, some teachers mentioned that students from higher-income backgrounds or a history of high achievement were much more likely to take the advanced courses than their peers (the issue of course selection alone is worthy of its own dissertation; see Pekel, 2013). Only one teacher in the district was currently teaching sections of both AP and regular world history at the time of data collection. When asked about differences between the two course levels, she explained that, although somewhat counterintuitive, the regular sections were actually able to delve deeper into topics than the AP sections. The College Board requires that certain topics must be covered, including many more non-Western cultures, and this results in a broader but shallower coverage of each topic. Further, the AP sections must finish all topics before the AP test administration, which occurs about one month before the end of the school year.

These policies and realities characterize several differences between advanced and regular sections of world history in the current district. Students decide whether or not to enroll in an AP course; those who are interested in the course topic, convinced of its importance, and who feel they can handle the work involved are the ones who enroll in advanced courses. These students move at a faster pace, cover more topics, and cover each in less depth than their peers in regular sections of world history.

Sample Size and Power Analysis

A priori power analyses were conducted using the MC2G (Brooks, 2003) and MCMR (Brooks, 2008) software to ensure that the proposed sample size would allow for enough power to detect the predicted effect sizes. However, the final survey sample was larger than predicted. Post hoc power analyses indicate that the analysis to answer RQ1 with survey data had power of 85% to detect a small effect (d = 0.20) with a sample size of 315 students in advanced and 758 in regular courses (Brooks, 2003). For RQ2 and RQ3, using eight predictors, the analysis had power of 94% to detect a small effect (R^2 =

.02) with a sample size of 1073 (Brooks, 2008). Though the survey sample was larger than expected, the microanalysis sample was smaller. Due to the sensitivity of microanalysis measures, fewer participants were necessary to achieve high levels of power than with self-report measures (Kitsantas & Zimmerman, 2002). Consequently, a priori power analyses for the microanalysis indicated that the above analyses would have 75% power to detect a large effect (R^2 = .30) with a total sample size of 40. However, because only 15 students agreed to participate in this phase, a regression with even 3 predictors was determined to have only about 40% power to detect a large effect. Therefore, the results must be interpreted with caution and not considered to be conclusive.

Procedure

The researcher obtained a list of names and addresses for all students enrolled in world history courses in the district. Each family received a letter explaining the survey and what to do if they did not want the student to participate. Given the intensity of microanalytic measurement techniques, a smaller group of students was sampled randomly from the population of those included in the self-report measure sample to participate in the microanalysis phase. 150 students were chosen at random, stratified by course level, to engage individually in a microanalytic task. Parents were invited to opt in to this phase of the study by signing and returning a form to their child's school. The researcher mailed letters home along with the survey consent forms to the parents of selected students during the first round of recruitment; due to low return rates, teachers distributed a second round of letters in class to students whose parents had not yet responded.

Data collection took place within two phases. In phase I, the researcher administered a self-report measure of academic motivation, self-regulatory strategy use, and perceptions of the classroom environment to all participating world history students during their history classes. This measure was comprised of scales drawn from other instruments, with the exception of the demand scale, which the researcher created for this study. The survey took students approximately 20 minutes to complete. Students in each school completed the survey in a single day, with all schools' survey administrations occurring across three consecutive school days, and students who were absent on survey day did not have an opportunity to take the survey later.

In phase II, the researcher worked with school staff to schedule the microanalysis interviews for approximately one month later. Each interview took about 10 minutes. Five students, selected at random, received $20 gift cards for their participation in phase II. The microanalysis interviews were conducted one-on-one between the researcher and each participating student. Students were asked to read a passage about a world history topic and answer five written questions about it. Before, during, and after their work on the task, the researcher orally asked students about their motivational and self-regulatory processes. One of the history teachers provided the passage, a grade-level-appropriate excerpt from a piece about ancient Spartan children. After asking the initial forethought questions, the researcher gave the students the passage sheet, question sheet, a pencil, a pen, and a highlighter, and told them they could write on both sheets using any tools they wanted.

At the end of the school year, the researcher obtained third trimester world history grades, final cumulative GPAs, and demographic variables including eligibility for free/reduced price lunch and gender, from the district research department.

Measures

Students used a 7-point scale to respond to all self-report items in each scale below. The items were administered as one 71-item instrument (see Appendix B for the final survey instrument). Some items on the classroom environment perceptions scale were removed for the data analysis, per the results of the confirmatory factor analysis, which will be discussed at the end of this section.

Academic motivation, self-report. Self-report measures of student motivation to learn were drawn from the Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich, Smith, Garcia, & McKeachie, 1993). The MSLQ is an 81-item measure of students' motivation beliefs, metacognitive strategy use, and management of resources in the context of an academic course, using a seven-point scale (1= not at all true of me, to 7 = very true of me). The MSLQ can be administered as a whole, or any scale can be used individually (Pintrich et al., 1993). Two of the components of motivation which have been shown in the literature to relate most strongly to self-regulation and achievement are task value and self-efficacy. Consequently, the task value (6 items, $\alpha = .92$) and self-efficacy (8 items; $\alpha = .92$) scales from the MSLQ comprised the self-report measures of motivation to learn in this study. The internal consistency reliability for the combined motivation scale was $\alpha = .92$.

Self-regulatory strategy use, self-report. Because general measures of self-regulatory thoughts and behaviors have been criticized for their lack of specificity to context, this study used a more tailored self-report measure of self-regulated learning strategy use: the Self-Regulation Strategy Inventory (SRSI; Cleary, 2006). The SRSI is a 28-item self-report instrument that measures students' use of various self-regulatory strategies while studying for a test in a particular subject (i.e., science) using a seven-point scale (1= never, to 7 = always). All instances of the subject "science" were replaced with "world history" for the current study. The internal consistency reliability was high for the measure as a whole (α = .91), and reasonably high for each of three subfactors as well: Managing Environment and Behavior (12 items; α = .88), Seeking and Learning Information (8 items; α = .80), and Maladaptive Regulatory Behavior (8 items; α = .77).

Motivation and self-regulatory strategy use, microanalytic data. The researcher designed a self-regulated learning microanalysis protocol based on the guidelines provided by Cleary (2011), as well as on other suggestions for collecting microanalytic SRL data (e.g., DiBenedetto & Zimmerman, 2010; Winne & Perry, 2000). The resulting 12-item measure (see Appendix C) addressed each of the components of Zimmerman's (2000) three-phase feedback loop, including self-efficacy, task value, goal setting, strategy use, self-monitoring, self-evaluation, self-satisfaction, and adaptive versus defensive reaction. Five items had open-ended responses, and these required coding by the researcher and another rater to obtain inter-rater reliability (IRR; see Table 2). The other rater was also a graduate student familiar with self-regulated learning and microanalytic techniques. The researcher gave the second rater a coding manual describing the coding criteria. IRR results are presented below as the percentage of responses for each item to which both raters assigned the same code. Overall IRR was 86% including the self-monitoring item, and 92% excluding the self-monitoring item.

Table 2

Microanalysis Coding and Inter-Rater Reliability (IRR)

Self-Regulatory Process	Scale/Code	IRR
Self-Efficacy	1-100	--
Interest (General)	1-100	--
Interest (Specific)	1-100	--
Importance	1-100	--
Grade Goal	6 pt. scale from 0% to 100% correct	--
Plans	1 or 0 (yes or no)	100%
Strategies	Count	88%
Self-Monitoring	Count	63%
Grade Estimate	6 pt. scale from 0% to 100% correct	--
Attribution	Ability, luck, or strategy use	81%
Satisfaction	5 pt. scale from Very Dissatisfied to Very Satisfied	--
Reaction	1 or 0 (adaptive or defensive)	100%

For the plans item, students were scored a 1 if they reported any specific plans for how to complete the task, and a 0 if they did not; only one student's response was scored as 0. For the strategies item, students were prompted to explain what they were doing if the researcher noticed them using a strategy while working. Notably, the researcher did not ask questions if the student did not make any marks on the task materials. To code the strategies item, researchers counted the number of strategies a student reported. Every student was asked the self-monitoring item immediately after finishing the task, which was also scored as a count of the number of self-monitoring strategies reported. There were several problems with this item which will be discussed further in the discussion section below. The attribution item was coded as relating to ability, luck, or strategy use, and only one code was assigned to any given response. Finally, for the reaction item, each response was coded as either adaptive or defensive. Students who answered 100%

of the items correctly received an adaptive code regardless of what they said (per Cleary, 2011), and only one student's response was scored as defensive.

Classroom environment, self-report. Students responded to 28 self-report items that assessed their perceptions of the level of academic challenge and classroom support for self-regulation. The classroom characteristics that support self-regulation and were measured in this study included teacher support for autonomy, quality and quantity of feedback, and encouragement for cooperative work. Together, internal consistency reliability for all 28 classroom perceptions items was high (Cronbach's α = .93). Notably, the purpose of this instrument was not to measure all characteristics of the classroom environment that might be relevant to achievement, but only those specifically related in the literature to promoting or supporting self-regulatory strategy use.

Academic demand. For the purposes of this study, students' perceptions of academic challenge or demand were operationally defined as the extent to which students perceived that their teachers expected them to work hard and that this effort was necessary to achieve success. The researcher created a three-item measure, drawing from the literature on engagement and high teacher expectations for student success on rigorous coursework. Internal consistency reliability for this scale was fairly poor (α = .58), largely due to the small number of items and students' tendency to answer one item quite differently from the other two. Cronbach's alpha for the two "my teacher..." items alone was .67. The researcher decided to maintain all three items in the scale because they all contributed conceptually to the definition of demand in this study, and the increase in reliability was not large enough to warrant removing an important item. The items in this scale included, "I have to work hard to get a good grade on assignments in this class," "My teacher expects that I will do my best in this class", and "My teacher is always challenging me to do better and learn more."

Teacher support for autonomy. Students' perceptions of their teacher's support for autonomy in the classroom were measured with the Autonomy Support Scale (short form) from the Learning Climate Questionnaire (Williams & Deci, 1996). The long form of this scale has demonstrated high internal consistency in previous work (15 items; Cronbach's α = .93). The internal consistency reliability for the six-item short form, recommended by the scale's authors, also demonstrated high reliability in the current study (α = .90). This scale contains items such as "I feel that my teacher provides me choices and options" and "My teacher showed confidence in my ability to do well in this class."

Quality, quantity, and timing of feedback. Students' perceptions of the feedback they receive in their course were measured with two scales from the Assessment Experience Questionnaire (AEQ; Gibbs & Simpson, 2003). Results of a factor analysis indicated that these two theoretical scales loaded onto the same factor empirically, although the authors only indicated internal consistency reliability estimates for each original scale separately. The quantity and timing of feedback scale (6 items; α = .87) includes statements such as "In this course, I get plenty of feedback about how I am doing" and "The feedback comes too late to be useful" (reverse scored). The quality of feedback scale originally contained six items, and although empirical analysis suggested that one item did not function well as a measure of the same construct as the other items, it was still included in the internal consistency estimate (α = .77). Only the five remaining items from this scale were used in this study. They include statements such as "The feedback I get in this course shows me how to do better next time" and "I don't understand some of the feedback I get in this course" (reverse scored).

Due to the empirical findings regarding this scale, the 11 items were treated together as a measure of students' perceptions of the quality, quantity, and timing of feedback they receive in the course. This measure demonstrated good internal consistency reliability in the current study ($\alpha = .83$).

Cooperative work. The promoting interaction scale, created by Ryan and Patrick (2001), contains eight items that measure students' perceptions of their teacher's encouragement of cooperative work in the classroom. The scale demonstrated high internal consistency reliability in the current study ($\alpha = .91$) and includes items such as "My teacher encourages us to share ideas in class" and "If you have a problem in (this class) you can just talk to someone about it."

Actual academic achievement. Academic achievement was measured using third trimester world history grades, which were obtained at the end of the school year from the district research and evaluation director. The district does not assign grades of A+, so grades ranged from A to F.

Research Design and Data Analyses

The current study employed a correlational research design, in order to examine relationships between self-regulation and motivation, achievement, classroom context, and students' perceptions of their classroom environment. Previous work has examined the relationship between students' perceptions of their classroom environment and their self-regulated learning (Pintrich, Roeser, & DeGroot, 1994), but in the current study, the researcher conducted a literature review and factor analysis to create an updated measure of the classroom environment factors most strongly associated with self-regulation and motivation. Previous work has also investigated the relationship between course level, achievement, and self-regulation (Cleary & Chen, 2009), but the current study additionally explored the hypothesis that perceived demand was the cause of this relationship. The results of the microanalytic analysis are largely descriptive due to the unexpectedly low sample size. Thus, the researcher used correlational, inferential, exploratory, and descriptive techniques to examine the relationships of interest in the current study.

Following data collection, scales were created from the self-report survey items by taking the mean of each item in the scale, as indicated above. Because the three self-regulation scales theoretically measured the same construct and were correlated in the current data (*r* ranged from .41 to .64), they were treated as one comprehensive measure of self-regulatory strategy use. The motivation scales and the classroom perceptions scales were analyzed both together and separately due to unique characteristics of the subscales. Significance levels were attenuated by the number of analyses conducted to answer each research question, due to the large number of analyses as well as the large survey sample size.

To answer RQ1, one-way ANOVAs were used to test for group differences (AP versus regular course level) in students' self-reported motivation (task value and self-efficacy), self-regulatory strategy use, and perceptions of the environment between students in advanced and regular courses. Because nine separate analyses were used to answer this question, the *p* value required for significance was attenuated to .005.

A regression model was used to answer RQ2, with SES and gender, course level, motivation to learn history, and self-regulatory strategy use predicting achievement. The interaction terms of each scale of interest and course level were also included, to determine whether there was a different relationship between the variables of interest and achievement by course level. The six predictor variables in this model required a corrected *p* value of .008 to reach statistical significance.

To answer RQ3, the researcher used a regression equation to predict self-regulation with each of the classroom environment perception variables (demand, autonomy, feedback, and cooperation). Control variables in this model included SES, gender, course level, and motivation to learn. The composite classroom environment score, as well as each classroom environment variable, was measured as both an individual scale score and a deviation score from the classroom mean, in order to control for nesting within classrooms. The attenuated *p* value used for these analyses was .006. The researcher fitted four different regression models, in order to examine the predictive value of the comprehensive classroom environment perceptions scale (Model A), the contributions of each perception variable separately (Model C), and each of these models as deviations from the classroom mean (Models B and D, respectively).

In order to answer RQ4, the researcher used the available microanalysis data to answer the research questions and compare the results to the findings obtained with the survey data. Due to an unexpectedly low sample size, descriptive comparisons between students in AP and regular courses addressed RQ1, and correlations between the microanalytic measures of motivation and self-regulation with survey data regarding perceptions of the classroom environment addressed RQ3. Finally, the researcher compared the inferences derived from each type of data.

Factor Analysis

Because the researcher created the composite classroom environment perceptions instrument by combining items from different subscales together, it was necessary to examine the structure of this instrument as a whole, as well as that of the independent subscales. The researcher randomly selected half of the sample for exploratory factor analysis to determine how the factors covaried, and then conducted a confirmatory factor analysis on the other half of the sample to confirm whether this model was a good fit to a different set of data.

With SPSS software, the researcher used principal axis factoring with direct oblimin rotation. An oblique rotation was used because the factors were theoretically expected to correlate as perceptions of the classroom environment that predict self-regulated learning. Items with coefficients below .4 were removed from subsequent analyses, to reduce the likelihood of cross-loading. Six factors with eigenvalues greater than 1 emerged: autonomy, cooperation, feedback (positively worded), feedback (negatively worded), cooperation related to school work (e.g., "My world history teacher allows us to discuss our work with classmates"), and cooperation related to general friendliness (e.g., "My world history teacher encourages us to get to know all the other students in class). The researcher decided to maintain only one feedback scale and covary the error terms in the CFA, and to maintain only one cooperation scale by removing the items related only to friendliness. Appendix D presents the pattern matrix produced by the EFA.

The researcher then tested the model suggested by the EFA with CFA techniques using Generalized Least Squares (GLS) methods in the AMOS software. Although Maximum Likelihood (ML) is usually the preferred method for CFA, Flora and Curran (2004) noted that ML techniques do not estimate well for ordinal data. Unlike ML, GLS techniques do not assume that responses will be distributed normally (Hox, 1995), and so were considered to be more appropriate for the current data. Appendix E presents the model coefficients, and Appendix F presents the graphic for the full model with standardized estimates.

The EFA indicated that the negatively and positively worded items from the proposed feedback scale loaded onto two separate factors. One benefit of CFA in this case is that it controls for method effects; allowing the error terms of the negatively worded items to covary separately improves model fit and is consistent with the theory that all of these items are related to feedback in the classroom (Brown, 2006; Harrington, 2009). Covarying of the errors produces a more accurate model when items are very similarly worded as well (Brown, 2006). As suggested by model fit indices as well as theoretical considerations, the residuals of four sets of items were allowed to covary in the current model: positively worded feedback items, negatively worded feedback items, consecutive autonomy items starting with “I feel” and consecutive autonomy items starting with “my teacher”.

The final model maintained 21 of the original 28 classroom environment perceptions items to which students responded. Table 3 below details the model fit indices. Together, the different indices suggest acceptable model fit. Because X^2 is very sensitive to large samples, the ratio of X^2 to degrees of freedom, or the relative chi square, was used here to account for the large sample size in the current study. Researchers indicate that it should be less than about 2 or 3 (Carmines and McIver, 1981). Absolute fit indices such as GFI should be greater than .90 and preferably greater than .95 (Hu and Bentler, 1999). The RMSEA, a noncentrality based index, should be less than .06 (Brown, 2006). The current model demonstrates good fit to the data according to the X^2/df ratio and the RMSEA, and fairly good fit with the GFI.

Table 3
Model Fit Statistics

	X^2/df	GFI	RMSEA
Full Model	2.41	.934	.051

Chapter 4: Results

Table 4 presents post-factor analysis means, standard deviations, and internal consistency reliability estimates for each scale and subscale on the survey, as well as correlations between the scales and subscales. The results presented in Table 4 describe the final 21-item classroom environment perceptions measure. As a whole, students in world history courses at the three high schools reported higher self-efficacy (M = 5.44) than task value (M = 4.78) for world history. The mean score on the Self Regulation Strategy Inventory (SRSI) was 4.34, which corresponds with just above the halfway point of the scale. Among the classroom environment perceptions subscales, students agreed most strongly that their classrooms were cooperative (M = 5.56) and least strongly that they received high-quality and timely feedback (M = 4.74), though even this latter score was above the halfway point of the scale.

Internal consistency reliability was adequate (at or above .80) for every scale and subscale except for the demand subscale. This scale was newly created for the current study and contained only three items, which may have resulted in the low reliability. Although student responses to two of the items were more consistent than with the third, all three items were maintained in order to capture the construct of demand as initially intended.

The correlations between the major constructs measured in the survey (motivation, self-regulated learning, and classroom perceptions) were as follows: motivation and self-regulation, r = .41; motivation and classroom perceptions, r = .47; self-regulation and classroom perceptions, r = .39. This indicates that each major construct explained about 15-20% of the variation in each other, which was within the expected range given the relationships between these constructs as identified in the literature. The strongest correlate of course grades in Table 4 was self-efficacy (r = .53). It is possible that confidence led to increased motivation to succeed, but perhaps more likely that students who were earning good grades in the course reported confidence that they would continue to do so. The weakest correlate of course grades was perceived demand in the classroom (r = .03). A possible explanation for this near-zero relationship may be that some students who perceived their course as difficult rose to the challenge and succeeded, while others failed to self-regulate and did not perform as well, and the two types of students cancelled each other out. Further investigation was necessary to determine the nature of this relationship.

Organization of Results

The results of the current study are organized by research question. Because two methods were used, both survey and microanalysis results are presented separately under each research question; thus findings from research question #4 were distributed under headings for each of the previous three questions. The microanalysis results include a comparison to the findings produced with the survey methodology. Because the actual sample size for the microanalytic phase of the study was so much smaller than anticipated (15 versus 40 participants), the researcher used descriptive and simple correlational analyses to answer the research questions where possible. It was not always possible to answer every question with the microanalytic data.

In the survey results analysis, the researcher always controlled for three variables in each multiple regression model: low-income background, or socio-economic status (SES), as measured by eligibility for free or reduced-price lunch; gender; and score on the motivation scale. SES is well known as a variable that unfortunately correlates strongly with educational achievement variables, and gender tends to correlate in particular with variables related to effort and self-regulation. Motivation was included because it is closely related to self-regulation, and prior studies have shown stronger impacts on motivation than on self-regulation. Because the goal of the current study was to examine impacts of and on self-regulation as an independent construct, motivation was included as a control variable.

Table 4

Correlations Among Primary Survey Variables and Internal Consistency Estimates

	Mean	SD	Motivation	Self-Efficacy	Task Value	SRSI	Classroom Perceptions	Demand	Autonomy	Feedback	Coop	Grade
Motivation Scale	5.15	1.12	.922	.868	.854	.409	.470	.153	.465	.374	.320	.417
Self-Efficacy Subscale	*5.44*	*1.16*		.922	.482	.364	.385	.001	.406	.331	.276	.534
Task Value Subscale	*4.78*	*1.48*			.920	.339	.427	.268	.398	.314	.273	.175
SRSI	4.34	0.97				.908	.385	.349	.335	.232	.279	.349
Classroom Perceptions Scale	5.06	0.96					.882	.546	.849	.831	.670	.244
Demand Subscale	*5.46*	*1.18*						.582	.395	.280	.284	.025
Autonomy Subscale	*4.91*	*1.47*							.898	.564	.472	.229
Feedback Subscale	*4.74*	*1.13*								.804	.345	.193
Cooperation Subscale	*5.56*	*1.31*									.847	.229
Course Grade	8.86	3.17										--

Note. Internal consistency reliability estimates (Cronbach's alpha) are presented along the diagonal. All scales ranged from 1-7 except for course grade, which ranged from 1-12, with larger numbers indicating better grades. The average grade of 8.86 corresponds with slightly below a B.

RQ1: Do motivation, self-regulatory strategy use, and perceptions of the classroom environment differ between students in advanced and regular courses?

To examine differences in survey variables by course level (advanced vs. regular), nine separate one-way ANOVAs were employed for each scale (motivation, self-regulation, and composite classroom environment perceptions) and subscale (self-efficacy, task value, demand, autonomy, feedback, and cooperative work). Based on the literature, the researcher hypothesized that students in AP and regular courses would not differ significantly in their self-regulatory strategy use. Table 5 presents the means and standard deviations by course level for each of the scales and subscales on the survey.

One-way ANOVAs indicated that there were no significant differences between students in AP and regular history courses on their overall motivation to learn history or, as hypothesized, self-regulation of their history learning (Table 6). Further analysis of the motivation data by each of the two subscales resulted in a different conclusion: although AP and regular history students reported similar levels of self-efficacy in history, students in the AP courses reported higher levels of task value, including interest in the subject ($d = 0.37$). The difference between the groups on their perceptions of the classroom environment was statistically significant ($d = 0.22$). The researcher also tested for group differences for each classroom environment subscale independently. Four separate one-way ANOVAs indicated that students' perceptions that their history classes were demanding ($d = 0.51$) and cooperative ($d = 0.48$) differed significantly between the AP and regular course students, while perceptions that their teachers allowed them autonomy and gave quality feedback did not differ.

Table 5

Means of Study Scales and Subscales by Course Level

	AP		Regular	
	M	*SD*	*M*	*SD*
Motivation	5.24	1.07	5.11	1.14
Self-Efficacy	*5.31*	*1.13*	*5.49*	*1.17*
Task Value	*5.16*	*1.38*	*4.62*	*1.50*
SRSI	4.43	0.87	4.31	1.01
Classroom Perceptions	5.21	0.97	5.00	0.95
Demand	*5.87*	*1.09*	*5.29*	*1.17*
Autonomy	*4.87*	*1.53*	*4.92*	*1.44*
Feedback	*4.78*	*1.22*	*4.73*	*1.09*
Cooperation	*5.97*	*1.03*	*5.39*	*1.37*
Course Grade	9.37	2.75	8.64	3.30

Table 6

ANOVA Table for Differences between AP and Regular History Course Students on Study Scales and Subscales

Outcome	Source	SS	*df*	*F*	*p*
Motivation Scale	Course Level	4	1	3.02	.083
	Error	1347	1070		
Self-Efficacy Subscale	Course Level	7	1	5.20	.023
	Error	1432	1068		
Task Value Subscale	Course Level	63	1	29.14	<.001*
	Error	2285	1065		
Self-Regulatory Strategy Inventory	Course Level	4	1	3.02	.083
	Error	1347	1070		
Classroom Environment Perceptions	Course Level	10	1	10.54	.001*
	Error	950	1042		
Demand Subscale	Course Level	72	1	54.49	<.001*
	Error	1394	1054		
Autonomy Subscale	Course Level	0	1	0.20	.655
	Error	2267	1053		
Feedback Subscale	Course Level	1	1	0.46	.499
	Error	1339	1046		
Cooperation Subscale	Course Level	72	1	43.60	<.001*
	Error	1730	1053		

*Significant at corrected *p* value of <.005 (.05/9 analyses)

RQ1, Microanalysis. A descriptive comparison of the means for each group's microanalytic responses determined that AP students had higher means than regular students on both interest measures, as well as on actual task score (see Table 7). Regular course students had higher mean responses to questions about self-efficacy, the importance of world history, grade goals, planning, and grade evaluation. Both groups had similar levels of strategy use.

Table 7
Means and Standard Deviations for Microanalytic Measures by Course Level (RQ1)

Microanalytic Measure	AP		Regular	
	Mean	*SD*	*Mean*	*SD*
Forethought Phase				
Confidence	75.89	20.95	88.33	9.31
Interest (general world history)	85.11	18.27	78.33	16.02
Interest (ancient/classical cultures)	82.22	12.26	69.00	11.42
Importance	68.33	20.77	87.50	11.73
Grade Goal	88.89	10.54	93.33	10.33
Plans	0.56	0.53	0.83	0.41
Performance Control Phase				
Strategy Use	0.56	0.88	0.67	0.52
Self-Monitoring	*1.67*	*1.00*	*2.17*	*1.17*
Self-Reflection Phase				
Grade Evaluation	86.67	10.00	93.33	10.33
Actual Task Score	86.67	10.00	80.00	21.91

Table 8 presents the results of the attribution measure, which was coded to reflect whether students attributed their performance to their use (or non-use) of a strategy, to the luck of the situation or task materials, or to stable characteristics of themselves such as personality or ability. Although the groups were very small, making it difficult to draw strong conclusions, it seems that students from the AP course were more likely to make strategy attributions than students from the regular course. Luck (task material characteristics) was the most common attribution for both course level groups.

Results of the satisfaction measure are not presented in the tables because they were correlated at 1.0 with actual task score; that is, students who scored 100% on the task reported that their satisfaction level was 5/5, a score of 80% always corresponded with a satisfaction level of 4/5, and so on.

Table 8
Frequency of Attributions for Microanalytic Task by Course Level (RQ1, cont.)

Microanalytic Measure	AP		Regular	
	Frequency	%	Frequency	%
Strategy	3	33	1	17
Luck	5	56	3	50
Ability	1	11	2	33

Comparing the two methodologies, the microanalysis motivation results generally paralleled the survey results: AP students had lower confidence but higher interest using both methods. One difference between the methods is that the survey measured both interest and importance as one scale, task value, while microanalysis asked about interest and importance separately. Although AP students reported higher *interest* than regular students via both survey (task value scores of 5.16 and 4.62, respectively) and microanalytic (85 versus 78 for general interest) methods, students in regular courses reported higher *importance* than AP students in the microanalysis session (68 versus 88).

For self-regulation, survey results indicated that AP students reported slightly higher levels but that this difference was not significant. The microanalytic results suggest a small difference between the groups but in the opposite direction, with regular course students planning, using strategies, and self-monitoring more than AP students. The reader is reminded that there were some problems with the self-monitoring item, including a low IRR of 63%, so results for this item should be interpreted cautiously. In summary, it seems that the results obtained using a very small microanalytic sample were fairly representative of the results using a large survey sample, with a closer parallel between the two methods of measuring motivation than self-regulation.

RQ2a: To what extent do the effects of self-regulatory strategy use on achievement differ between students in advanced and regular courses?

For RQ2, the researcher sought first to replicate a finding from previous researchers and then to test their hypothesis about the reason for the finding (Cleary & Chen, 2009). In the current study, RQ2a employed a multiple regression analysis to examine whether there was a significant interaction effect of *course level* on the relationship between self-regulation and course grades, and RQ2b examined whether there was a significant interaction effect of *perceived demand* on the relationship between self-regulation and course grades.

For RQ2a, the researcher hypothesized that there would not be a significant main effect of self-regulation, but that there would be a significant interaction effect, with self-regulation as a stronger predictor of achievement in AP courses than in regular courses. The multiple regression analysis indicated significant main effects of course level and motivation to learn, but not self-regulatory strategy use, on third trimester history grades (see Table 9). Students in AP classes and those reporting more motivation to learn earned higher grades than students in regular classes and those reporting lower motivation. The interaction between course level and self-regulation just reached significance, $\beta = .44$, but in the opposite direction than hypothesized. Regular-course students reporting very high self-regulation earned higher grades than AP students at the same level of self-regulation, and regular-course students reporting low self-regulation earned lower grades than AP students also reporting low self-regulation. In other words, self-regulation mattered more for the achievement of students in regular than in AP classes. Figure 3 offers a visual representation of this relationship.

RQ2b: To what extent do the effects of motivation and self-regulatory strategy use on achievement differ by students' perceptions of academic demand in their classrooms?

RQ2b employed a multiple regression analysis to examine whether there was a significant interaction effect of perceived demand on the relationship between self-regulation and course grades. The researcher hypothesized that there would be a significant interaction effect of perceived demand, such that self-regulatory strategy use would matter more for predicting achievement among students who perceived their world history classes as very demanding, than among students who perceived their classes as less demanding. For RQ2b, the main effect of motivation was statistically significant, again with higher levels predicting higher grades (see Table 9). As hypothesized, the interaction between self-regulation and demand was also statistically significant. A scatter plot of grades regressed onto self-regulation scale scores, with fit lines representing students' reports of low (≤ 5, the bottom 33% of students) or high (≥ 6, the top 33%) demand, helped to clarify the direction of this relationship. A visual analysis of this plot suggested that at high levels of self-regulation, students reporting both low and high demand in their history classrooms earned fairly high grades (see Figure 4). At low levels of self-regulation, however, students who perceived their history classes as highly demanding earned lower grades than their peers in low-demand classrooms. Put another way, low levels of self-regulation were associated with lower grades for everyone, but the effect was stronger for students who felt their history classes were very academically demanding.

Table 9

Comparison of Regression Models Predicting Third Trimester History Course Grade with Self-Regulatory Strategy Use

Predictor	RQ2a: Interaction with Course Level		RQ2b: Interaction with Perceived Demand	
	β	*p*	*β*	*p*
Intercept		.002		.078
SES	-.215	<.001*	-.209	<.001*
Gender	.115	<.001*	.103	<.001*
Course Level	-.398	.002*	-.089	.001*
Motivation Scale	.350	<.001*	.296	<.001*
Self-Regulatory Strategy Inventory (SRSI)	-.112	.315	.336	<.001*
Demand Subscale	--	--	.021	.609
Course Level * SRSI	.435	.008*	--	--
Course Level * Demand Subscale	--	--	-.235	<.001*
R^2	.283		.308	

*Significant at corrected *p* value of <.008 (.05/6 analyses)

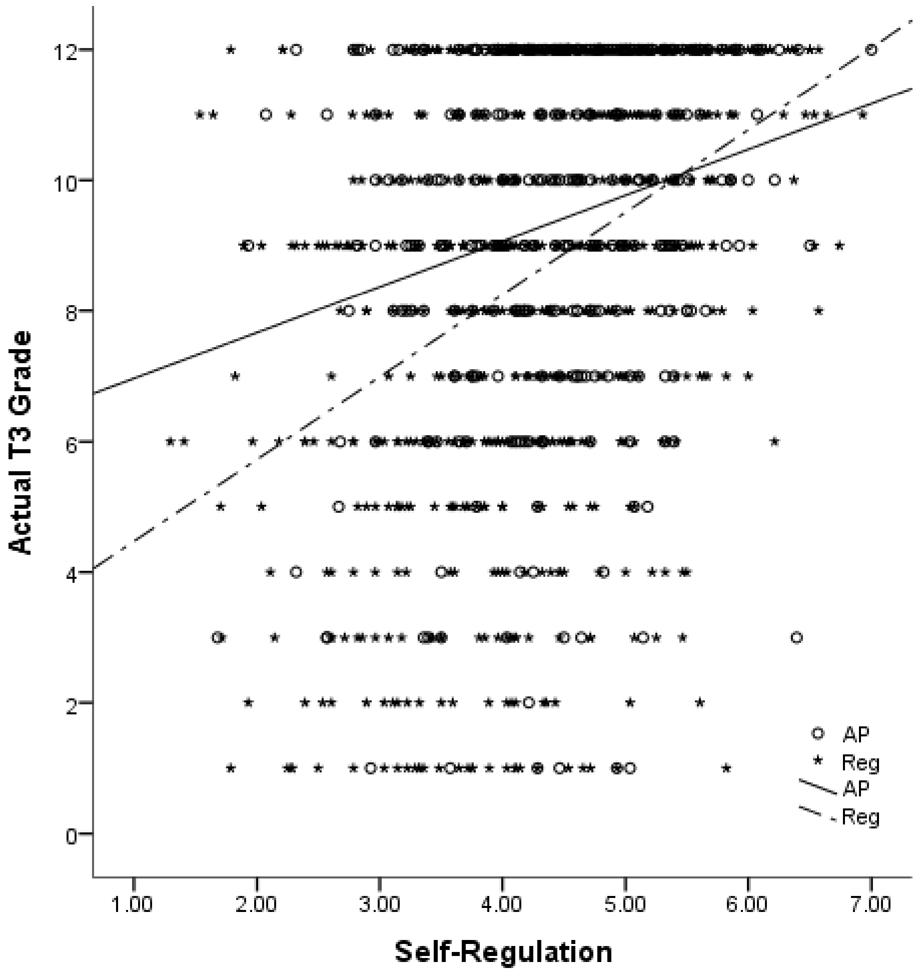

Figure 3. Interaction effect of course level and self-regulation on actual course grades.

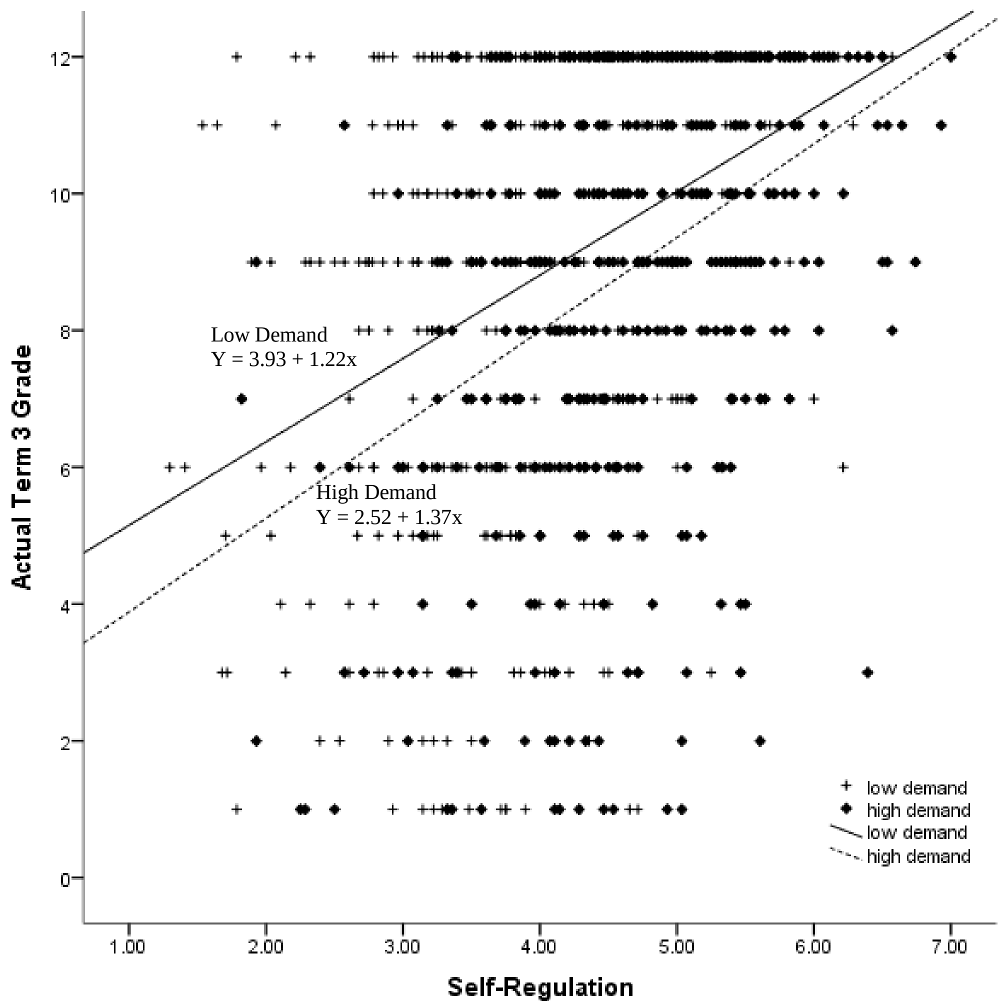

Figure 4. Interaction effect of demand and self-regulation on actual course grades.

RQ2, Microanalysis. Due to the small sample obtained for the microanalysis and the complexity of this research question, it was not possible to determine whether self-regulation was more important in advanced or regular courses, using the microanalytic data.

RQ3: To what extent do students' perceptions of the classroom environment predict their academic self-regulation?

Four multiple regression models were used to answer this question. Both AP and regular course students were combined as one group for this analysis, so no interaction effects were predicted or examined. The researcher hypothesized that students' perceptions of their classroom environment would be a significant predictor of their self-regulation.

In order to control for any possible effects of students nested within classrooms, a deviation score was created based on the individual scale scores for each classroom environment perceptions variable (composite, demand, autonomy, feedback, and cooperative work), as used by Pintrich and colleagues (1994). To create the deviation score, the researcher first calculated a class mean for each variable for each section of world history, based on each individual's scale score. The deviation score for each student was his/her individual score minus the class mean. In addition to examining results by individual and deviation scores, the researcher also looked at effects of both the classroom perceptions scale as a whole as well as each individual classroom environment perception subscale (demand, autonomy, feedback, and cooperative work). Table 10 explains the four models presented in Table 11, and Table 11 presents the results of the multiple regression analyses.

Table 10

Models Presented in Table 11

	Individual Scale Score	**Deviation Score (Scale Score Minus Class Mean)**
Composite Classroom Perceptions Scale	Model A	Model B
Four Separate Classroom Perceptions Subscales (demand, autonomy, feedback, cooperative work)	Model C	Model D

The results of the multiple regression analyses indicated that after controlling for course level and motivation, students' perceptions of their overall classroom environment (composite classroom environment perceptions scale) significantly predicted their scores on the Self-Regulation Strategy Inventory (see Table 11). Students who perceived their classrooms as more demanding, more autonomous, providing better feedback, and more cooperative reported more self-regulatory strategy use than students who perceived their classrooms as lower on these characteristics. This relationship was statistically significant when classroom perceptions were measured as a scale score (Model A, β = .21) as well as when they were measured as a deviation from the class mean (Model B, β = .19).

The researcher also examined the relationships between each of the four subscales and self-regulation, using both subscale scores (Model C) and deviations from the class mean for each variable (Model D). Table 11 shows that after controlling for motivation and course level, demand was the only component of classroom perceptions that significantly predicted self-regulation, with higher levels of demand associated with more self-regulatory strategy use. Similar results were obtained using both subscale scores (β = .26, Model C) and deviations from the class subscale means (β = .22, Model D).

Due to the unexpected finding that perceived autonomy support, feedback, and peer cooperation were not significant predictors of self-regulation, the researcher conducted some follow-up analyses to investigate further. Table 12 presents the results of modifying Model C above (the four separate classroom perceptions subscales as scale scores) by omitting demand (Model E) or omitting motivation (Model F). In Model E, omitting demand, perceived autonomy became a significant predictor of self-regulatory strategy use. In Model F, omitting motivation, both perceived autonomy and cooperation became significant predictors of self-regulatory strategy use. Perceived quality, quantity, and timeliness of feedback was not a significant predictor of self-regulation in any of the models examined. Omitting demand or motivation from Model C reduced its explanatory value from $R^2 = .318$ to $R^2 = .266$ or .215, respectively.

In sum, students' composite perceptions of their classroom environment predicted their self-regulation in their world history classes, with perceived demand being the component of the classroom environment that had the strongest relationship with self-regulation. These conclusions did not change whether perceptions of the classroom environment were measured as individual scale scores or deviations from the class mean, indicating that for the most part, nesting within classrooms was not a strong factor in students' perceptions.

Table 11

Comparison of Regression Models Predicting Self-Regulation with Classroom Environment Perceptions

Predictor	Model A: Scale Score		Model B: Deviation Score		Model C: Subscale Scores		Model D: Subscale Deviation Scores	
	β	*p*	*β*	*p*	*β*	*p*	*β*	*p*
Intercept		<.001*		<.001*		.070		<.001*
SES	-.010	.714	-.005	.848	-.021	.425	-.017	.517
Gender	.234	<.001*	.242	<.001*	.215	<.001*	.219	<.001*
Course Level	-.013	.616	-.033	.213	.036	.189	-.033	.204
Motivation Scale	.356	<.001*	.381	<.001*	.379	<.001*	.387	<.001*
Classroom Perceptions	.212	<.001*	.186	<.001*	--	--	--	--
Demand	--	--	--	--	.263	<.001*	.220	<.001*
Autonomy	--	--	--	--	.051	.165	.095	.008
Feedback	--	--	--	--	-.026	.424	-.025	.430
Cooperation	--	--	--	--	.063	.038	.015	.604
R^2	.272		.267		.318		.305	

*Significant at corrected *p* value of <.006 (.05/8 analyses)

Table 12

Predicting Self-Regulation with Classroom Environment Perceptions, Modified

Predictor	Model E: Omitting Demand		Model F: Omitting Motivation	
	β	*p*	*β*	*p*
Intercept		<.001*		<.001*
SES	-.005	.856	-.051	.065
Gender	.236	<.001*	.149	<.001*
Course Level	-.021	.453	.024	.407
Motivation Scale	.367	<.001*	--	--
Demand	--	--	.246	<.001*
Autonomy	.144	<.001*	.179	<.001*
Feedback	-.008	.807	.032	.346
Cooperation	.078	.013	.109	.001*
R^2	.266		.215	

*Significant at corrected *p* value of <.007 (.05/7 analyses)

RQ3, Microanalysis. The small size of the microanalytic sample made it difficult to detect a statistically significant relationship between the classroom perceptions variables from the survey and the self-regulation variables from the microanalytic task. In fact, none of the microanalytic self-regulation variables were strongly or significantly correlated with any of the classroom perceptions variables from the survey. Nevertheless, two of the microanalysis *motivation* variables had strong, significant associations with the classroom perceptions scale: general interest in world history (r = .724) and importance of world history for achieving personal goals (r = .651). Students who reported in a structured interview that they found world history interesting, or that they felt succeeding in the class was important for meeting their goals, also perceived their classrooms as higher on the characteristics associated with promoting self-regulation. In particular, higher levels of interest were associated with higher perceived demand, feedback quality, and cooperation, and greater perceptions of importance were associated with higher perceived autonomy (see Table 13).

Table 13
Correlations Between Microanalysis and Survey Responses

Survey: Classroom Perceptions Scales	Microanalysis: General Interest	Microanalysis: Importance
Composite Classroom Environment	.724*	.651*
Demand	.648*	.514
Autonomy	.251	.679*
Feedback	.703*	.482
Cooperation	.556*	.393

*Statistically significant at p < .05.

Thus, like the survey results, the microanalysis results suggest that motivation and classroom perceptions are strongly linked; but unlike the survey results, the microanalytic results did not provide evidence to support a relationship between self-regulation and perceptions of the classroom environment.

Summary of Differences Between Methods. When evaluating the results together, the survey and microanalytic findings tended to suggest very similar conclusions regarding the motivational variables. When drawing conclusions about self-regulation, however, the two methods produced slightly different results when comparing AP and regular course students (small differences in opposite directions), and rather different results when linking perceptions of the classroom environment to self-regulation (significant relationship in the survey results but not in the microanalysis results). The researcher will interpret these differences in the discussion.

Chapter 5: Discussion

Self-regulated learning has been recognized as a promising area for intervention to improve academic performance for a range of students and subjects (e.g., Cleary, Platten, & Nelson, 2008; Graham & Harris, 2003; Shimabukuro, Prater, Jenkins, & Edelen-Smith, 1999). Research has shown that characteristics of the learning environment, including academic press, autonomy, feedback, and cooperative relationships, can promote motivation and self-regulation in the classroom (National Research Council, 2003; Nicol & MacFarlane-Dick, 2006; Pintrich, Roeser, & DeGroot, 1994; Ryan & Deci, 2000). The current study examined how these classroom characteristics varied between two secondary classroom settings, advanced placement and regular world history courses, whether self-regulation mattered more in one setting than the other, and the extent to which perceptions of the classroom environment predicted self-regulated learning. The study employed both survey and microanalytic methods.

Similarities and differences in study variables by course level. The first research question addressed whether important study variables relating to motivation, self-regulation, and perceptions of the classroom environment varied by course level. According to survey data, students in the AP world history course did not differ significantly from their peers in regular sections of the course on overall motivation, self-regulatory strategy use, or perceptions of autonomy or quality feedback in their classes. However, AP students did report greater interest in and importance of succeeding in world history, as well as a greater perception that their course was challenging and provided opportunities to cooperate with other students in the class. Microanalytic data generally supported the same conclusions regarding motivational and self-regulatory variables.

Because students in the district self-selected into AP courses, these results may well indicate that students who valued world history as a subject were more likely to enroll in the AP section of the course. Because the methods of the current study are correlational and data were only collected once toward the end of the year, it is also possible that the AP course presented world history content as more interesting and important than did the regular course. At the time of data collection, students in the AP course were preparing to take the AP exam, which provided the additional value of potential low-cost college credit. Further, according to teacher report, the AP course covered more material and more nonwestern cultures and moved at a faster pace than the regular course, which may have contributed to increased interest for some students.

Notably, students in the regular sections on average reported slightly, but not significantly, higher self-efficacy for learning world history. This suggests either that choosing to enroll in an AP course was not related to confidence of success in that course, or that students in the regular course found it to be easier than the AP students found theirs. This latter hypothesis is supported by the significantly higher ratings of academic demand among AP students. The finding may be consistent with literature on achievement calibration, which has demonstrated that lower-achieving students tend to overestimate their skills more than high achievers (Chen, 2003; Garavalia & Gredler, 2002); however, both course level groups included many high achievers.

The results indicating different patterns of motivational beliefs by course level suggest that motivation should be viewed as a multidimensional construct. Theories of motivation tend to recognize the different domains that it includes, such as self-efficacy, interest, and importance, but findings from the current study suggest that each of these may deserve separate examination. When examined as a whole, motivation did not differ between students in AP and regular sections of world history, according to the survey results; however, on closer examination, self-efficacy was slightly lower among AP students and valuing of world history was significantly higher. The microanalytic results suggest that even this distinction is not fine enough; the AP students in the small sample reported higher interest in but lower importance of world history than did the regular section students. Some responses during the microanalytic task suggest that importance could be broken down even further. Several students reported that it was difficult to respond to the importance item because they considered two dimensions of importance of world history: the value of getting good grades in class and the value of learning the content for their future lives and careers. These seemingly fine distinctions may be important in studying students' advanced course taking patterns and what motivates them to work hard in school.

Need for self-regulation by course level. The second research question (RQ2a) addressed whether self-regulation was more important for successful performance in AP versus regular courses. Contrary to the findings of Cleary and Chen (2009), self-regulated learning mattered more for performance in the regular sections of world history than in the AP sections. This finding was small to moderate in size. One possible reason that the current study produced the opposite effects of the Cleary and Chen work is classroom context – the previous study examined middle school students in math, and the current study examined high school students in social studies. Other research has shown that self-regulated learning differs between subjects, with self-regulation in social studies having a greater effect on grades than in math (Wolters & Pintrich, 1998). The finding that self-regulation matters more for achievement in a regular course than in an AP course confirms that the self-regulated learning skills of planning, monitoring, and modifying are important not just for the most advanced students, but for all students. The results suggest that students in the regular course may have even more to gain from learning and developing their self-regulatory strategy use skills than students in advanced courses.

Need for self-regulation by perceived demand. In their 2009 work, Cleary and Chen posited that perhaps the reason for their finding that self-regulation mattered more in advanced courses was that advanced math courses were more demanding than regular math courses. The researchers hypothesized that higher levels of demand necessitated more self-regulatory behavior in order to meet achievement goals. Although the current study found the opposite results of the original research, it may lend some support to Cleary and Chen's demand hypothesis. Research Question 2b examined whether self-regulation was more important for successful performance in courses that students perceived to be highly demanding versus less demanding. Although the size of the effect was small, there was a statistically significant interaction effect suggesting that self-regulation did matter more for success in highly demanding classrooms, as perceived by students. Students who reported their self-regulation at a 7 were predicted to earn an A regardless of perceived demand. Students who reported their self-regulation at a 1 and who perceived their class as difficult were predicted to earn a 3.89, or about a high D. Students who reported their self-regulation at a 1 and who perceived their class as easy were predicted to earn a 5.15, or about a C-. Though this effect was not large, it was consistent, and a difference of 2/3 of a letter grade could be interpreted as practically significant.

An important contribution of this study was its effort to replicate the results of a previous study – Cleary and Chen (2009). In the context of intervention, replication in different environments or under different conditions is essential for understanding whether a given technique can be expected to be effective (Kratochwill & Shernoff, 2004). The current study attempted to replicate findings in a different school level and course subject and found results in the opposite direction of the original work. That is, self-regulation mattered more for success in *advanced* courses in middle school math, but it mattered more in *regular* courses in high school history. Nevertheless, the authors' causal hypothesis for their findings found some support in the contexts examined by the current study – self-regulation mattered more for success when students found their classroom environments academically demanding. Researchers should continue to pursue replication of others' findings in different contexts, especially when studying motivation and self-regulation, as these variables have been shown to be quite context-dependent (e.g., Pressley, 1986; Winne & Perry, 2000; Zimmerman, 2000).

The result that self-regulated learning matters more for achievement when students find a course to be highly demanding has implications for the classroom. The current study lends support to the hypothesis that difficult tasks and high expectations might foster an environment that requires students to engage cognitively with the material. This is consistent with the research on academic press, which asserts that students perform best when working at the optimal level of challenge in an environment with high expectations for success (Lee & Smith, 1999; National Research Council, 2004; Phillips, 1997; Wentzel, 2002). It appears that when teachers provide challenging assignments and convey to students that they expect a strong effort and high rate of success, they create an environment that demands more cognitive engagement from students.

Perceptions of the classroom environment and self-regulated learning. When measured as a composite variable, students' perception that their classroom environment was challenging, supported autonomy, provided quality feedback, and encouraged cooperation was a significant predictor of self-regulatory behavior. Students who felt challenged and supported in ways that the literature has suggested promote self-regulation did indeed report greater self-regulation than students who did not feel supported in these ways. However, when the composite classroom environment perceptions variable was broken down into subscales, only one remained statistically significant: perceived demand. Independently, with demand included in the model, neither perceived autonomy, feedback, nor cooperation was a significant predictor of self-regulatory strategy use. This is inconsistent with the research literature on promoting self-regulation, which identified these three variables as among the most important.

When demand was not included in the model, however, autonomy became a significant predictor of self-regulated learning. There is some evidence that demand overlaps considerably with autonomy, with the two variables correlated at $r = .40$. When motivation was not included in the model, demand, autonomy, and cooperation were all significant predictors of self-regulation. There is also evidence that demand was less strongly associated with motivation than were the support variables ($r_{demand} = .15$, versus $r_{autonomy} = .47$, $r_{feedback} = .37$ and $r_{cooperation} = .32$). This is important because motivation was used as a control variable in this analysis and may have accounted for much of the variation in the support variables. The research is clear that a sense of choice and the opportunity to work with peers are motivating for students (e.g., Ames, 1992; Goodenow, 1993; Pintrich, Roeser, & DeGroot, 1994). Thus it is possible that the support variables are significant predictors of self-regulated learning, but they are more associated with motivation than is demand. Further, there are many other related variables that were beyond the scope of the study that could have been involved. Teachers' achievement goal orientations, for example, or the extent to which they encourage students to pursue goals of proving or improving their knowledge, have been shown to impact students' motivation, effort, and persistence (Dweck, 1986).

A simpler explanation is that creating a challenging classroom environment is the primary way to promote self-regulated learning, among those classroom environment characteristics examined in the current study. Perhaps good feedback, freedom to choose the techniques that work best, and opportunities to cooperate with peers will not promote self-regulatory behavior if the assigned tasks are too easy or familiar and do not demand a need for it. This hypothesis is somewhat supported by Lee and Smith's (1999) finding that social support alone had no positive impact on achievement and in fact sometimes had a negative impact – only the students in schools with high academic press realized achievement gains, and social support in these schools was associated with increased gains. Other researchers have found that easy tasks do not trigger self-regulatory strategy use in students or cause them to generate the use of new strategies (Winne & Jamieson-Noel, 2002). These findings suggest that challenging assignments and high expectations for student effort, as perceived by the students, may be the best environmental characteristics for promoting cognitive engagement, self-regulatory behavior, and subsequently achievement in the classroom.

Microanalysis as methodology. One question this study set out to answer was whether microanalysis is a better measure of self-regulation than survey methods. Although the current study was unable to conclusively determine this, the small amount of data available suggest that the answer is no. The self-report measure had a stronger link with course achievement, cumulative achievement, and both microanalytic and self-report measures of motivation, relationships that prior studies have established. From a practical perspective, the difficulty in obtaining participants in itself is an indicator that self-report methods may be superior in some circumstances; any potential value added by microanalytic methods is not realized when students choose not to participate, as the current study has demonstrated.

In analyzing the results of the microanalysis, one important discrepancy concerns the finding that both methods produced similar results when measuring motivation, but different results when measuring self-regulated learning. One possible reason is that the motivation measures required less inference on the part of the researchers, because they all used numerical scales. On the other hand, several of the self-regulation items required observation, interpretation, counting, and coding of responses, which introduced the possibility of more error. Students who did not report specific plans, for example, may have just been less verbal than those who did; other researchers have suggested that talkativeness can be a confounding factor in analyzing students' interview responses (Zimmerman & Martinez-Pons, 1986). Regarding strategies, students only earned points for strategies the interviewer could observe, so students who were using covert, mental strategies did not receive credit even if they did use a strategy.

In the current study, the self-monitoring microanalysis question based on the example from Cleary (2011, p. 337) seemed to confuse students and led to unreliable responses. Some students responded to this question about monitoring their task behavior, while others responded regarding their metacognitive or motivational monitoring. A better question in the future might address this latter type of monitoring in particular, such as, “Did you keep track of anything to make sure you stayed focused while you were working?” or “Did you pay attention to anything about the way you were completing the task that helped you to adjust your strategies?” More than one question might be needed to tap into this complex process.

Another possible reason for the inconsistent findings between the self-report and microanalysis methods in the current study was the level of difficulty of the microanalytic task. Compared to the level of challenge in their history classes, the microanalytic task was likely quite easy. The survey results indicated that the average student in the survey sample rated the level of demand of their world history course at about a 5.5 out of 7. The researcher attempted to create a fair, grade-level appropriate microanalytic task that would not be exceedingly difficult for low achievers; however, the volunteers for this phase of the study tended to be high achievers. Most of the participants in the microanalytic phase likely chose to help with the study because they were confident in their world history content skills. Student achievement data support the hypothesis that the microanalysis participants were high achievers; their average GPA was 3.5, compared to the average GPA in the total sample of 3.1. The microanalysis participants' average history grade was also higher at about B+, compared to the average world history student's grade just below a B. This suggests that the microanalysis task was too easy for the students who participated in the microanalysis phase of data collection. Research has shown that when tasks are easy, such as when they are very familiar or when the items are directly related to the task, students do not need to deploy their strategies or self-regulation skills in order to be successful (Winne & Jamieson-Noel, 2002). The ease, familiarity, and straightforwardness of the task may be another reason why students did not use many overt strategies or report much self-monitoring. It might also explain why so many students made luck attributions – they may have considered themselves lucky to get such an easy task given the typical difficulty of their course.

Limitations and Future Directions

Correlational design. The major limitation of this study is its correlational design. Although the study results have demonstrated relationships between key variables, it is impossible to determine the direction of these relationships. For example, students who found their classrooms more demanding, and to a lesser degree, more supportive also reported more self-regulatory strategy use. It is not possible to determine whether the classroom environment caused students to self-regulate more, or whether highly self-regulating students were more likely to perceive their classrooms as demanding and supportive. Similarly, it is difficult to determine whether the motivational variables of self-efficacy, interest, and perceived importance caused students to select AP versus regular course enrollment, or whether the content of the course influenced students' confidence and perceptions of the value of world history.

An important future direction for this line of research is to examine these relationships independently with an experimental research design, in order to investigate causality. A study that randomly assigns teachers at the classroom level to participate in training on the benefits of rigorous coursework and high expectations, autonomy support, quality feedback, and relationships with and between students could allow for examination of causality. Notably, such a study would examine the effects of the training, and not necessarily the effects of the environmental characteristics themselves. In order to understand the effects of a single classroom environment characteristic, teachers could learn about and implement only one at a time and allow fidelity observations in their classrooms.

Of all areas of the classroom environment, the current study provided the strongest support that perceived demand is associated with self-regulatory behavior. Thus it would seem that demand would be the most promising area for further investigation, but it would be challenging to randomly assign difficulty of course material and teacher expectations. One solution might be to implement the teacher training at random and investigate the effects of the training, as noted above. Another solution might be to attempt these manipulations only for part of the year, or only within a special program (e.g., summer school, an enrichment program, an elective course, etc.). Regardless of how the experiment is designed, student perception data should be collected to ensure students perceived the more demanding class as was intended.

Creation of a new instrument. Another limitation was the use of a new instrument created for the study. Although many of the classroom environment perceptions items had been used before, this was the first time they were used together as a composite scale. Exploratory and confirmatory factor analysis provided preliminary evidence that the classroom environment perceptions scale was multi-dimensional and invariant across two samples from the same population. However, the instrument would benefit from further study including more and better items, different student populations, and different course subjects. In particular, the demand subscale requires significant attention. The scale included only three items and had a low internal consistency reliability coefficient. This could possibly indicate that demand may not be unidimensional. Because this subscale was such an important predictor of self-regulation in the current study, future research should continue to add to and improve the demand items. Such a scale could serve both to increase the field's understanding of the importance of demand and to help educators provide an optimally challenging classroom.

Microanalysis sample size and task. Another significant limitation of the study is the sample size in the microanalysis phase. Very few definitive conclusions could be drawn due to the low participation rate. Further, the sample appeared to be mostly high achievers, which limited the value of comparisons between the two course level groups. The difficulty level of the task, especially given the achievement level of the few participants, further limited the richness of the data and the conclusions that could be drawn. Future research should continue to examine the value of microanalysis for answering questions about self-regulated learning. Better incentives for participation, including but not limited to requiring participation as a class activity, might increase the participant pool and provide more representative data. Using a more difficult task might also require students to engage their best strategies and result in richer and more accurate findings. Researchers might benefit from asking students a question about how difficult they perceived the task to be as part of the microanalytic protocol, both to improve future tasks and to test hypotheses about increased engagement in the presence of more difficult tasks.

Implications for Education

The results of this study provided strong evidence of a relationship between perceived demand in the classroom and self-regulated learning strategy use. Students who perceived their courses as more demanding reported engaging in more self-regulatory strategy use. Further, students who reported that their classes were demanding needed to put forth more self-regulatory effort than students who reported that their classes were not demanding in order to earn the same grade in the course. Although not necessarily causal, this relationship suggests that work requiring student effort, communication of high expectations, and challenging students to learn and succeed is associated with positive, effective work habits and higher achievement. Further study is needed, but the literature supports the recommendation that educators combine rigorous coursework, high expectations for success, and communication of the need for effort (Phillips, 1997; Wentzel, 2002).

This study demonstrated that self-regulation matters for achievement, not just in advanced courses, but in all sections of the course studied. In fact, in the current sample, self-regulation mattered *more* for students in regular sections of the course. This finding may help to discredit the misperception that self-regulated learning skills are only necessary for the most advanced students. Although the findings were correlational, they suggest a stronger relationship between self-regulated learning strategy use and achievement among lower achievers and students in regular courses, versus higher achievers and students in advanced courses. Educators may benefit from using self-regulated learning skill development as an intervention to help middle- and high-school students who are struggling with their coursework.

Self-regulated learning skills will help students not only with their middle and high school coursework, but in postsecondary education and work settings beyond education as well. “Noncognitive” factors such as growth mindset, self-efficacy, and intellectual engagement in solving novel problems become especially important as students take on greater challenges in postsecondary (Farrington et al., 2012). Students need opportunities to practice and develop their self-regulatory skills in the more supportive contexts of elementary and secondary school, as postsecondary settings will often provide challenges that require students to self-regulate their learning but offer less support.

Finally, this study implemented a microanalytic assessment of students’ self-regulation that could be used in schools to determine areas for intervention. The task and assessment protocol together took only about ten minutes to complete with each student and provided the researcher with information about students’ motivation to learn a specific course topic, including self-efficacy, interest, perceived importance, and goals. Further, the task allowed the researcher to observe students as they completed a realistic course activity and provided information about their self-regulatory behavior, such as how students plan, use strategies, self-monitor, make attributions, and evaluate their performance. These data are important in predicting student performance and are not already routinely collected in schools. For individual assessment purposes, the task could be any activity drawn from the student’s curriculum, so long as it allows for examination of the processes of concern. If the results of the assessment indicate low motivation, educators can work with students to build successes to improve their confidence, discuss the value of the subject in the real world to increase task value, or implement goal-setting interventions. If the results indicate difficulty with a given self-regulatory strategy, intervention can focus on building skills with that strategy. Although the microanalytic task and protocol will require revision for future research purposes, as used in this study they provide a model for a potentially effective assessment tool that can inform targeted intervention.

References

Ames, C. (1992). Classrooms: Goals, structures, and student motivation. *Journal of Educational Psychology, 84(3),* 261-271.

Appleton, J. J., Christenson, S. L., Kim, D., & Reschly, A. L. (2006). Measuring cognitive and psychological engagement: Validation of the Student Engagement Instrument. *Journal of School Psychology, 44,* 427 – 445.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice-Hall.

Bielaczyk, K., Pirolli, P. L., & Brown, A. L. (1995). Training in self-explanation and self-regulation strategies: Investigating the effects of knowledge acquisition activities on problem solving. *Cognition and Instruction, 13*, 221-252.

Boekaerts, M. (1997). Self-regulated learning: A new concept embraced by researchers, policy makers, educators, teachers, and students. *Learning and Instruction, 7*, 161-186.

Brooks, G. P. (1998). Precision efficacy analysis for regression. Paper presented at the meeting of the Mid-Western Educational Research Association, Chicago, IL.

Brooks, G. P. (2003). Using monte carlo methods to teach statistics: The MC2G computer program. *Understanding Statistics*, *2*, 137-150.

Brown, A. L. (1994). The advancement of learning. *Educational Researcher, 23,* 4-12.

Brown, T. A. (2006). *Confirmatory factor analysis for applied research*. New York: Guilford Press.

Butler, D. (1998). The strategic content learning approach to promoting self-regulated learning: A report of three studies. *Journal of Educational Psychology, 90,* 682–697.

Butler, D. & Winne, P. (1995). Feedback and self-regulated learning: A theoretical synthesis. *Review of Educational Research, 65*, 245–281.

Cameron, M. I., & Robinson, V. M. (1980). Effects of cognitive training on academic and on-task behavior of hyperactive children. *Journal of Abnormal Child Psychology*, 8, 405-419.

Carmines, E. G., & McIver, J. P. (1981). Analyzing models with unobserved variables: Analysis of covariance structures. In E. F. Borgatta (Ed.), *Social measurement: Current issues* (pp. 65-115). Beverly Hills: Sage Publications.

Carroll, J. B. (1963). A model of school learning. *Teachers College Record, 64,* 723-733.

Chen, P. P. (2003). Exploring the accuracy and predictability of the self-efficacy beliefs of seventh-grade mathematics students. *Learning and Individual Differences, 14,* 79-92.

Cleary, T. J. (2006). The development and validation of the Self-Regulation Strategy Inventory – Self-Report. *Journal of School Psychology, 44*, 307-322.

Cleary, T. J. (2011). Emergence of self-regulated learning microanalysis: Historical overview, essential features, and implications for research and practice. In B. J. Zimmerman & D. H. Schunk, (Eds.) *Handbook of self-regulation of learning and performance* (pp. 329-345). New York, NY: Routledge.

Cleary, T. J., & Chen, P. P. (2009). Self-regulation, motivation, and math achievement in middle school: Variations across grade level and math context. *Journal of School Psychology, 47,* 291-314.

Cleary, T. J., Platten, P., & Nelson, A. (2008). Effectiveness of the Self-Regulation Empowerment Program with urban high school students. *Journal of Advanced Academics, 20(1),* 70-107.

Cleary, T.J., & Zimmerman, B. J. (2004). Self-Regulation Empowerment Program: A school-based program to enhance self-regulated and self-motivated cycles of student learning. *Psychology in the Schools, 41*, 537-550.

Darling, N., Hamilton, S. F., & Niego, S. (1994). Adolescents' relations with adults outside the family. In R. Montemayor, G. R. Adams, & T.P Gullotta (Eds.), Personal relationships during adolescence (pp. 216–235). Newbury Park, CA: Sage.

Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin, 125*, 627-668.

DeCorte, E., Verschaffel, L, & Op'T Eynde, P. (2000). Self regulation: A characteristic and a goal of math education. In M. Boekaerts, P. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 687-727). Orlando, FL: Academic Press.

DiBenedetto, M. K., & Zimmerman, B. J. (2010). Differences in self-regulatory processes among students studying science: A microanalytic investigation. *The International Journal of Educational and Psychological Assessment, 5,* 2-24.

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

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

Farrington, C. A., Roderick, M., Allensworth, E., Nagaoka, J., Keyes, T. S., Johnson, D. W., & Beechum, N. O. (2012). *Teaching Adolescents to Become Learners: The Role of Noncognitive Factors in Shaping School Performance – A Critical Literature Review*. Consortium on Chicago School Research, Chicago, IL.

Flora, D. B., & Curran, P. J. (2004). An empirical evaluation of alternative methods of estimation for confirmatory factor analysis with ordinal data. *Psychological Methods, 9,* 466-491.

Fuchs, L. S., Fuchs, D., Prentice, K., Burch, M., Hamlett, C. L., Owen, R., & Schroeter, K. (2003). Enhancing third-grade students' mathematical problem solving with self-regulated learning strategies. *Journal of Educational Psychology, 95*, 306-315.

Garavalia, L. S., & Gredler, M. E. (2002). An exploratory study of academic goal setting, achievement calibration, and self-regulated learning. *Journal of Instructional Psychology*, *29*, 221-230.

Gibbs, G., & Simpson, C. (2003). *Measuring the response of students to assessment: The Assessment Experience Questionnaire.* Paper presented at the 11th Improving Student Learning Symposium, Hinckley, UK, September 1-3.

Goodenow, C. (1993). Classroom belonging among early adolescent students: Relationships to motivation and achievement. *Journal of Early Adolescence, 13(1),* 21-43.

Goodenow, C., & Grady, K. E. (1993). The relationship of school belonging and friends' values to academic motivation among urban adolescent students. *The Journal of Experimental Education, 62(1),* 60-71.

Graham, S. (1990). The role of production factors in learning disabled students' compositions. *Journal of Educational Psychology, 82*, 781-791.

Graham, S. & Harris, K. R. (2003). Students with learning disabilities and the process of writing: A meta-analysis of SRSD studies. In H. L. Swanson, K. R. Harris, & S. Graham (Eds.), Handbook of Learning Disabilities (pp. 323-344). New York, NY: Guilford Press.

Graham, S., Harris, K. R., & Troia, G. A. (1998). Writing and self-regulation: Cases from the self-regulated strategy development model. In D. H. Schunk & B. J. Zimmerman, (Eds.) *Self-regulated learning: From teaching to self-reflective practice.* (pp. 20-41). New York, NY: Guilford.

Greene, B. A., & Miller, R. B. (1996). Influences on achievement: Goals, perceived ability, and cognitive engagement. Contemporary Educational Psychology, 21, 181-192.

Hadwin, A. F., & Jarvela, S. (2011). Introduction to a special issue on social aspects of self-regulated learning: Where social and self meet in the strategic regulation of learning. *Teachers College Record, 113*, 235-239.

Hadwin, A. F., Winne, P. H., Stockley, D. B., Nesbit, J. C., & Woszczyna, C. (2001). Context moderates students' self reports about how they study. *Journal of Educational Psychology, 93(3),* 477-487.

Harrington, D. (2009). *Confirmatory factor analysis*. New York: Oxford University Press.

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. New York, NY: Routledge.

Haller, E. P., Child, D. A., & Walberg, H. J. (1988). Can comprehension be taught? A quantitative synthesis of metacognitive studies. *Educational Researcher, 17,* 5-8.

Henderson, V. L., & Dweck, C. S. (1990). Achievement and motivation in adolescence: A new model and data. In S. Feldman & G. Elliott (Eds.) *At the threshold: The developing adolescent.* Cambridge, MA: Harvard University Press.

Hofer, B. K., Yu, S. L., & Pintrich, P. R. (1998). Teaching college students to be self-regulated learners. In D. H. Schunk & B. J. Zimmerman, (Eds.) *Self-regulated learning: From teaching to self-reflective practice.* (pp. 57-85). New York, NY: Guilford.

Hox, J. J. (1995). Covariance structure modeling in Windows: A multitrait-multimethod analysis using Amos, Eqs, and Lisrel. *Bulletin de Méthodologie Sociologique, 46*, 71-87.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1-55.

Jackson, T., Mackenzie, J., & Hobfoll, S. (2000). Communal aspects of self-regulation. In M. Boekaerts, P. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 275-296). Orlando, FL: Academic Press.

Kitsantas, A., & Zimmerman, B. J. (2002). Comparing self-regulatory processes among novice, non-expert, and expert volleyball players: A microanalytic study. *Journal of Applied Sport Psychology, 14,* 91–105.

Kratochwill, T. R., & Shernoff, E. S. (2004). Evidence-based practice: Promoting evidence-based interventions in school psychology. *School Psychology Review, 33,* 34-48.

Lee, V. E., & Smith, J. B. (1999). Social support and achievement for young adolescents in Chicago: The role of school academic press. *American Educational Research Journal*, *36*, 907-945.

Meece, J. L., Anderman, E. M., & Anderman, L. H. (2006). Classroom goal structure, student motivation, and academic achievement. *Annual Review of Psychology, 57*, 487-503.

Mueller, C. M., & Dweck, C. S. (1998). Praise for intelligence can undermine children's motivation and performance. *Journal of Personality and Social Psychology*, *75*, 33-52.

National Research Council and the Institute of Medicine. (2004). Engaging schools: Fostering high school students' motivation to learn. Washington, DC: The National Academies Press.

Nicol, D. J., & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: A model and seven principles of good feedback practice. *Studies in Higher Education, 31*, 199-218.

Ntoumanis, N. (2005). A prospective study of participation in optional school physical education using a self-determination theory framework. *Journal of Educational Psychology*, *97*, 444-453.

Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research*, *66*, 543-578).

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

Paris, S. G., & Winograd, P. (1990). The role of self-regulated learning in contextual teaching: Principles and practices for teacher preparation. A commissioned paper for the U.S. DoE project *Preparing Teachers to Use Contextual Teaching and Learning Strategies to Improve Student Success In and Beyond School.*

Perry, N. E. (1998). Young children's self-regulated learning and contexts that support it. *Journal of Educational Psychology*, *90*, 715-729.

Perry, N. E., & Rahim, A. (2011). Studying self-regulated learning in classrooms. In B. J. Zimmerman & D. H. Schunk, (Eds.) *Handbook of self-regulation of learning and performance* (pp. 122-136). New York, NY: Routledge.

Perry, N. E., VandeKamp, K. O., Mercer, L, K., & Nordby, C. J. (2002). Investigating teacher-student interactions that foster self-regulated learning. *Educational Psychologist, 37*, 5-16.

Phillips, M. (1997). What makes schools effective? A comparison of the relationships of communitarian climate and academic climate to mathematics achievement and attendance during middle school. *American Educational Research Journal, 34,* 633-662.

Pintrich, P. R. (2004). A conceptual framework for assessing motivation and self-regulated learning in college students. *Educational Psychology Review, 16*, 385-407.

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

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

Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie, W. J. (1993). Reliability and predictive validity of the Motivated Strategies for Learning Questionnaire (MSLQ). *Educational and Psychological Measurement*, *53*, 801-813.

Pressley, M. (1986). The relevance of the good strategy user mode to the teaching of mathematics. *Educational Psychologist, 21,*139-161.

Pressley, M., El-Dinary, P. B., Wharton-McDonald, R., & Brown, R. (1998). Transactional instruction of comprehension in the elementary grades. In D. H. Schunk & B. J. Zimmerman, (Eds.) *Self-regulated learning: From teaching to self-reflective practice.* (pp. 42-56). New York, NY: Guilford.

Randi, J., & Corno, L. (2000). Teacher innovations in self-regulated learning. In M. Boekaerts, P. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 651-686). Orlando, FL: Academic Press.

Reeve, J. (2012). A self-determination theory perspective on student engagement. In S.L. Christenson, A. L. Reschly, & C. Wylie, (Eds.), *The Handbook of Research on Student Engagement.* (pp. 149-172). New York, NY: Springer Science.

Ruban, L, & Reis, S. M. (2006). Patterns of self-regulatory strategy use among low-achieving and high-achieving university students. *Roeper Review, 28(3),* 148-156.

Russell, V.J., Ainley, M., & Frydenberg, E. (2005). Schooling issues digest: Student motivation and engagement. Retrieved on June 9, 2010 from: http://www.dest.gov.au/sectors/school_education/publications_resources/schooling_issues_digest/schooling_issues_digest_motivation_engagement.htm.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*, 68-78.

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

Sadler, D. R. (1989). Formative assessment and the design of instructional systems. *Instructional Science*, *18*, 119-144.

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

Siegle, D., Rubenstein, L. D., Pollard, E., & Romey, E. (2010). Exploring the relationship of college freshmen honors students' effort and ability attribution, interest, and implicit theory of intelligence with perceived ability. *Gifted Child Quarterly, 54(2)*, 92-101.

Simmons, R. G., & Blyth, D. A. (1987). *Moving into adolescence: The impact of pubertal change and school context*. Hawthorne, NY: Aldine DeGruyter.

Shimabukuro, S. M., Prater, M. A., Jenkins, A., Edelen-Smith, P. (1999). The effects of self-monitoring of academic performance on students with learning disabilities and ADD/ADHD. *Education and Treatment of Children, 22(4)*, 397-414.

Skinner, E. A., & Belmont, M. J. (1993). Motivation in the classroom: Reciprocal effects of teacher behavior and student engagement across the school year. *Journal of Educational Psychology, 85*, 571-581.

Urdan, T., & Schoenfelder, E. (2006). Classroom effects on student motivation: Goal structures, social relationships, and competence beliefs. *Journal of School Psychology, 44*, 331-349.

Verschaffel, L., DeCorte, E, Lasure, S., Van Vaerenbergh, G., Bogaerts, H., & Ratinckx, E. (1999). Learning to solve mathematical application problems: A design experiment with fifth graders. *Mathematical Thinking and Learning, 1*, 195-229.

Weinstein, C. E., Husman, J., & Dierking, D. R. (2000). Self-regulation interventions with a focus on learning strategies. In M. Boekaerts, P. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 728-749). Orlando, FL: Academic Press.

Weiner, B. (1979). A theory of motivation for some classroom experiences. *Journal of Educational Psychology*, *71*, 3-25.

Wentzel, K. R. (2002). Are effective teachers like good parents? Teaching styles and student adjustment in early adolescence. *Child Development*, *73*, 287-301.

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

Williams, G. C., & Deci, E. L. (1996). Internalization of biopsychosocial values by medical students: A test of self-determination theory. *Journal of Personality and Social Psychology*, *70*, 767-779.

Winne, P. H., & Jamieson-Noel, D. L. (2002). Exploring student calibration of self-reports about study tactics and achievement. *Contemporary Educational Psychology*, *27*, 259–276.

Winne, P. H., & Perry, N. E. (2000). Measuring self-regulated learning. In M. Boekaerts, P. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 531–566). Orlando, FL: Academic Press.

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

Wolters, C. A., & Pintrich, P. R. (1998). Contextual differences in student motivation and self-regulated learning in mathematics, English, and social studies classrooms. *Instructional Science, 26*, 27-47.

Young, M. R. (2005). The motivational effects of the classroom environment in facilitating self-regulated learning. *Journal of Marketing Education, 27*, 25-40.

Zimmerman, B.J. (1998). Developing self-fulfilling cycles of academic regulation: An analysis of exemplary instructional models. In D. H. Schunk & B. J. Zimmerman, (Eds.) *Self-regulated learning: From teaching to self-reflective practice*. (pp. 1-19). New York, NY: Guilford.

Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of Self-Regulation* (pp. 13-39). Orlando, FL: Academic Press.

Zimmerman, B. J., & Martinez-Pons, M. (1986). Development of a structured interview for assessing student use of self-regulated learning strategies. *American Educational Research Journal*, *23*, 614-628.

Zimmerman, B. J., & Martinez-Pons, M. (1990). Student Differences in Self-Regulated Learning: Relating Grade, Sex, and Giftedness to Self-Efficacy and Strategy Use. *Journal of Educational Psychology, 82*, 51-59.

Appendix A. Number of Students by School, Teacher, and Section

School	**Teacher**	**Section (Class Period)**	**Number of Students**	**Course Level**
School A	1	5	17	Regular
School A	2	1	26	Regular
School A	2	2	20	Regular
School A	2	3	26	Regular
School A	2	4	28	Regular
School A	2	5	20	Regular
School A	2	6	14	Regular
School A	3	1	24	Regular
School A	3	3	25	Regular
School A	3	4	24	Regular
School A	3	5	25	Regular
School A	3	6	16	Regular
School A	4	2	26	AP
School A	4	3	23	AP
School A	4	6	19	AP
School A Subtotal	**4**		**333**	
School B	5	1	20	AP
School B	6	1	20	AP
School B	6	2	25	AP
School B	6	3	31	AP
School B	6	4	29	AP
School B	7	1	29	Regular
School B	7	2	26	Regular
School B	7	4	31	Regular
School B	7	5	26	Regular
School B	8	1	28	Regular
School B	8	4	27	Regular
School B	8	5	17	Regular
School B	9	2	30	Regular
School B	9	3	24	Regular
School B	9	6	29	Regular
School B Subtotal	**5**		**392**	
School C	10	1	27	AP
School C	10	2	27	AP
School C	10	3	27	AP
School C	10	5	20	AP
School C	11	4	30	Regular

School	Teacher	Section (Class Period)	Number of Students	Course Level
School C	11	5	24	Regular
School C	12	1	24	Regular
School C	12	2	29	Regular
School C	12	3	25	Regular
School C	12	4	25	Regular
School C	12	6	21	AP
School C	13	5	16	Regular
School C	13	6	16	Regular
School C	14	5	16	Regular
School C	14	6	21	Regular
School C Subtotal	**5**		**348**	
Total	**14**		**1073**	

Appendix B

World History Study Habits and Classroom Characteristics Survey

MARKING INSTRUCTIONS

- Use a No. 2 pencil or a blue or black ink pen only.
- Do not use pens with ink that soaks through the paper.
- Make solid marks that fill the response completely.
- Make no stray marks on this form.

CORRECT: ● INCORRECT: ✓ ⊗ ◒ ◔

Instructions: Please select the number for each statement that best reflects your opinion.

The first set of statements relates to your beliefs about your world history class.	not at all true of me						very true of me
1. I believe I will receive an excellent grade in this class.	①	②	③	④	⑤	⑥	⑦
2. I'm certain I can understand the most difficult material presented in the textbook for this course.	①	②	③	④	⑤	⑥	⑦
3. I'm confident I can understand the basic concepts taught in this course.	①	②	③	④	⑤	⑥	⑦
4. I'm confident I can understand the most complex material presented by the teacher in this course.	①	②	③	④	⑤	⑥	⑦
5. I'm confident I can do an excellent job on the assignments and tests in this course.	①	②	③	④	⑤	⑥	⑦
6. I expect to do well in this class.	①	②	③	④	⑤	⑥	⑦
7. I'm certain I can master the skills being taught in this class.	①	②	③	④	⑤	⑥	⑦
8. Considering the difficulty of this course, the teacher, and my skills, I think I will do well in this class.	①	②	③	④	⑤	⑥	⑦
9. I think I will be able to use what I learn in this course in other courses in the future.	①	②	③	④	⑤	⑥	⑦
10. It is important for me to learn the course material in this class.	①	②	③	④	⑤	⑥	⑦
11. I am very interested in the content area of this course.	①	②	③	④	⑤	⑥	⑦
12. I think the course material in this class is useful for me to learn.	①	②	③	④	⑤	⑥	⑦
13. I like the subject matter of this course.	①	②	③	④	⑤	⑥	⑦
14. Understanding the subject matter of this course is very important to me.	①	②	③	④	⑤	⑥	⑦

The next set of statements has to do with the ways you do school work and study for your world history class.	never						always
15. I make sure no one disturbs me when I study.	①	②	③	④	⑤	⑥	⑦
16. I make a schedule to help me organize my study time.	①	②	③	④	⑤	⑥	⑦
17. I finish all of my studying before I play video games or with my friends.	①	②	③	④	⑤	⑥	⑦
18. I try to study in a quiet place.	①	②	③	④	⑤	⑥	⑦
19. I think about how best to study before I begin studying.	①	②	③	④	⑤	⑥	⑦
20. I try to study in a place that has no distractions (e.g., noise, people talking).	①	②	③	④	⑤	⑥	⑦
21. I quiz myself to see how much I am learning during studying.	①	②	③	④	⑤	⑥	⑦
22. I study hard even when there are more fun things to do at home.	①	②	③	④	⑤	⑥	⑦
23. I tell myself to keep trying when I can't learn a topic or idea.	①	②	③	④	⑤	⑥	⑦
24. I use binders or folders to organize my world history study materials.	①	②	③	④	⑤	⑥	⑦
25. I tell myself exactly what I want to accomplish during studying.	①	②	③	④	⑤	⑥	⑦
26. I carefully organize my study materials so I don't lose them.	①	②	③	④	⑤	⑥	⑦
27. I ask my teacher questions when I do not understand something.	①	②	③	④	⑤	⑥	⑦
28. I try to see how my notes from world history class relate to things I already know.	①	②	③	④	⑤	⑥	⑦
29. I make pictures or drawings to help me learn world history concepts.	①	②	③	④	⑤	⑥	⑦
30. I look over my homework assignments if I don't understand something.	①	②	③	④	⑤	⑥	⑦
31. I think about the types of questions that might be on a test.	①	②	③	④	⑤	⑥	⑦
32. I ask my world history teacher about the topics that will be on upcoming tests.	①	②	③	④	⑤	⑥	⑦
33. I rely on my world history class notes to study.	①	②	③	④	⑤	⑥	⑦
34. I try to identify the format of upcoming world history tests.	①	②	③	④	⑤	⑥	⑦
35. I forget to bring home my world history materials when I need to study.	①	②	③	④	⑤	⑥	⑦

The next set of statements has to do with the ways you do school work and study for your world history class. (Continued)

	never						always
36. I avoid going to extra-help sessions in world history.	1	2	3	4	5	6	7
37. I lose important world history handouts or materials.	1	2	3	4	5	6	7
38. I give up or quit when I do not understand something.	1	2	3	4	5	6	7
39. I let my friends interrupt me when I am studying.	1	2	3	4	5	6	7
40. I avoid asking questions in class about things I don't understand.	1	2	3	4	5	6	7
41. I wait to the last minute to study for world history tests.	1	2	3	4	5	6	7
42. I try to forget about the topics that I have trouble learning.	1	2	3	4	5	6	7

This last set of statements asks about your thoughts on things that happen in your classroom.

	strongly disagree						strongly agree
43. I have to work hard to get a good grade on assignments in this class.	1	2	3	4	5	6	7
44. My teacher expects that I will do my best in this class.	1	2	3	4	5	6	7
45. My teacher is always challenging me to do better and learn more.	1	2	3	4	5	6	7
46. I feel that my teacher provides me choices and options.	1	2	3	4	5	6	7
47. I feel understood by my teacher.	1	2	3	4	5	6	7
48. My teacher shows confidence in my ability to do well in world history.	1	2	3	4	5	6	7
49. My teacher encourages me to ask questions.	1	2	3	4	5	6	7
50. My teacher listens to how I would like to do things.	1	2	3	4	5	6	7
51. My teacher tries to understand how I see things before suggesting a new way to do things.	1	2	3	4	5	6	7
52. In this course, I get plenty of feedback about how I am doing.	1	2	3	4	5	6	7
53. The feedback comes very quickly after turning in an assignment.	1	2	3	4	5	6	7
54. There is hardly any feedback on my assignments when I get them back.	1	2	3	4	5	6	7
55. When I get things wrong or misunderstand them, I don't receive much guidance on what to do about it.	1	2	3	4	5	6	7
56. I would learn more if I received more feedback.	1	2	3	4	5	6	7
57. The feedback I get comes too late to be useful.	1	2	3	4	5	6	7
58. The feedback I get in this course helps me to understand things better.	1	2	3	4	5	6	7
59. The feedback shows me how to do better next time.	1	2	3	4	5	6	7
60. Once I have read the feedback, I understand why I got the grades I did.	1	2	3	4	5	6	7
61. I don't understand some of the feedback I get in this course.	1	2	3	4	5	6	7
62. I can rarely see from the feedback what I need to do to improve.	1	2	3	4	5	6	7
63. My world history teacher allows us to discuss our work with classmates.	1	2	3	4	5	6	7
64. My teacher lets us ask other students when we need help in class.	1	2	3	4	5	6	7
65. My world history teacher encourages us to share ideas in class.	1	2	3	4	5	6	7
66. My world history teacher encourages us to get to know all the other students in class.	1	2	3	4	5	6	7
67. My world history teacher encourages us to get to know our classmates' names.	1	2	3	4	5	6	7
68. My world history teacher encourages us to be helpful to other students with their course work.	1	2	3	4	5	6	7
69. If you have a problem in world history class you can just talk to someone about it.	1	2	3	4	5	6	7
70. People in my world history class often work together to answer questions.	1	2	3	4	5	6	7

71. Please mark your best estimate of your current grade in your world history class.

A+ A A- B+ B B- C+ C C- D+ D D- F

Thank you for your help with this study!

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Appendix C
Microanalytic Protocol

Thank you for agreeing to participate in this study! You may remember taking a survey about your study habits for me last month -- today we're doing the second phase of the same study. I'm interested in how high school students think about tasks for school as they're working on them. So to measure that, I'm going to give you a passage to read on a world history topic and a 5-question quiz to answer about the passage. Your score on the quiz has nothing to do with your grade in class, but please take it seriously and do your best, because my study depends on it! I have some interview questions I'd like to ask you before, during, and after your work on the task. The questions might seem a little strange, but just think about what I'm asking and do your best.

Everything about the survey applies to what we're doing today -- your participation is voluntary and your answers are confidential -- EXCEPT I know your name and which answers are yours (obviously). However, I will never share individual students' answers with teachers, parents, principals, etc. I will average together groups of students to share in any presentations or papers based on this study.

After I have finished my study, I will randomly select 5 students who have completed the survey task with me to win a $20 gift card. Where would you like me to send your gift card if you are a lucky winner?

Do you have any questions for me before we start?

1. Study ID

Phase I. Forethought

Questions 1-6 on self-efficacy, interest (general and specific), perceived instrumentality, grade goal, and strategic planning.

2. On a scale from 1-100, with 100 being the most, how confident do you feel that you can read a world history passage and answer questions correctly about it?

3. On a scale from 1-100, with 100 being the most, how interesting is world history to you?

4. On a scale from 1-100, how interesting is the topic of ancient/classical cultures to you?

5. On a scale from 1-100, how important is being able to answer questions about world history for attaining your personal achievement goals?

6. If you were going to answer these questions as a quiz and receive a grade for class, what would be your grade goal?

○ 0% ○ 20% ○ 40% ○ 60% ○ 80% ○ 100%

7. Do you have any particular plans for how to read the passage and answer the questions?

Phase II. Performance Control

Tell students "You will have about 10 minutes to complete the task. I might ask some questions while you're working. Please let me know when you're finished."

Questions 7-9, including task strategies (ask during), self-monitoring (ask immediately after), and self-monitoring/self-evaluation (ask immediately after).

8. (*During task). I noticed that you are (highlighting, making notes, etc.); could you explain to me what you are doing and why?

9. (*Immediately after). Did you keep track of anything or self-monitor while you were working?

10. (*Immediately after). What score do you think you got on the quiz?

○ 0% ○ 20% ○ 40% ○ 60% ○ 80% ○ 100%

Phase III. Self-Reflection

At this point, grade the quiz and show students how they did. This page includes Questions 10-12 regarding causal attributions, self-satisfaction, and adaptive vs. defensive reaction.

11. If 0%-80%, why do you think you didn't get 100% on this task?
Or, if 100%, why do you think you did so well on this task?

12. On a scale of 1-5, with 1 being "very dissatisfied" and 5 being "very satisfied," how satisfied are you with your score on this task?

○ Very dissatisfied ○ Dissatisfied ○ Neither ○ Satisfied ◉ Very satisfied

13. Is there anything you would do differently next time if you had a task like this again?

Appendix D

Exploratory Factor Analysis Pattern Matrix

	Factor					
	1	2	3	4	5	6
43. work hard						
44. do my best						.623
45. challenging						.540
46. choices	.593					
47. feel understood	.727					
48. confidence	.548					
49. questions						
50. listens	.858					
51. how I see things	.852					
52. plenty	.518					
53. quickly	.431					
54r. hardly any		.480				
55r. not much guidance		.553				
56r. would learn more		.489				
57r. too late		.594				
58. understand better			-.781			
59. better next time			-.749			
60. understand why grades			-.456			
61r. don't understand		.675				
62r. rarely see improve		.718				
63. discuss work				.851		
64. ask other students				.816		
65. share ideas				.664		
66. get to know others					.680	
67. classmates' names					.801	
68. helpful to others					.468	
69. talk about problem						
70. work together				.505		

Appendix E

Standardized and Unstandardized Coefficients

Observed Variable	Latent Construct	*β*	*B*	*SE*
43. I have to work hard to get a good grade on assignments in this class	Demand	.239	1.000	--
44. My teacher expects that I will do my best in this class.	Demand	.684	1.894	.418
45. My teacher is always challenging me to do better and learn more.	Demand	.889	3.356	.724
51. My teacher tries to understand how I see things before suggesting a new way to do things.	Autonomy	.795	1.000	--
50. My teacher listens to how I would like to do things.	Autonomy	.769	.979	.042
48. My teacher shows confidence in my ability to do well in world history.	Autonomy	.831	.935	.054
47. I feel understood by my teacher.	Autonomy	.850	1.155	.062
46. I feel that my teacher provides me choices and options.	Autonomy	.749	.931	.057
62r. I can rarely see from the feedback what I need to do to improve.	Feedback	.371	1.000	--
61r. I don't understand some of the feedback I get in this course.	Feedback	.190	.492	.127
60. Once I have read the feedback, I understand why I got the grades I did.	Feedback	.656	1.788	.264
59. The feedback shows me how to do better next time.	Feedback	.709	1.933	.286
58. The feedback I get in this course helps me to understand things better.	Feedback	.754	1.936	.292
57r. The feedback I get comes too late to be useful.	Feedback	.331	.916	.153
55r. When I get things wrong or misunderstand them, I don't receive much guidance on what to do about it.	Feedback	.475	1.293	.183
54r. There is hardly any feedback on my assignments when I get them back.	Feedback	.412	1.246	.185
63. My world history teacher allows us to discuss our work with classmates.	Cooperation	.794	1.000	--
64. My teacher lets us ask other students when we need help in class.	Cooperation	.828	1.043	.056
65. My world history teacher encourages us to share ideas in class.	Cooperation	.794	.975	.058
70. People in my world history class often work together to answer questions.	Cooperation	.634	.859	.064

Appendix F
Full Model Diagram with Standardized Estimates