The Emotional Experiences of University Students:

Exploring the Role of Achievement Emotions in Self-Regulated Learning

by

Elizabeth Webster

B.A., University of Waterloo, 2008

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Supervisory Committee

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Abstract

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The purpose of this study was to investigate the role of achievement emotions in self-regulated learning (SRL). Participants included 111 university students enrolled in a first-year course designed to teach and improve SRL. Students reported their emotional experiences while working on self-set studying goals at three times during the semester. Measures included self-reported goal attainment, intensity ratings for nine emotions, and open-ended descriptions of emotion regulation strategies. Students reported enacting a variety of strategies to regulate their emotions, often in response to boredom and anxiety. Goal attainment positively correlated with positive emotions and negatively correlated with negative emotions other than boredom. Follow-up regressions revealed that positive emotions explained more unique variance than negative emotions in goal attainment. Over time, goal attainment and emotions did not change; however, correlations between times indicated that students were reporting situation-specific emotions. Contributions of this exploratory study to theory, research, and practice are discussed.

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Chapter 1

Introduction

Obtaining a post-secondary education is beneficial for both students and society. In Canada, a university education results in higher earnings and lower unemployment rates (Statistics Canada, 2009) and contributes to the nation's ability to remain competitive in the expanding global economy (Ma & Frempong, 2007). Retaining students at the university level is vital. Unfortunately, a recent report found that 16% of students enrolled in university eventually dropped out (Shaienks, Gluszynski, & Bayard, 2008). Ma and Frempong (2007) identified several factors as key contributors to attrition rates. Three of these were (a) poor first year academic achievement, (b) having no one on campus to talk to about personal issues, and (c) lacking a sense of belonging (i.e. feeling like just a number). These findings indicate a need for further research into factors that will encourage students to stay in school and attain academic success.

Achievement emotions are emotions that occur in relation to specific academic activities and outcomes (Pekrun, 2006). Research in this area has flourished during the last decade (Pekrun & Schutz, 2007) establishing that achievement emotions are related to students' academic performance (e.g. Pekrun, Elliot, & Maier, 2009; Ruthig et al., 2008), achievement goal orientations (e.g. Daniels et al., 2008), and goals for performance (e.g. Ilies & Judge, 2005). Findings to date indicate that emotions are a significant aspect of the learning process; however, more research is needed before conclusions can be drawn with respect to theory and practice (Pekrun & Schutz, 2007).

One avenue for further investigation is the role that achievement emotions play in self-regulated learning (SRL). SRL is a process through which students accomplish their

goals by actively regulating their cognitions, motivational states, and behaviors (Zimmerman, 1986). Successful self-regulated learners are able to set high-quality goals, select appropriate strategies to achieve those goals, monitor their progress, and adapt their learning as necessary (Winne & Hadwin, 2008; Zimmerman, 1990). Because achievement emotions occur in relation to learning activities and outcomes, the experience and regulation of these emotions may play a significant role in SRL. Indeed, emerging research and theory indicate that achievement emotions correlate with the use of learning strategies and the ability to self-regulate (Pekrun, Goetz, Titz, & Perry, 2002; Schutz & Davis, 2000). In addition, researchers in the area of SRL have begun to acknowledge and examine emotions and emotion regulation (Schutz & Davis, 2000). For example, the volitional aspect of SRL (i.e., psychological processes that guide the enactment of intentions) includes emotion control as one of its key subprocesses (Corno, 2001).

Despite increased focus on emotions in education and SRL, a call remains for future research to extend and integrate previous findings (Linnenbrink, 2007; Pekrun & Schutz, 2007). Thus, one of the main purposes of this study is to further elucidate the role of achievement emotions in SRL and academic achievement by investigating students' emotional experiences over time in authentic academic contexts. Corroborative evidence in this area could be used to enhance current SRL models and to design instruction and interventions that help students become proficient self-regulated learners. If students experience greater emotional well-being and academic success their likelihood of dropping out may be lessened.

Chapter 2

Literature Review

Definitions of Emotions and Achievement Emotions

Prior to a review of the theories and research, the term *achievement emotions* will be defined, starting with a definition of the broader construct of *emotions*.

Emotions. Emotions, as defined by Pekrun (2006), are "multi-component, coordinated processes of psychological subsystems including affective, cognitive, motivational, expressive, and peripheral physiological processes" (p. 316). Emotions can motivate individuals, help them focus attention, and guide responses to important events (Pekrun et al., 2002). The experience of an emotion arises from interpreting and evaluating both the emotional state and the context in which it occurs (Schutz & DeCuir, 2002).

Some researchers have used the terms *emotion* and *affect* interchangeably (e.g. Shell & Husman, 2008) whereas others have distinguished between the two (e.g. Linnenbrink & Pintrich, 2002; Meyer & Turner, 2006). In accordance with the latter view, Rosenberg (1998) suggests that affect is a more general construct that includes emotions along with affective traits and moods. Emotions and moods are considered transient states whereas affective traits are considered stable and enduring personality traits. Emotions and moods can be further differentiated by their intensity and duration, with moods less intense and longer lasting than emotions. Furthermore, emotions typically occur in response to environmental stimuli and they exert more of an influence on consciousness and attention than moods. In contrast to these distinctions, Pekrun (2006) purports that the differentiating features of emotions and moods (i.e. intensity,

duration, and focus) are dimensional rather than dichotomous, suggesting that both should be considered emotions rather than separate categories. Because there is no universally agreed upon distinction among all the labels, the present literature review will include research pertaining to any affective or emotional construct occurring in achievement contexts.

Achievement emotions. Achievement emotions occur specifically in relation to academic activities and outcomes (Pekrun, 2006). In the past, research on achievement emotions has focused largely on test anxiety and – to a much lesser extent – other emotions related to achievement outcomes (i.e. success and failure; Pekrun et al., 2002). To account for the diverse range of positive and negative emotions that are related to both outcomes and achievement-related activities, Pekrun et al. (2002) introduced the term *academic emotions*. Although this term has shown up in later articles, it appears the majority of the relevant literature has adopted the term *achievement emotions*; thus, this latter term will be used henceforth.

According to Pekrun (2006; Pekrun, Frenzel, Goetz, & Perry, 2007), achievement emotions can be characterized on three dimensions: (a) object focus, (b) occurrence, and (c) valence and activation. Object focus refers to the focus of an emotion on either an academic activity or an academic outcome. Occurrence refers to when an emotion transpires in relation to its focus. That is, prospective emotions (e.g. hope and anxiety) occur before academic outcomes are realized and result from anticipating success or failure. Retrospective emotions (e.g. relief and shame) occur after outcomes are realized and result from attributing the outcome to internal or external causes (Pekrun, 2006). Process-related emotions, such as enjoyment and boredom, occur during the task (Pekrun,

1992). Finally, valence refers to whether emotions are positive/pleasant or negative/unpleasant and activation refers to whether or not they cause arousal. These classifications result in four groups: (a) positive, activating emotions (e.g. enjoyment, hope, pride); (b) positive, deactivating emotions (e.g. relief); (c) negative, activating emotions (e.g. anger, anxiety, shame); and (d) negative, deactivating emotions (e.g. boredom, hopelessness; Linnenbrink, 2007; Pekrun et al., 2007).

Control-Value Theory of Achievement Emotions

Pekrun et al. (2002) developed the control-value theory of achievement emotions to explain the antecedents and outcomes of achievement emotions. The following sections describe the assumptions of this theory.

Antecedents of achievement emotions. According to this theory, "individuals experience specific achievement emotions when they feel in control of, or out of control of, achievement activities and outcomes that are subjectively important to them" (Pekrun et al., 2007, p. 16). Hence, an individual's appraisal of both personal control over the event and the importance of the event will influence subsequent emotions. For example, if a student believes her mark on an upcoming exam is partially controlled by the amount of effort she puts into her studying, she may experience hope. However, if she does poorly on the exam and blames a lack of ability, she may experience shame.

Perceptions of control and value may be influenced by multiple factors including achievement goal orientation, personality, and social and cultural environment (Pekrun, 2006). With respect to goal orientation, Pekrun, Elliot, and Maier (2006) posit that goal orientation affects individual appraisals, which in turn affect emotions. In particular, mastery orientations "focus attention on ongoing mastery of the activity, controllability

and available competencies, and the positive value of the activity itself" (Pekrun et al., 2006, p. 586), thereby eliciting positive activity emotions, such as enjoyment of learning. Performance orientations, which are focused on achievement outcomes, may elicit either positive or negative outcome emotions. If oriented towards attaining success (performance approach orientation), an individual may feel more in control of and value the potential outcomes, thus experiencing positive emotions such as hope or pride. On the other hand, if oriented towards avoiding failure (performance avoidance orientation), he or she may not feel in control of the end result, thus experiencing negative emotions such as hopelessness or anxiety.

Personality factors, such as enduring individual beliefs and temperament, may affect appraisals as well as achievement emotions more directly (Pekrun et al, 2007). For instance, an individual with a high self-perception of his abilities may view a challenging task as doable, therefore feeling positive emotions. An individual's temperament may also affect the types and intensities of emotions she experiences.

Finally, it is important to note the social-cultural context in which an emotion occurs. In educational settings, this includes factors such as quality of instruction, task demands, autonomy support, feedback, and achievement expectations (Pekrun, 2006; Pekrun et al., 2007). Aspects such as these may impact students' perceptions of control and the importance they place on academic activities or outcomes. For example, students may feel more control over their achievement outcomes in environments stressing personal improvement than in competitive environments stressing standards relative to their peers. As another example, if tasks are too easy or too difficult, students may value the task less than if the task demands match their capabilities.

Outcomes of achievement emotions. The control-value theory contains assumptions about the relationship between emotions and particular outcomes (Pekrun et al., 2007; Pekrun et al., 2002). One assumption is that emotions use cognitive resources, reducing the focus and cognitive capacity for tasks. For instance, research on test anxiety has shown that anxiety can negatively impact performance. This leads to the postulate that anxiety reduces students' capacity for working memory, robbing this resource from further cognitive tasks. Meinhardt and Pekrun (2003) tested this assumption in two similar experiments in which positive, negative, or neutral affect were induced in university students with pictures or by imagining emotional events. Participants were subsequently asked to count the number of times they heard, for example, a low tone during a series of high tones. Measurement of participants' brain activity revealed that positive and negative emotions reduced the amplitude of a brain area related to processing the tones, indicating a reduction in cognitive resource allocation for the task. Pekrun et al. (2002) note, however, that positive emotions related to the task, such as enjoyment of learning the material, may help to focus rather than decrease attention toward the task. Their own research has supported this, with findings that positive emotions correlated positively with flow experiences and negatively with task-irrelevant thinking.

A second assumption of the control-value theory is that emotions influence motivation to learn (Pekrun et al., 2007; Pekrun et al., 2002). Pekrun et al. (2002) summarize their empirical findings showing that (a) enjoyment, hope, and pride (positive activating emotions) positively related to interest, intrinsic motivation, extrinsic motivation, and self-reported effort; and (b) boredom and hopelessness (negative

deactivating emotions) negatively related to the same variables. The effects of positive deactivating and negative activating emotions are considered to be more complex. For example, anxiety (negative activating) related to potential failure on an exam may reduce intrinsic motivation (i.e., motivation to perform the task for its own sake), but increase extrinsic motivation to avoid failure. Furthermore, the motivational reactions of students may depend on individual characteristics. For instance, Turner, Husman, and Schallert (2002) found in their research on shame (negative activating) that "shame-resilient" students responded to shame with increased motivation whereas "shame-nonresilient" students could not maintain their effort after experiencing shame.

Achievement emotions may also influence learning strategies and self-regulated learning (Pekrun et al., 2007; Pekrun et al., 2002). With respect to learning strategies, the theory posits that (a) positive activating emotions facilitate the use of flexible learning strategies, such as elaboration and organization; (b) negative activating emotions facilitate the use of learning strategies that are less flexible, such as rehearsal; and (c) deactivating emotions impede the use of learning strategies because they encourage shallow information processing. Pekrun et al. (2007, Pekrun et al., 2002) purport that cognitive flexibility and adaptive use of learning strategies are components of self-regulated learning. Thus, they hypothesize that positive emotions encourage self-regulation whereas negative emotions encourage external regulation (i.e. reliance on others to, for example, set learning goals, choose strategies, and monitor and evaluate learning). Titz (2001, as cited in Pekrun et al., 2002) found correlations between positive emotions and perceived self-regulation as well as between negative emotions and

perceived external regulation. This finding evidences a relation between emotions and self-regulation, but does not confirm the causal direction.

With respect to academic performance, the relation is more complex and likely involves multiple mechanisms and various interactions with other variables such as task demands (Pekrun et al., 2007). Similar to the predictions concerning motivation, the theory postulates that positive activating emotions have positive effects and negative deactivating emotions have negative effects on performance. It is more difficult, however, to predict the effects of positive deactivating and negative activating emotions. Empirical evidence for the relation between achievement emotions and performance is discussed further in the next section.

Although the aforementioned assumptions describe relations that are mainly unidirectional (i.e., appraisals affect emotions and emotions affect learning), Pekrun et al. (2007) acknowledge that these relations are likely bidirectional and reciprocal. For example, anxiety may cause a student to perform poorly on an exam, which may in turn lead to more anxiety. Pekrun et al. report results from their own longitudinal studies that have revealed a reciprocal link between emotions and achievement.

Empirical Research on Achievement Emotions and Other Academic Constructs

A new line of research has begun to explore the topic of achievement emotions among children through to post-secondary students. This section gives an overview of the empirical research conducted with respect to the relation between achievement emotions and (a) performance, (b) goal orientations, and (c) domain specificity.

Achievement emotions are related to performance. As academic performance is extremely important at the university level, it is fitting that researchers have examined

relations between achievement emotions and performance. The majority of research has focused on test anxiety, with findings indicating a negative relation between test anxiety and performance (Hembree, 1988; Zeidner, 1998, 2007). Emerging research findings also show statistically significant relations between emotions other than test anxiety with academic achievement (Ainley, Hidi, & Berndorff, 2002; Pekrun et al., 2009; Pekrun et al., 2002; Ruthig et al., 2008).

Ruthig et al. (2008) investigated the predictive qualities of achievement emotions for the performance of 620 first-year post-secondary students. Students were administered a survey that assessed boredom, anxiety, and enjoyment. Performance was measured by final course grades, cumulative GPA, and voluntary course withdrawal. Boredom and anxiety were found to be negative predictors of performance across the three outcome variables and enjoyment was a positive predictor of final course grades.

In studies reported by Pekrun et al. (2002), university students' positive emotions, such as enjoyment, hope, and pride, were positively related to academic performance. Moreover, negative emotions corresponded with withdrawal from university courses and were more intense in students who dropped out of university. In another study led by Pekrun (Pekrun et al., 2009), the relations of achievement emotions to midterm exam performance were examined in 218 university students. Students reported their emotions one day prior to the exam. Analyses revealed a positive correlation between performance and both hope and pride and a negative correlation between performance and the emotions of boredom, anger, anxiety, hopelessness, and shame.

Ainley et al. (2002) found evidence for an indirect link between emotions and performance. They investigated the link in an experiment with 117 Australian Grade 8

students and 104 Canadian Grade 9 students. Sessions were conducted using computer software that allowed the researchers to assess various constructs while students read three text passages on a computer. Interest was assessed with rating scales administered before and after each passage. Affect was measured subsequent to reading each of three sections in the text passages, with students choosing from among 11 different emotions (happiness, anger, boredom, etc.), and then indicating the intensity of each emotion on a 5-point Likert scale. Performance was assessed with a multiple choice test after reading. Finally, persistence was measured as the amount of time spent reading each section of a text. A goodness-of-fit model showed that interest predicted affect, affect predicted persistence, and persistence predicted test score, illustrating that emotions indirectly predicted performance through persistence.

Achievement emotions are related to students' goal orientations and goals. Setting goals is a major component of self-regulated learning (Winne & Hadwin, 1998; Zimmerman, 2008). Research on goals and achievement emotions has revealed a relation between emotions and achievement goal orientations (Daniels et al., 2008, 2009; Linnenbrink, 2007; Pekrun et al., 2009) and a mediating effect of emotions between feedback and performance prediction goals (Ilies & Judge, 2005).

Linnenbrink (2007) summarized a series of studies conducted with colleagues on task-related motivation and affect in upper elementary, middle school, and college students. Motivation was measured as students' endorsement of either mastery orientations or performance goal orientations. In general, mastery goal orientations were positively related to positive affect and negatively related to negative affect. Findings were less consistent for performance goal orientations, which were found to be positively

related to positive affect in some research but unrelated in other research. Linnenbrink suggests that alternate methods of research, such as obtaining physiological indicators rather than self-report measures, might produce more consistent results and elucidate the role of affect in education.

In the study by Pekrun et al. (2009) described in the previous section, three types of achievement goals were also included: (a) mastery goals (focused on the development of competence), (b) performance-approach goals (focused on attaining a particular outcome), and (c) performance-avoidance goals (focused on avoiding negative outcomes). Separate regression analyses for each of the achievement emotions revealed several statistically significant relationships with the three types of achievement goals. In particular, mastery goals positively predicted enjoyment, hope, and pride, and negatively predicted boredom, anger, hopelessness, and shame. Performance-avoidance goals positively predicted anger, anxiety, hopelessness, and shame and negatively predicted hope and pride. Performance-approach goals positively predicted hope and pride. A mediating effect was also found for emotions in the relationship between achievement goals and performance. Specifically, hope and pride mediated the relationship between performance-approach goals and performance; hope, pride, anger, anxiety, hopelessness, and shame mediated performance-avoidance goals and performance; and hope, pride, boredom, anger, hopelessness, and shame mediated mastery goals and performance.

Pekrun et al. (2009) concluded that emotions and goals have important differential functions in predicting performance. They also provided the following recommendations for future research: (a) in addition to the relation between achievement goals and achievement emotions per se, examine the link between achievement goals and regulation

of these emotions; (b) investigate the relations among goals, emotions, and performance in other academic contexts beyond testing situations; and (c) because their study focused mainly on the effect of goals on emotions and the effect of both goals and emotions on performance, analyze reciprocal and bidirectional links among goals, emotions, and performance.

Daniels et al. (2008, 2009) analyzed data from a longitudinal study, beginning in 1992, in which self-report data were collected from Canadian undergraduate students in introductory psychology courses at two points during the academic year. Findings from both studies provided evidence of a significant relation between achievement emotions and achievement goals. Specifically, data from the 2000 and 2001 cohorts, consisting of 1002 students, indicated that mastery goals, either alone or in combination with performance goals, were associated with higher enjoyment and lower boredom than performance goals (Daniels et al., 2008). In addition, students who endorsed performance goals, either alone or in combination with mastery goals, reported greater anxiety than those who endorsed predominantly mastery goals. Analysis of data from the 1997 and 2003 cohorts, consisting of 669 students, showed that (a) hopefulness positively predicted both mastery and performance-approach goals, (b) helplessness negatively predicted mastery goals, (c) mastery goals positively predicted enjoyment and negatively predicted boredom and anxiety, (d) performance goals positively predicted anxiety, and (e) emotions predicted achievement and mediated the relationship between goals and achievement.

In contrast to the naturalistic studies by Daniels et al. (2008, 2009), Ilies & Judge (2005) conducted an experiment to investigate the relation between goal-setting and

emotions. A sample of 745 university students completed a series of eight trials in a computer task. Before each trial, participants reported their affect and set a goal for their performance on the next trial. After each trial, the students received feedback about their performance. Results showed that participants set lower goals after receiving negative feedback and they set higher goals after receiving positive feedback. Furthermore, positive affect predicted setting higher goals and also mediated the effect of feedback on goals.

Achievement emotions are domain-specific. In their first year of university, students often take courses in a variety of domains and, hence, may experience different emotions within each domain. This supposition has been validated by research with adolescents in two separate studies conducted by Goetz and colleagues (Goetz, Frenzel, Pekrun, Hall, & Ludtke, 2007; Goetz, Pekrun, Hall, & Haag, 2006). The first study included 200 German students in grades 7 to 10 (Goetz et al., 2006). Students reported the intensity of their enjoyment, anxiety, and boredom in six subjects (Latin, English, German, math, music, and sports). Using structural equation modeling, results indicated that emotions were largely domain-specific. For example, given a student's rating of enjoyment for math, it would be easier to predict her ratings of the other emotions in math rather than predict her ratings of enjoyment for another subject (e.g., English). In addition, mean correlations for each emotion across all subjects indicated that the degree of domain-specificity differed among emotions, with anxiety less domain specific than enjoyment or boredom.

In the second study, Goetz et al. (2007) assessed the emotions of 542 German students in Grades 8 and 11 to examine the difference between grade levels. The

emotions of enjoyment, pride, anxiety, anger, and boredom were measured in four subjects (math, physics, German, and English). Analyses paralleled the previous study, showing domain-specificity. Analyses also revealed that associations between emotions across domains were stronger in Grade 8 than Grade 11 students, indicating that emotions become increasingly domain-specific with age. In contrast to the first study, anxiety was found to be more domain-specific than the other emotions with the exception of enjoyment. The authors suggested this could be the result of using single items to measure each emotion in the first study, whereas they used multiple items in the second study. Despite this difference, both studies provide evidence for the domain-specificity of achievement emotions.

Achievement Emotions and Self-Regulated Learning

Self-regulated learning (SRL) is an important construct in education. Theories and research about SRL propose that students can (a) improve their ability to learn through selective use of metacognitive and motivational strategies; (b) set task specific goals to direct, monitor, and evaluate learning processes and strategies; (c) proactively select, structure, and regulate learning contexts, tasks, and environments; and (d) play a significant role in choosing the form and amount of instruction they need (Winne & Hadwin, 1998; Zimmerman, 1990). More simply, students are agentic, goal-directed, and control their own learning by choosing and adjusting their strategies to accomplish their goals as needed. Learning to self-regulate learning, behavior, and motivation is essential for success in academic tasks and contexts.

Schutz and Davis (2000) contend that emotions play a role in SRL, claiming that "the emotions we create and attempt to regulate while transacting within our environment

are factors that influence the potential success of our self-directed attempts" (p. 244). In other words, the appraisals that people make about their goals and standards influence their emotions which, in turn, influence their self-regulatory behavior. For example, a student may decide that an upcoming test is important to achieving his goal to do well in the course, but he does not have confidence in his ability to succeed on the test, resulting in hopelessness. To change the negative emotion of hopelessness to a positive emotion, he may seek help for test-taking skills, put more effort into studying, and utilize encouraging self-talk. Although this example illustrates how a student's emotions can shape productive self-regulatory behaviors, not all students will react positively to their emotions. Thus, one aim for research should be to help students respond to and regulate their emotions in a strategic and effective way.

Empirical support for the role of emotions in SRL is found in a study by Shell and Husman (2008). They administered questionnaires to 397 university students that measured various constructs including perceived control, motivation, affect, and strategic self-regulation. Based on these measures, the researchers performed canonical correlation analyses. Three dimensions emerged describing different patterns of strategic self-regulation: (a) good strategy use vs. apathy; (b) knowledge building vs. surface learning; and (c) learned helplessness, ranging from low to high. In the first dimension, good strategy use represented a pattern of higher scores on the following constructs: self-regulated strategy use (planning, goal-setting, monitoring, and evaluating), knowledge building (exploration and interconnection of knowledge), high-level questioning (to extend or expand on information), low-level questioning (to obtain or clarify information), study time, and perceived study effort. Apathy represented lower levels of

the same constructs. Good strategy use was connected with higher perceived control, higher mastery and performance approach goal orientations, lower work avoidance goal orientation, and higher positive affect; apathy was connected with the opposite pattern, with a particularly strong contribution of work avoidance.

In the second dimension, knowledge building represented higher knowledge-building strategies and high-level questioning, but lower self-regulated strategy use and study time (Shell & Husman, 2008). Surface learning represented higher self-regulated strategy use, study time, and low-level questioning, but lower knowledge-building strategies. Knowledge building was connected to higher perceived control, higher mastery goal orientation, and higher positive and lower negative affect. Surface learning was connected with mixed control beliefs, lower mastery goal orientation, and lower positive and higher negative affect. Finally, a high level of learned helplessness (mainly represented by a greater lack of regulation) in the third dimension was connected with a dysfunctional pattern of control, higher work avoidance goal orientation, and higher negative affect and anxiety. A low level of learned helplessness was connected with a mixed pattern of control, lower work avoidance goal orientation, and lower levels of negative affect and anxiety. The authors concluded that control, goal orientation, and affect combine to create different patterns that differentially influence strategic self-regulated strategy use.

Pekrun et al. (2002) also found evidence for a link between emotions and SRL. They conducted a series of studies in which they obtained measures of achievement emotions, learning strategies and effort, and perceived self-regulation in university and school students. Findings showed that positive emotions related to the use of more

sophisticated learning strategies (i.e., metacognitive strategies, elaboration, organization, and critical thinking) and perceived self-regulation (as opposed to external regulation).

An important factor in relations among emotions, SRL, and achievement is how students respond to their emotions. As mentioned previously, personality and individual differences may affect this response. Thus, negative emotions will not always lead to negative reactions. Returning to Turner et al.'s (2002) research on shame, among students who experienced shame after receiving an undesirable test score, shame-resilient students adapted their studying by initiating both volitional strategies to motivate themselves and cognitive strategies that promoted deeper learning. This resulted in higher grades on the next test. Shame-nonresilient students, on the other hand, tended to lose motivation and continued to use unsuccessful strategies, resulting in similar or lower grades on the next test.

Winne and Hadwin's Model of Self-Regulated Learning

The aforementioned studies validate the importance of achievement emotions in academic contexts and particularly in the process of self-regulation. For the current study, this topic will be considered in the context of Winne and Hadwin's (1998, 2008) model of SRL. This model is largely based on information processing theory which, in an educational context, proposes that learning occurs when information is received, processed, and stored in memory (Winne, 2001). Information processing models of SRL explain self-regulation typically as a negative feedback loop, in which students monitor their learning and use feedback about discrepancies between performance (studying products) and existing standards to self-adjust learning processes (Zimmerman & Schunk, 2001).

Winne and Hadwin (1998, 2008) postulate that self-regulation of learning or studying contains four recursive, weakly sequenced phases (see Figure 1): (a) task definition, (b) goal setting and planning, (c) enactment, and (d) adaptation. In task definition, students generate an understanding of a task and its requirements, as well as the information and resources available for its completion. Once the task has been defined, students can set task-related goals and devise a plan to achieve those goals using strategies determined to be appropriate for the task. In the third stage, students put the plan into action. Finally, students monitor and assess their progress in relation to their goals and standards. This may result in a need to adjust task understanding, goals and strategies, or personal standards in order to increase the opportunity for success.

Within each phase of the model, five factors are posited to interact with each other and propel the cycle: conditions, operations, products, evaluations, and standards (COPES; Winne & Hadwin, 1998, 2008). Conditions refer to both external task and internal cognitive conditions. Task conditions include resources, instructional cues, time, and social context. Cognitive conditions include beliefs, dispositions, and styles; motivational factors and orientations; domain knowledge; knowledge of the task; and knowledge of study tactics and strategies. Both types of conditions may facilitate or impede task completion. Operations refer to tactics and strategies the learner enacts, and products refer to the outcomes of these operations. Evaluations occur when the learner compares products to standards for the task. If a discrepancy is recognized, the learner can make adjustments, such as altering beliefs, revising goals, or changing strategies.

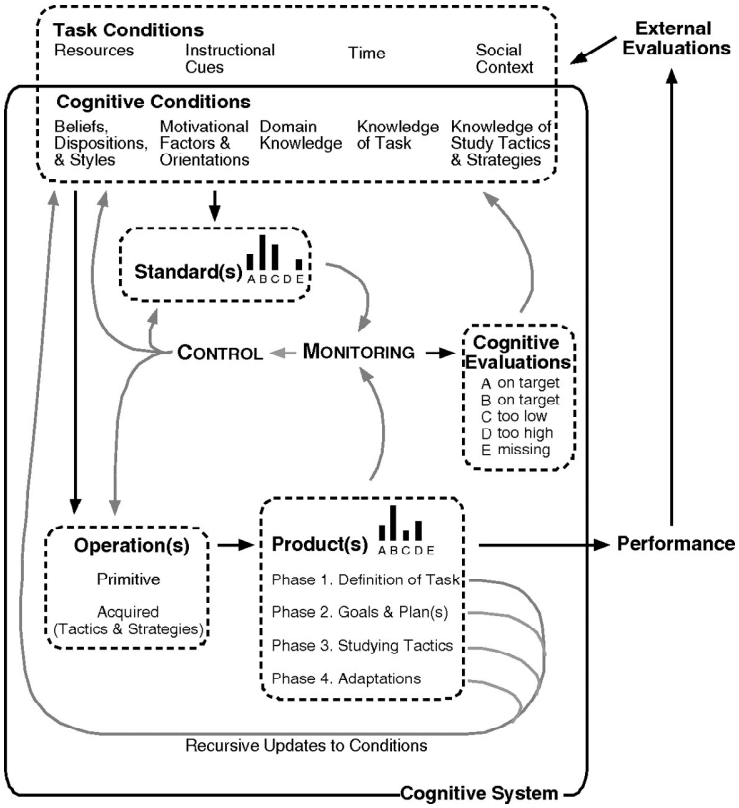

*Figure 1.*Winne and Hadwin's model of self-regulated learning. From Winne, P. H., & Hadwin, A. F. (1998) "Studying as Self-Regulated Learning." In D. J. Hacker, J. Dunlosky, & A. C. Graesser (Eds.), *Metacognition in educational theory and practice.* Hillsdale, NJ: Lawrence Erlbaum Associates. Reproduced with permission of Taylor & Francis Group LLC via Copyright Clearance Center, Inc.

Winne and Hadwin (2008) suggest that emotions occur as both internal conditions and products. As conditions, students' emotions influence their studying or learning during any phase of the cycle. For example, experiencing shame about not understanding some aspect of a task may prevent a student from asking for help, thus interfering with her ability to effectively monitor and evaluate her progress. As products, emotions occur as a result of either performing operations or evaluating other products during the phases. For example, a student may evaluate his progress on a task as not meeting his goals for that task, resulting in feelings of frustration or anger. These emotions then become

conditions for subsequent actions the student takes, such as altering his standards for the task or simply abandoning the task.

Not only is affect considered to interact with the phases of studying, but it can also be a target for regulation (Winne & Hadwin, 2008). From this perspective, students can generate awareness and understanding of their emotions, set goals and enact strategies to change their emotions, and monitor and evaluate their emotions in comparison to standards. If they perceive a gap between their current emotional states and their standards, they can instigate regulatory actions to reduce that gap. Taken all together, Winne and Hadwin's (1998, 2008) model shows that emotions are an integral part of SRL. However, more empirical research is necessary to support and further understand the role of emotions.

Although other models of SRL include affective components (e.g. Boekaerts & Niemivirta, 2000; Pintrich, 2000; Zimmerman, 2000), Winne and Hadwin's (1998, 2008) model more thoroughly describes the processes within each phase of SRL (Greene & Azevedo, 2007). Thus, this model provides a strong foundation to examine students' emotions in relation to other processes as they engage in studying. For instance, in the present investigation, emotions will be assessed in relation to students' self-evaluations related to their goal enactment. Further, because adaptation is a key component of SRL, these variables will be examined over time to look for changes that might indicate students are engaging in regulatory processes.

Regulation of Achievement Emotions

Pintrich (2000) outlines four areas that students may attempt to regulate in their goal-directed pursuits, including cognition, motivation/affect, behavior, and context. Among educational psychologists, the area of motivation/affect has received much less attention than cognition. Notable exceptions include research on volitional control and motivation regulation. Volitional control includes strategies for regulating affect with an emphasis on controlling negative affect and emotions that distract the individual from the learning task (Corno, 2001).With respect to motivation, Wolters (1998) investigated strategies that university students indicated they would use to increase their motivation. A small percent reported they would attempt to regulate emotional aspects of the task. Thus, these lines of research indicate that emotion regulation (ER) should not be overlooked in SRL research. Further research may offer more insight into the ER strategies used by students for a variety of emotions and tasks.

The control-value theory of achievement emotions has implications for ER (Pekrun et al., 2007). In the context of this theory, regulating emotions may occur at any point during the reciprocal interaction of emotions and their antecedents and effects. In particular, students may attempt to change or modify (a) their control and value appraisals, (b) the emotion itself, (c) their academic competences (e.g. learning strategies), or (d) the environment. This is similar to the process of ER occurring in Winne and Hadwin's (2008) model, discussed earlier. Empirical evidence using either of these models as a framework is scarce. However, other researchers addressing ER incorporate similar elements in their research, as discussed next.

Schutz and Davis (2000) describe three dimensions of ER that closely parallel those suggested by Pekrun et al. (2007) and have been examined in relation to test-taking situations. The three dimensions are (a) cognitive-appraising processes, (b) task-focusing processes, and (c) emotion-focusing processes. Cognitive-appraising processes refer to judgments of progress toward a goal. The regulation of these processes involves becoming aware of one's own maladaptive appraisals and corresponding beliefs and cognitions and then attempting to change these into adaptive processes. Task-focusing processes refer to attempts to gain, maintain, or regain focus on the task at hand. Regulation may involve using thoughts or tactics that focus attention on the task (e.g. looking for specific information in the task), reducing tension (e.g. slow breathing or taking a break), or contemplating the importance or positive aspects of the task. Finally, emotion-focusing processes refer to focusing on the self and the thoughts and feelings related to the task, which may result in a disengagement from the task.

Davis, DiStefano, and Schutz (2008) investigated cognitive appraisals, anxiety, and ER during test-taking in a sample of 2,215 first-year undergraduate students. Cognitive appraisals included judgments of (a) goal importance (the importance of tests for goal attainment), (b) goal congruence (the extent to which test scores contribute to goal attainment), (c) agency (amount of control over test outcomes), and (d) testing problem efficacy (ability to manage problems encountered during tests). ER consisted of self-reported use of (a) task-focused processes (maintaining focus on strategies relevant to test-taking), (b) regaining task focus (reducing tension or reappraising test importance), and (c) emotion-focused processes (disengaging from the test and focusing on feelings and thoughts about the test).

Davis et al. (2008) found that different patterns of cognitive appraisals were associated with different patterns of anxiety and ER. For example, students with low ratings on all four cognitive appraisals reported some of the highest levels of anxiety. With respect to ER strategies, these students reported the least use of task-focused processes and tension reduction and greater use of the emotion-focused strategies of importance reappraisal and wishful thinking (which are considered behaviors that psychologically distance individuals from the task). Academic achievement, as measured by standardized test scores (SAT scores), was relatively lower for these students. In contrast, students with high ratings on all four judgments reported lower levels of anxiety, greater use of task-focused processes and tension reduction, less use of importance reappraisal and wishful thinking, and had higher SAT scores. These findings suggest that reducing negative and increasing positive appraisals may result in lower test anxiety (negative affect), better use of subsequent ER strategies, and higher academic achievement.

Another model applicable for the study of and instruction in ER strategies is Gross's (1998) process model of ER. Gross defines ER as "the processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions" (p. 275). These processes may happen automatically or by control and they may be conscious or unconscious. Furthermore, these processes may be antecedent-focused (occurring prior to when the emotion is experienced) or response-focused (occurring when the emotion is experienced).

On the basis of his process model, Gross (1998) identified four antecedent-focused strategies and one response-focused strategy used for regulating emotions. The

antecedent-focused strategies include (a) situation selection (choosing a situation that elicits desirable emotions), (b) situation modification (changing a situation to elicit desirable emotions), (c) attentional deployment (refocusing attention on aspects of a situation that will elicit desirable emotions), and (d) cognitive change (appraising a situation in such a way that elicits desirable emotions). The response-focused strategy of response modulation refers to altering emotional responses to a situation. Some specific methods of response modulation include using drugs, exercising, and relaxation. Another method is suppression, which refers to actively inhibiting emotional expression.

Empirical research on Gross's (1998) ER strategies has predominantly focused on cognitive change and suppression. Findings are that reappraising a situation has beneficial effects whereas suppressing emotions has detrimental effects. For example, in a series of studies conducted with undergraduate students, Gross and John (2003) found that self-reported reappraisal was correlated with greater experience and expression of positive emotions and less experience and expression of negative emotions. Suppression was correlated with less experience and expression of positive emotions and greater experience (but not expression) of negative emotions. They also found that reappraisal was associated with higher levels of positive functioning whereas suppression was associated with lower levels of positive functioning. Positive functioning included variables such as self-esteem, environmental mastery, autonomy, and positive relationships with others.

A negative relation between suppression and social functioning was substantiated in a recent study in which self-reported suppression of 278 students entering first-year university predicted less social support from parents and peers, less closeness to others,

and lower social and academic satisfaction (Srivastava, Tamir, McGonigal, John, & Gross, 2009). Given that two of the factors identified as important to drop-out rates in university students are (a) lacking a sense of belonging and (b) having no one to talk to about personal issues (Ma & Frempong, 2007), perhaps by increasing reappraisal strategies and decreasing suppression strategies students may find it easier to make and keep friends who can offer support.

The potential of reappraisal as an effective ER strategy is apparent in the finding from a laboratory experiment that different appraisals in the same situation caused different emotions (Siemer, Mauss, & Gross, 2007). In this study, 122 female university students received negative feedback about their performance (e.g., they were moving too much or speaking too quietly) as they counted backwards. Afterwards, participants rated both their emotions (i.e., guilty, shameful, angry, amused, and pleased) and their appraisals of the situation (e.g., how much control they felt they had over the situation). Analyses revealed that (a) each emotion was associated with a different pattern of appraisals and (b) different emotional profiles were predicted by different patterns of appraisals, indicating that appraisals influenced emotional responses. These findings imply that reappraisal of a situation may lead to desirable emotional responses.

The majority of past research has concentrated on the regulation of negative emotions (Tugade & Fredrickson, 2007). Tugade and Fredrickson (2007) argue, however, that regulating positive emotions can have beneficial outcomes. One strategy for maintaining or enhancing positive emotions is savoring. Savoring involves (a) using cognitive or behavioral strategies to prolong enjoyment in current events, (b) anticipating future positive events, and (c) reminiscing about past positive events (Bryant, 1989). In a

series of studies conducted with undergraduate students, Bryant (2003) found that savoring, measured with his Savoring Beliefs Inventory, was (a) positively related to a variety of constructs including affect intensity, reported self-control behaviors, life satisfaction, value fulfillment, self-esteem, and happiness and (b) negatively related to hopelessness, depression, and unhappy affect. These findings indicate that savoring may have a positive impact on an individual's emotions.

Preliminary evidence about ER suggests that students can and should regulate their emotions. However, more research is needed to investigate the effectiveness of various strategies for different students in different situations. Furthermore, it is important to start implementing and assessing interventions designed to help students strategically regulate their emotions.

Although not specific to achievement emotions, research in the area of emotional intelligence (the ability to recognize, construct, and regulate emotions; Mayer & Salovey, 1995) may offer encouragement for the benefits of emotion regulation modules. For example, Parker, Saklofske, Wood, and Collin (2009) summarized research indicating that programs to promote emotional intelligence (EI) at post-secondary institutions had positive impacts (e.g., increased EI in first-year students and increased retention for at-risk students). However, a review by Humphrey, Curran, Morris, Farrell, and Woods (2007) suggests that the construct and effects of EI have not been adequately assessed to date. They note that high-quality longitudinal studies specifically addressing EI are needed.

Challenges to Measuring Achievement Emotions

Schutz, Hong, Cross, and Osbon (2006) identify what is likely the greatest challenge in studying emotions: the nature of emotions themselves. Specifically, emotions are complex and have the potential to change in type and intensity at any moment. Attaining accurate or meaningful results may be difficult because (a) collecting data during an event may disrupt the individual and influence his or her emotions; (b) emotions are not easily controlled, nor is it ethical to do so; and (c) relying on retrospective accounts may not tap into the actual emotions that were experienced. Moreover, Pekrun and Schutz (2007; see also Pekrun, 2006) suggest that self-report measures, such as experience sampling and diaries, are limited because they (a) do not capture emotional processes in real time; (b) do not easily produce data that can show complex, nonlinear relationships; (c) are subject to response bias; and (d) cannot easily assess unconscious emotional processes. Thus, they recommend using behavioral measures, such as observation of facial expressions and specific features of speech, and neuropsychological measures that reveal cortical and subcortical affective processes. However, observational measures have limitations as well. For instance, students may not always express the emotions they are experiencing (Schutz et al., 2006).

Another issue is that researchers often correlate variables across participants making it difficult to predict the processes occurring within individuals (Pekrun, 2006). Thus, research is needed that examines emotional processes within individuals. After this, the processes can be tested across individuals in order to validate the generalizability of the findings. An example of this kind of study was conducted by Pekrun and Hofmann (1996, as cited in Pekrun, 2006) in which university students' emotions were examined

over a period of six weeks inclusive of their final exams. Results showed the development of hope and anxiety was unique to individual students such that mean scores across participants did not represent any single participant. On the other hand, they found that enjoyment and motivation to learn were generalizable in that they correlated positively over time for all participants. Thus, caution is warranted when analyzing data across participants without first analyzing data within individuals.

Methods of Measuring Achievement Emotions

Schutz and DeCuir (2002) describe three approaches to investigating emotions: (a) investigating variables, (b) investigating the process and meaning of emotional experiences, and (c) investigating the social-historical context of emotions. Investigating variables involves defining the structure of particular constructs, usually through the use of surveys. This approach tends to result in constructs that are viewed as static variables and examined independently from each other. In contrast, Schutz and DeCuir suggest that emotions should be studied, along with cognition and motivation, from a holistic perspective that also considers the context surrounding them.

Investigating the process and meaning of emotional experiences involves gaining access to an individual's evaluations and interpretations of emotional states (Schutz & DeCuir, 2002). This approach redirects the focus of defining the structure of emotions to defining the experience of emotions. Narratives about the antecedents of emotions and the consequent reactions can be employed in this approach (Lazarus, 1999, as cited in Schutz & DeCuir, 2002).

The interpretation and evaluation of an emotional experience differs among people and across contexts. Thus, investigating the social-historical context of emotions

is also important (Schutz & DeCuir, 2002). Several studies have utilized surveys and interviews to investigate group emotions, such as ethnic and racial pride, and how these relate to the educational experiences of the group members. These three approaches to studying emotions complement each other and, when combined, would provide a more sophisticated perspective (Schutz et al., 2006).

Pekrun (2006) advocates using multiple research methods as well as both qualitative and quantitative designs, arguing that qualitative research provides descriptions of emotional phenomena and quantitative research provides methods of testing the antecedents and effects of emotions. Furthermore, both controlled laboratory experiments, which facilitate inferences about causality, and field experiments, which tap into real-life experiences, are needed.

Op't Eynde and Turner (2006) suggest various methods for investigating emotions such as interviews, observations, and discourse analysis, claiming that these can be used to elicit the appraisals, interpretations, and meanings formed by the students in the classroom context. To expand on this information, they propose using methods that allow for real-time tracking of emotional processes including on-line questionnaires, experience sampling, and video-based stimulated recall interviews. Similar to Pekrun and Schutz (2007), they also recommend using instruments that will measure facial expressions and neurophysiological components.

The use of process methods is promoted by Schmitz and Wiese (2006) and supported in a study in which German university students completed daily diaries during a five-week period during which they were trained in self-regulated learning. Each day, participants responded to questions before and after studying. Before studying, they were

asked to report their current emotional state (i.e., active, attentive, jittery, or afraid) and specify a learning goal for that day. After studying, they were again asked to report their emotional state and then indicate if they achieved their learning goal.

The authors analyzed the data using time-series analyses that allowed them to examine relations between components of SRL, the development of variables over time, and the effect of the training components (Schmitz & Wiese, 2006). Results supported the use of diaries and the investigation of behavior over time. For example, they found that variation within individuals was higher than variation across individuals with respect to time spent studying. The authors employed single-item measures in this study and were able to show reliability by calculating the means for each emotional state measure on odd days and even days and then correlating the means across subjects. Finally, because participants completed their diaries on paper, it was suggested that future research could also use computerized versions of the diaries.

Summary

With the exception of test anxiety, the topic of achievement emotions has become popular only recently. In the extant literature, researchers have provided evidence for the importance of emotions in education and have also offered recommendations for further research. For example, Pekrun and Schutz (2007) suggest that future studies should investigate both unpleasant emotions (e.g. anger, hopelessness, and boredom) and pleasant emotions (e.g. enjoyment, hope, and pride). In addition, there is a need for more research examining the patterns of these emotions as they are experienced by individuals across contexts and over time. To study the dynamics of emotions over time, Pekrun and Schutz advocate using (a) process-oriented approaches, such as physiological or

observational analyses over seconds or minutes; (b) time interval or event sampling during activities; and (c) longitudinal designs that assess the long-term development of emotions. The authors also note the need for more research into the antecedents of emotions and the effects of emotions on learning, teaching, and performance.

In her review of the interaction of affect, motivation, and engagement, Linnenbrink (2007) reports inconsistent findings, especially with respect to the relationship between affect and cognitive engagement. She notes that many studies have examined these variables solely at the end of a task and that future research should assess these variables longitudinally in order to map out a causal relation. Furthermore, the type of task and affect regulation should be considered in the interaction among the variables.

Because research on emotions in education is a relatively new field, there is a definite need to replicate and expand on previous findings in order to strengthen the information and reveal new avenues of research. Achievement emotions have been examined in relation to achievement goal orientations; however, no studies were located that examined emotions in relation to the attainment of studying goals set by students over the course of a semester. Further, the role of emotions in Winne and Hadwin's (1998, 2008) model of SRL has been discussed from a theoretical viewpoint but little, if any, empirical research has investigated achievement emotions using this model as a framework.

Purpose and Research Questions

The purpose of this study was to (a) examine the relations among emotions, goal attainment, and academic achievement and (b) explore the dynamics of emotions and

their regulation as they unfold over a semester. As such, the following research questions were posed:

1. What strategies do undergraduate students report using to regulate their emotions in the context of academic work?
2. What are the relations among achievement emotions, goal attainment, and academic achievement?
3. How do achievement emotions and goal attainment change over the course of a semester?

Positive emotions – those that are activating in particular – have been found to predict higher academic performance, and negative emotions have been found to predict lower academic performance (Pekrun et al., 2009; Pekrun et al., 2002; Ruthig et al., 2008); thus, it was hypothesized that positive emotions would positively correlate with academic achievement and negative emotions would negatively correlate with academic achievement. In the same respect, it was hypothesized that positive emotions would positively correlate and negative emotions would negatively correlate with goal attainment.

Training in SRL helps students to learn about their academic strengths and weaknesses, set better goals, and enact appropriate adaptive learning strategies. This should presumably lead to more positive feelings associated with their goals as well as higher goal attainment. Thus, in the current study, it was expected that (a) self-reported goal attainment would increase, (b) positive emotions would increase, and (c) negative emotions would decrease over the course of the semester.

To investigate these research questions and test their corresponding hypotheses, the current study followed a sample of university students enrolled in a first-year learning strategies course over for one semester. Students completed weekly reflections in which they reflected on their emotions and described their methods of regulating these emotions.

Chapter 3

Methods

Research Design

This was a mixed methods design that included both qualitative and quantitative data analyses. Correlation and regression analyses were conducted to determine relations among achievement emotions, goal attainment, and academic achievement. Within-subjects analyses were conducted to investigate changes in achievement emotions and goal attainment over time. Qualitative data about students' responses to their emotional challenges were also collected and examined to identify emotion regulation strategies.

Participants and Sampling Strategy

As part of a larger research project, the present study used a convenience sample of university students in a first-year course entitled ED-D 101: Learning Strategies for University Success (see next section for course information). Although all students completed the measures as part of their normal course activity, their coursework data were used only if they had also consented to research participation. In the Fall 2009 semester, 111 students (72 female; 39 male) agreed to release their data. The majority were first or second year students, and they came from a variety of faculties (see Figures 2 and 3). Students' mean GPA for the semester was 5.01 out of 9.0 with a standard deviation of 1.93.

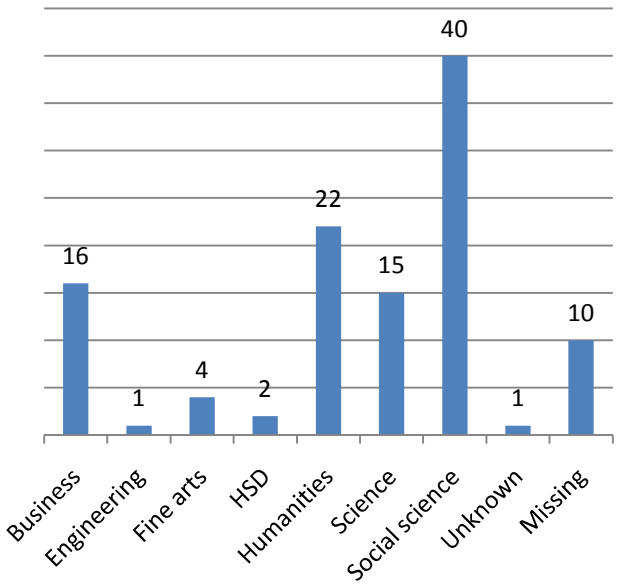

Figure 2. Number of students in each faculty. HSD = Human and Social Development.

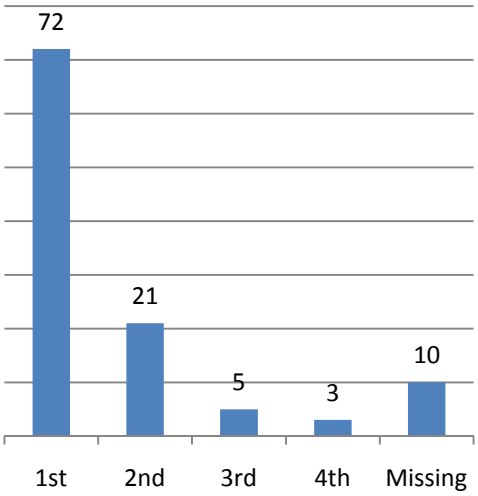

Figure 3. Number of students in each year of study.

Research Context

In ED-D 101, students learn how to become self-regulated learners by setting productive goals, choosing appropriate strategies to achieve those goals, monitoring their progress, and making adjustments to their methods as necessary. The course has a lecture component and a lab component each week. All students attend the lecture, during which

they learn about Winne and Hadwin's (1998) model of self-regulated learning, productive goal-setting, and strategies they can use for different academic tasks. The lab component consists of students working in groups of about 10 to 20 to apply the concepts presented in lectures, reflect upon and self-evaluate learning in their other courses, apply and modify strategies as needed, and engage in collaborative work to promote sharing of ideas and experiences related to the SRL process.

Measures

At the beginning of each lab, students completed reflections in which they reported on the prior week's studying goals. For the current study, the following data were collected during three of these weekly reflections spaced out over the semester (see Appendix A for a copy of the reflection).

Goal attainment. As a measure of goal attainment, students rated their ability to attain the goal they set the previous week on a scale from 1 (not very successful) to 10 (very successful).

Emotional intensity. On a scale from 1 (not at all) to 10 (extremely), students rated the intensity of nine emotions they experienced while working toward the goal they set the previous week. These emotions were enjoyment, hope, pride, relief, anger, anxiety, shame, boredom, and hopelessness, chosen because they were identified as significant in past research (Pekrun et al., 2002). There was also space for students to add emotions not on the predefined list.

Emotional challenge. A measure of emotional challenge was determined by asking students to select from the rated emotions an emotion that had negatively affected their goal progress.

Emotion regulation strategies. To learn about strategies students used to regulate their emotions, an open-ended question asked them to describe what they did to address the emotional challenge they identified in the previous question.

Academic achievement. Finally, to measure academic achievement, students' GPAs for the semester were obtained.

Procedure

The Fall 2009 semester included ten labs in total. At the beginning of the semester, students were informed about the study and asked to indicate their consent via an electronic version of the information consent letter (see Appendix B), which was made available on the course website throughout the semester. Students had the option to sign the letter or retract their participation until the end of the semester. Students completed reflections every week, but only data collected in the third, sixth, and ninth labs were used in this study (see Figure 4 for a timeline including weekly course topics). These three time points were chosen to reflect students' experiences at the beginning, middle, and end of the semester. Students accessed their weekly reflections through the course website, which was hosted by an online open source course management system entitled Moodle. They were given approximately 15 to 20 minutes at the beginning of each lab to complete their reflections before moving on to other lab activities.

Topic	Intro to Course	Intro to SRL	Task Under-standing	Goal-Setting	Enacting Strategies; Learning and Memory	Memory Strategies	Time Manage-ment	Reading for Learning	Notetaking; Rehearsing and Reviewing	Motivation and Emotion
Data Collection Points			**Time 1 Data Collection**			**Time 2 Data Collection**			**Time 3 Data Collection**	
Student Action	Set Week 1 goal.	Reflect on Week 1 goal. Set Week 2 goal.	**Reflect on emotions related to Week 2 goal.** Set Week 3 goal.	Reflect on Week 3 goal. Set Week 4 goal.	Reflect on Week 4 goal. Set Week 5 goal.	**Reflect on emotions related to Week 5 goal.** Set Week 6 goal.	Reflect on Week 6 goal. Set Week 7 goal.	Reflect on Week 7 goal. Set Week 8 goal.	**Reflect on emotions related to Week 8 goal.** Set Week 9 goal.	Reflect on Week 9 goal. Set Week 10 goal.
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10

Figure 4. Timeline of course topics, data collection points, and actions taken by students on their reflections.

Chapter 4

Results

Analysis results are presented separately for each of the three research questions. First presented are the emotional challenges and response strategies identified by students. Second, relations among achievement emotions, self-reported goal attainment, and academic achievement at the beginning, middle, and end of the semester are explored. Finally, in the third section, change over time in each of the constructs is examined.

Strategies Undergraduate Students Report Using to Regulate Their Emotions in the Context of Academic Work

When reflecting upon their goal attainment from the previous week, students were asked to select an emotion that negatively affected their progress and describe what they did to regulate that emotion. This section (a) describes the emotional challenges and response strategies students identified and (b) investigates the relation between emotional challenge and emotion regulation (ER) strategies.

Emotional challenge. Figure 5 displays the frequencies with which students selected each emotion at each of the three time points. The most frequently identified emotional challenges at all three times were boredom and anxiety. These were followed by hopelessness at Times 1 and 2 and both anger and hopelessness at Time 3. The remaining emotions were all selected much less frequently (less than 6%) at each time.

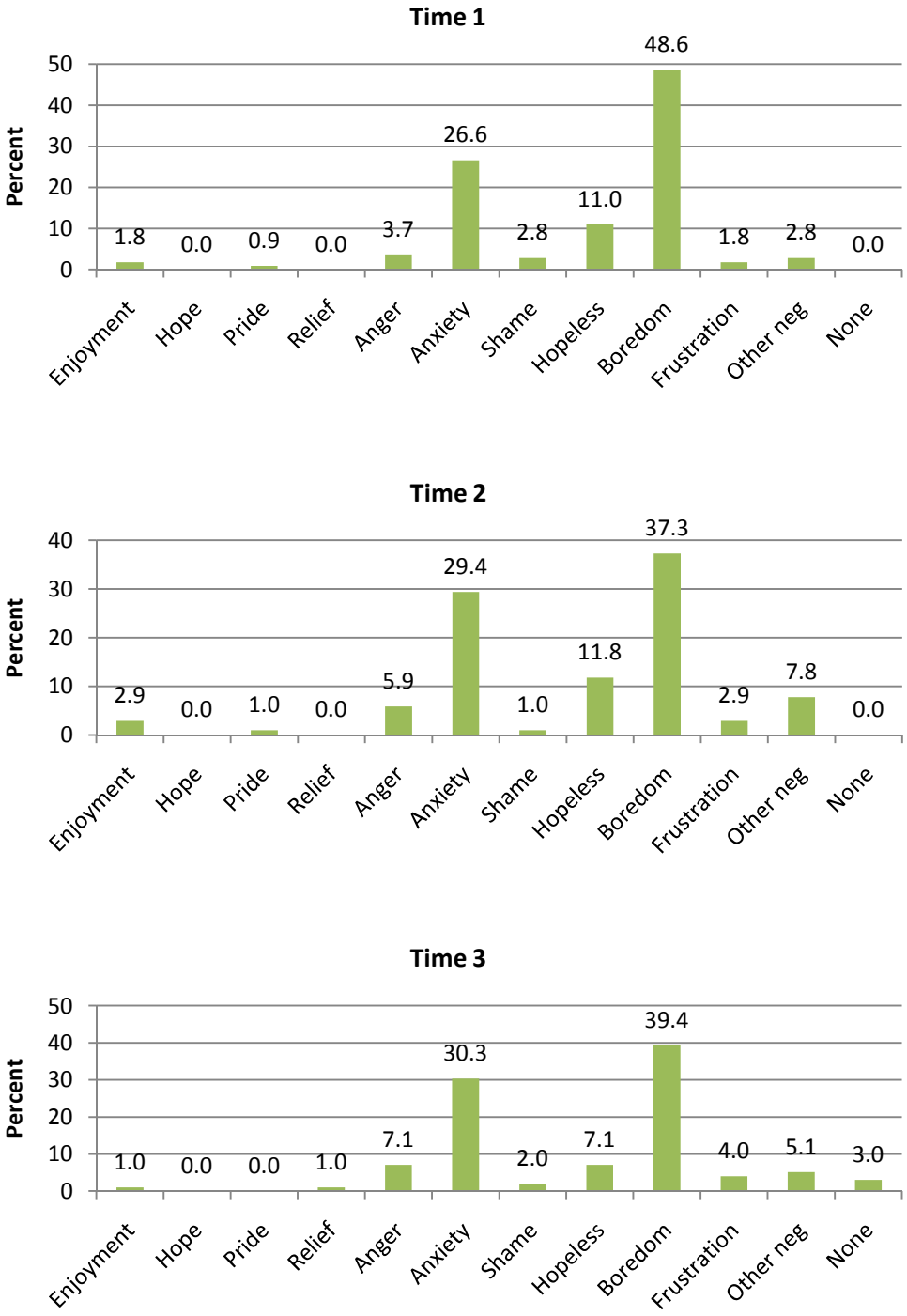

Figure 5. Frequency with which students selected each emotion as negatively affecting goal progress at Time 1 (n = 109), Time 2 (n = 102), and Time 3 (n = 99). *Other neg* refers to negative emotions that were not selected frequently enough to have their own category and *none* refers to responses in which students indicated they did not experience an emotional challenge.

Emotion regulation strategies. Students'ER strategies were coded following the procedures Wolters (1998) performed in his investigation of motivation regulation strategies among university students. That is, the initial categorization of ER strategies were based on theory and prior research; these categories were then refined based on the data.

The initial ER categories included those proposed by Gross (1998): (a) situation selection, (b) situation modification, (c) attentional deployment, (d) cognitive change, and (e) response modulation. In the first iteration of coding, students' strategies were coded into one of these five categories. At the same time, predominant themes that emerged from the responses were noted. These themes made it clear that more categories were needed because (a) it was difficult to fit some of the responses into one of the predefined categories, and (b) clearly distinct strategies were found within each predefined category. The themes were refined into 10 new categories, some of which remained similar to or the same as Gross's categories. This set of categories was discussed amongst three researchers whereupon one category was further differentiated into two separate categories, resulting in 11 categories in total.

The total number of responses across all three time samples was 309. The first author coded all responses using the final coding scheme. In some responses, more than one distinct strategy was identified. In these cases, the first identifiable strategy was coded. To establish reliability, Neuendorf (2002) reports that the minimum number of units that should be checked for reliability is 10% of the data (approximately 31 units in the present study) or 50 units; thus, a subset of 50 responses was chosen at random and coded by a second independent coder. An acceptable kappa of .90 was obtained.

Figure 6 and Table 1 (containing actual counts and percentages) display the frequency with which students reported using each strategy type within each of the three time periods and aggregated across all times. Descriptions of each category along with examples of students' responses are provided next.

Task/goal management. The majority of strategies overall (23.3%) fell into this category, in which students attempted to manage some aspect of their task or goal, such as making schedules, organizing their work, breaking the task into smaller pieces, and, most frequently, taking breaks. The use of task/goal management strategies remained fairly stable over time with a slightly higher percentage at Time 2. Examples of task/goal management strategies include: "I tried to set specific goals on how to accomplish all of the readings. Rather than attempting to get it all done in one sitting, I tried to only get through 10 pages at a time, than take a break or do some other work and then come back to it" and "To change my emotions of anxiety I set out a detailed study schedule with set goals for every few hours throughout the day. I plan for breaks, what I should have memorized, chapters read, and concepts understood. By doing this I can reduce my stress related anxiety about the exam because I know that if I'm following my schedule I'll be prepared."

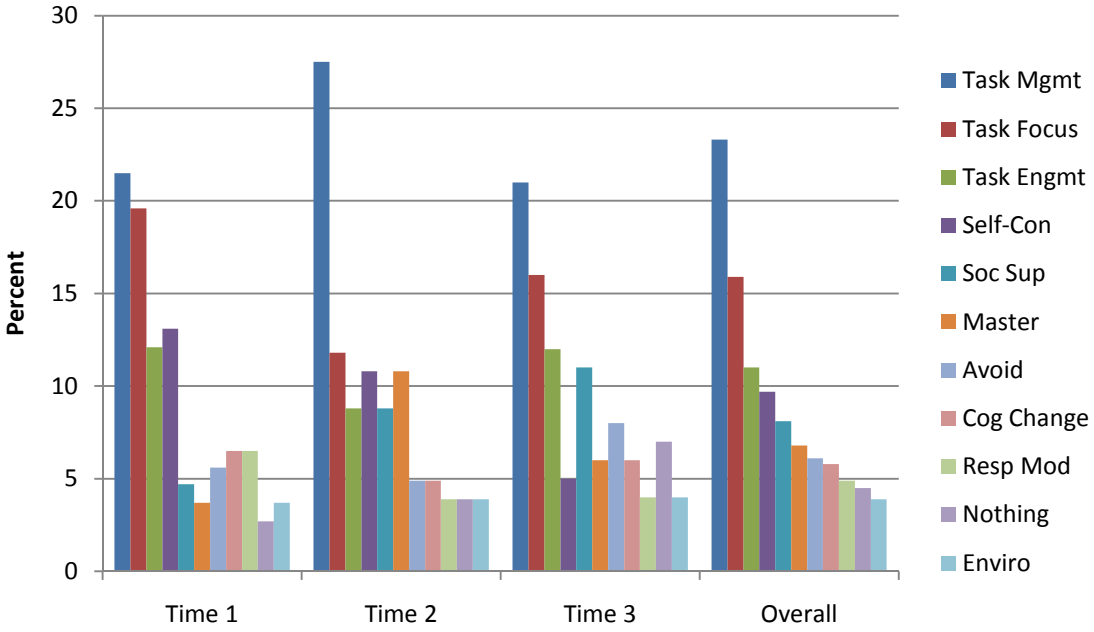

Figure 6. Frequency with which students reported using each emotion regulation strategy at each of the three time periods and aggregated across all time periods. Strategies are reported in the following order: task/goal management, task focus, task engagement, self-consequating thoughts and actions, social support, mastering content, task avoidance, cognitive change, response modulation, do nothing, and environment management.

Table 1
Proportion of Reported Emotion Regulation Strategies at Each Time and Overall

	Time 1		Time 2		Time 3		Total	
Category	*n*	%[a]	*n*	%[a]	*n*	%[a]	*n*	%[b]
Task/Goal Management	23	21.5	28	27.5	21	21.0	72	23.3
Task Focus	21	19.6	12	11.8	16	16.0	49	15.9
Task Engagement	13	12.1	9	8.8	12	12.0	34	11.0
Self-Consequating Thoughts/Actions	14	13.1	11	10.8	5	5.0	30	9.7
Social Support	5	4.7	9	8.8	11	11.0	25	8.1
Mastering Content	4	3.7	11	10.8	6	6.0	21	6.8
Task Avoidance	6	5.6	5	4.9	8	8.0	19	6.1
Cognitive Change	7	6.5	5	4.9	6	6.0	18	5.8
Response Modulation	7	6.5	4	3.9	4	4.0	15	4.9
Do Nothing	3	2.7	4	3.9	7	7.0	14	4.5
Environment Management	4	3.7	4	3.9	4	4.0	12	3.9
Total	107	100.0	102	100.0	100	100.0	309	100.0

[a]Percentages are of total strategies at each time. [b]Percentages are of total strategies aggregated across all times.

Task focus. Strategies in this category involved focusing on the task at hand rather than the challenging emotion, or speeding up task completion in order to eliminate the feeling associated with it. Students wrote statement such as: "I tried to ignore it and just get on with my work," "I did not allow my emotions to control me, because my feelings toward the assignment were irrelevant and I wanted to complete it before the weekend so I put my mind to it and accomplished this task," and "Got the assignment done more quickly." These strategies were the second most frequently cited (15.9% of the total) and showed a decrease at Time 2 before moving back up at Time 3.

Task engagement. When students reported engaging with the task in a different way or changing strategies, it was coded as task engagement. The techniques students used included "I tried to brainstorm personal experiences, thoughts and emotions that I could relate to the image I was responding to and draw on that to create an interesting piece of writing," "I tried to find things I thought were interesting in my readings," and "I started making cue-cards to accompany my reading and studying." The task engagement category represented finding new ways to engage with the task, often to reduce boredom by increasing interest. Task engagement strategies were reported 11.0% of the time overall and remained fairly stable over time with a slight decrease at Time 2.

Self-consequating thoughts and actions. These strategies included reports of thinking about the consequences of finishing or not finishing the task, or actually rewarding oneself for completing the task. Thus, students used consequences as an incentive to complete the task despite experiencing particular emotions. Self-consequating thoughts and actions were used 9.7% of the time over the three time samples and decreased over time. Specifically, self-consequating made up 13.1% of the

strategies at Time 1, 10.8% at Time 2, and only 5.0% at Time 3. Examples of self-consequating thoughts include: “I thought about the result of handing in a complete assignment and the benefit of learning the extra material” and “I reminded myself of how horrible it was on the last written assignment, when I left it all for the day before, and how much I want to avoid that.” An example of self-consequating actions is: “To try to change the feeling I motivated myself by saying, If I finished a certain number of pages while fully understanding the meaning I could watch my show that night or hang out with my friends.”

Social support. Approximately 8.1% of the strategies involved seeking help from peers or instructors, or simply talking or studying with friends. For example, students wrote statements such as: “To try and change my feeling of hopelessness I met up with other students in my class to discuss their ideas about how to answer the study questions (aka. essay topics for the midterm) as well as to go over concepts I didn't fully understand” and “I tried going to the math help in order to learn more and become not so frustrated and lost.” Students’ reports of using social support increased slightly over time from 4.7% at Time 1 to 8.8% at Time 2 to 11.0% at Time 3.

Mastering content. In this category, students reported attempts to enhance their competence or learning to reduce a negative emotion. This occurred in about 6.8% of all the strategies and it occurred more frequently at Time 2 (10.8%) as compared to Time 1 (3.7%) and Time 3 (6.0%). Representative responses coded in this category included: “I overcame the Anger by trying to learn from each questions so as to avoid future mistakes (as well as the future feelings of anger associated with that)” and “I just tried to relax and learn the material really well so I would have no reason to be anxious.” By mastering the

material, students thought this would help them to feel better. This was different from the previous category of task focus because students were focusing on learning rather than just working on the task.

Overlap could occur between this category and task engagement because students may have used strategies to enhance their learning to alleviate anxiety. What often made the distinction was the purpose of the strategies. That is, if students were using strategies and engaging in the task differently to *directly* change their emotions, this was coded as task engagement. In contrast, if they used strategies to *indirectly* influence their emotion through mastering the material, this was coded as mastering content.

Task avoidance. To reduce their emotions, sometimes students simply avoided the task (or a specific aspect of a task) that was causing their emotions. They made statements such as: "I changed the subject I was studying," and "I went to play computer games to change the feeling of boredom." These kinds of responses occurred in 6.1% of all the strategies and they remained relatively stable over time, with a slight higher proportion at Time 3.

Cognitive change. Cognitive change was one of Gross's (1998) categories and this represents strategies in which students altered their thinking or perceptions related to the task. Students often made statements about thinking positively about the task or thinking about the value or importance of the task. Gross did not explicitly include the value/importance aspect, but this is a key part of the control-value theory (Pekrun et al., 2007) and it fit nicely into this category. Use of these strategies was consistently low over time with a total of 5.8% overall. Examples include: "The next night, I looked at the little part of the essay that I had gotten done and that made me force myself to think

realistically about my schoolwork. I had realized that school is the most important thing for me at this point and that time is valuable," "I tried to calm myself and remind myself that I had lots of time to complete all my homework," and "I had a test on the chapters the next day so I needed to continually remind myself of the chapters importance."

These responses sometimes overlapped with self-consequating thoughts and actions. At times, students thought about the importance of the task for obtaining consequences, e.g., "I tried to tell myself that the reason why I should study longer is that I am not only studying for this midterm test, but also for my other French classes and my major." The subtle difference in some of these responses was the focus. When students focused on obtaining or avoiding consequences, this was coded as self-consequating whereas when students focused on altering their perceptions of the task, this was coded as cognitive change. In the example just provided, the student attempted to change his/her perceptions of the importance of the task rather than just focusing on the consequences of completing the task. Thus, this was coded as a cognitive change strategy.

Response modulation. Another of Gross's (1998) categories, response modulation strategies, included attempts to directly change an emotion, such as taking deep breaths or trying to relax or calm down. These strategies were rare, occurring 4.9% of the time, and included examples such as: "While writing the test I attempted to calm myself by taking a deep breath and literally telling myself to calm down, "I tried to get more sleep and rest at the appropriate times so that I was less tired and was more attentive, and "I simply tried to sit back and relax for a minute, took some deep breaths to calm down than I was not as frustrated."

Do nothing. This category, making up 4.5% of the strategies, included statements about doing nothing to change one's emotions, sometimes citing that the emotion was actually beneficial. For instance, students wrote: "I didn't really try anything to change this feeling. Perhaps I should've searched some methods in which I could've limited the amount of stress I was under," "I didn't try and change the feelings. I accepted what had happened and moved on," and "Honestly, I didn't do anything, it helped me finish faster." These statements increased slightly from Time 1 (2.7%) to Time 2 (3.9%) to Time 3 (7.0%).

Environment management. In this last category, students reported altering their environment to regulate their emotion. This included studying in a different location, such as the library, or changing something within the environment, such as listening to music while they worked. These strategies did not occur frequently (3.9% of all strategies), and this low frequency remained consistent across all three times. Students often reported using these methods to reduce or eliminate distractions. For example, one student wrote: "Closed the door and tried to ignore what was going on outside. Turned off my computer and put my cell phone away, somewhere where it wouldn't distract me."

Emotional challenge and emotion regulation. To explore the possibility that students regulated or adapted their responses to emotions they judged to be negatively affecting their goal progress, students' emotional challenges and their use of ER strategies over time were examined. Boredom and anxiety were found to be the most frequently selected emotional challenges at all times (see Figure 5). The analysis focused on these two emotions only as there was insufficient variability within the other emotions due to the low frequency counts. Transition matrixes record tallies that signify a row

event (Emotion at Time 1) is followed by a column event (Emotion at Time 2). They can be used to identify self-regulatory patterns in sequenced events (Hadwin, Nesbit, Jamieson-Noel, Code, & Winne, 2007). Nested transition tables were produced for week to week patterns in the emotion that was identified and the strategy that was used to address that emotional challenge from Time 1 to 2 (Table 2) and Time 2 to 3 (Table 3)..

Table 2
Transition Matrix of Emotional Challenges and Strategy Use at Time 1 and Time 2

	Time 2 Emotion					
	Anxiety			Boredom		
Time 1 Emotion	Same	Different	Total	Same	Different	Total
Anxiety	2	8	10	2	4	6
Boredom	3	9	12	5	18	23
Total	5	17	22	7	22	29

Note. Students who selected emotions other than anxiety or boredom at either Time 1 or Time 2 were not included in this table. *Same* refers to cases where students identified the same strategy at Time 1 and Time 2. *Different* refers to cases where students identified a different strategy at Time 1 and Time 2.

Table 3
Transition Matrix of Emotional Challenges and Strategy Use at Time 2 and Time 3

	Time 3 Emotion					
	Anxiety			Boredom		
Time 2 Emotion	Same	Different	Total	Same	Different	Total
Anxiety	1	9	10	2	7	9
Boredom	1	7	8	9	11	20
Total	2	16	18	11	18	29

Note. Students who selected emotions other than anxiety or boredom at either Time 2 or Time 3 were not included in this table. *Same* refers to cases where students identified the same strategy at Time 2 and Time 3. *Different* refers to cases where students identified a different strategy at Time 2 and Time 3.

With respect to emotional challenge, frequencies indicated that more students identified the same challenge rather than a different challenge in the subsequent data collection period. This was especially prominent with boredom. For instance, from Time 1 to Time 2, 18 students reported boredom at both times, whereas 9 students reported a change from boredom to anxiety and 6 students reported a change from anxiety to

boredom. With respect to ER strategies, more students reported using a different strategy than the same strategy the second time. From Time 1 to Time 2, 39 students reported a different strategy whereas 12 students reported the same strategy. From Time 2 to Time 3, 34 students reported a different strategy whereas 13 students reported the same strategy. For a more detailed breakdown of the types of strategies students reported using for boredom and anxiety at each time, see Tables 4 to 6. Strategies are listed in descending order from the most frequently used to the least frequently used for each emotion.

Table 4
Proportion of Strategies Used in Response to Boredom and Anxiety at Time 1

Boredom (n = 53)		Anxiety (n = 27)	
Response Strategy	%	Response Strategy	%
Task focus	22.6	Task/goal management	25.9
Self-consequating thoughts/actions	17.0	Response modulation	14.8
Task engagement	17.0	Task focus	14.8
Task/goal management	15.1	Cognitive change	11.1
Task avoidance	7.5	Social support	11.1
Do nothing	5.7	Self-consequating thoughts/actions	7.4
Environment management	5.7	Task engagement	7.4
Cognitive change	3.8	Mastering content	3.7
Response modulation	3.8	Environment management	3.7
Social support	1.9	Do nothing	0
Mastering content	0	Task avoidance	0

Table 5
Proportion of Strategies Used in Response to Boredom and Anxiety at Time 2

Boredom (n = 38)		Anxiety (n = 30)	
Response Strategy	%	Response Strategy	%
Task/goal management	34.2	Task/goal management	23.3
Self-consequating thoughts/actions	15.8	Mastering content	20.0
Environment management	10.5	Cognitive change	13.3
Task engagement	10.5	Task focus	13.3
Task avoidance	7.9	Self-consequating thoughts/actions	10.0
Task focus	7.9	Response modulation	6.7
Do nothing	5.3	Social support	6.7
Cognitive change	2.6	Do nothing	3.3
Mastering content	2.6	Task engagement	3.3
Social support	2.6	Environment management	0
Response modulation	0	Task avoidance	0

Table 6
Proportion of Strategies Used in Response to Boredom and Anxiety at Time 3

Boredom (n = 39)		Anxiety (n = 30)	
Response Strategy	%	Response Strategy	%
Task/goal management	38.5	Task focus	23.3
Task engagement	17.9	Task/goal management	20.0
Environment management	7.7	Social support	13.3
Task avoidance	7.7	Cognitive change	10.0
Task focus	7.7	Task engagement	10.0
Do nothing	5.1	Mastering content	6.7
Self-consequating thoughts/actions	5.1	Response modulation	6.7
Social support	5.1	Environment management	3.3
Cognitive change	2.6	Self-consequating thoughts/actions	3.3
Mastering content	2.6	Task avoidance	3.3
Response modulation	0	Do nothing	0

Relations Among Achievement Emotions, Goal Attainment, and Academic Achievement

Development of achievement emotions scales. Prior to conducting the correlation analyses, it was necessary to determine how the intensity ratings of achievement emotions would be included. Although there was space for students to add and rate extra emotions in their reflections, students' responses varied and the low frequencies of these additional emotions would make it more difficult to determine reliability of the scales. Thus, only the nine emotions listed in each reflection were included. Scale scores were calculated by taking the mean of the emotional intensity ratings.

Because theory suggests that activation levels may relate differentially to motivation and performance (e.g., Pekrun et al., 2007), the original intention was to form scales of positive activating (PA), positive deactivating (PDA), negative activating (NA), and negative deactivating (NDA) emotions. From the reflections data, enjoyment, hope, and pride were initially considered PA emotions whereas relief was the sole PDA emotion. To determine if relief should be analyzed separately from the PA emotions, all four emotions were tested for internal consistency. Cronbach's alpha for this scale was .77 at Time 1, .80 at Time 2, and .77 at Time 3. Table 7 contains the item-total statistics for the scale. The corrected item-total correlations show the correlation between each item and the total of the other items. In this case all items, including relief, were correlated at least moderately (above .40) with the other items, suggesting that they all fit well in the scale (Leech, Barrett, & Morgan, 2008). Table 7 also shows Cronbach's alpha if each item is deleted. As can be seen, removal of relief from the scale does not improve

the alpha above that for the full scale. Thus, it was decided to keep relief in the scale, subsequently labeled the positive (POS) emotions scale.

Table 7
Item-Total Statistics for the Positive Emotions Scale

	Time 1[a]		Time 2[b]		Time 3[c]	
	Corrected item-total correlation	Cronbach's alpha if item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted
Enjoyment	.60	.70	.45	.82	.54	.73
Hope	.45	.78	.61	.75	.52	.74
Pride	.73	.64	.83	.63	.75	.62
Relief	.54	.74	.58	.77	.49	.75

[a]Cronbach's alpha for the scale with all four items at Time 1 was .77. [b]Cronbach's alpha for the scale with all four items at Time 2 was .80. [c]Cronbach's alpha for the scale with all four items at Time 3 was .77.

Anger, anxiety, and shame were originally considered NA emotions, whereas hopelessness and boredom were considered NDA emotions. Again, to determine if these emotions should be separated into two scales, internal consistency was examined for all five emotions at each time period. The inter-item correlations indicated that hopelessness should be included with the original NA emotions whereas boredom should be analyzed separately due to its low correlation with each of the other emotions. Thus, a negative (NEG) emotions scale was created with anger, anxiety, shame, and hopelessness. Cronbach's alpha for this scale was .80 at Time 1, .85 at Time 2, and .76 at Time 3. Table 8 displays the item-total statistics for this scale. All items had item-total correlations greater than .40, indicating that they fit well with the other items in the scale. Removal of hopelessness lowered the alpha compared to the alpha for the full scale, and so it was kept as part of the NEG emotions scale. Boredom was still included in subsequent analyses on its own because this was the emotion most often cited by students as negatively affecting goal progress, showing its importance for these students.

Table 8
Item-Total Statistics for the Negative Emotions Scale

	Time 1[a]		Time 2[b]		Time 3[c]	
	Corrected item-total correlation	Cronbach's alpha if item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted
Anger	.57	.76	.66	.83	.45	.75
Anxiety	.57	.76	.69	.82	.55	.71
Shame	.65	.72	.67	.82	.55	.71
Hopeless	.64	.73	.77	.78	.69	.63

Note. Hopeless = hopelessness.
[a]Cronbach's alpha for the scale with all four items at Time 1 was .80. [b]Cronbach's alpha for the scale with all four items at Time 2 was .85. [c]Cronbach's alpha for the scale with all four items at Time 3 was .76.

Descriptive statistics. The mean scores and standard deviations for the POS and NEG emotion scales and boredom, along with self-reported goal attainment, are presented in Table 9. At times, students indicated a rating outside of the range of the scale provided (e.g. they reported 0 or 11 when the scale ranged from 1 to 10). In these cases, the ratings were changed to the extreme end of the scale (e.g., 0 was changed to 1 and 11 was changed to 10).

Table 9
Descriptives for Goal Attainment and Achievement Emotions at Each Time

	Time 1			Time 2			Time 3		
	M	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*
Goal Attainment	6.94	2.46	106	7.71	2.58	102	7.88	2.35	99
POS	6.20	1.94	107	5.67	2.10	97	6.22	1.93	88
NEG	3.92	2.05	107	3.85	2.23	96	3.46	1.78	88
Boredom	5.60	2.67	106	5.31	2.72	96	5.36	2.58	87

Selection of statistical analyses. Pearson product-moment correlations were calculated at each of the three time points to describe the relations among each category of achievement emotions (i.e. POS, NEG, and boredom) and goal attainment. Term GPA was also included to assess its relation with each category of achievement emotions and goal attainment.

Missing data. Pairwise deletion was used to deal with missing data such that cases were not included in a given correlation if they were missing a value for one variable in the pair. This meant that each case could be included in some correlations but deleted from others. This method was used rather than deleting the case from all correlations to ensure that the maximum number of cases was included in each correlation.

Assessment of statistical assumptions. Examination of descriptive statistics and histograms (see Appendix C for histograms) for each of the variables indicated no severe deviations from normality. Standardized scores for all cases on each variable did not reveal any univariate outliers beyond |3.3| using a critical alpha level of .001. Bivariate scatterplots between each pair of variables indicated roughly linear relations and homoscedasticity among all pairs (see Appendix D for scatterplots).

Results of correlation analyses. Results of the correlation analyses are displayed in Table 10. Correlations were very weak between term GPA and the other variables, providing no support for the hypotheses that achievement would (a) positively correlate with goal attainment, (b) positively correlate with positive emotions, and (c) negatively correlate with negative emotions. On the other hand, the hypothesis that self-reported goal attainment would relate to achievement emotions was largely supported. Attainment had a strong positive correlation (.53 to .71; see Cohen, 1992) with POS emotions at each time and a moderate to strong negative correlation (-.36 to -.56) with NEG emotions at each time. Boredom, however, had very weak correlations with goal attainment at all times.

Table 10
Correlations Among Term GPA, Goal Attainment, and Achievement Emotions at Each Time

	Time 1		Time 2		Time 3	
	Term GPA	Attainment	Term GPA	Attainment	Term GPA	Attainment
Attainment						
r	.03		.13		.00	
p	.803		.183		.982	
n	105		101		99	
Positive						
r	.00	.71*	.04	.59*	-.06	.53*
p	.988	.000	.729	.000	.568	.000
n	106	103	96	95	88	85
Negative						
r	-.14	-.56*	-.11	-.36*	-.11	-.40*
p	.162	.000	.293	.000	.314	.000
n	106	103	95	94	88	85
Boredom						
r	-.09	.02	-.16	.02	.00	.07
p	.378	.881	.118	.843	.980	.510
n	105	102	95	94	87	84

Note. The *n* for each correlation is different due to missing data.

Follow-up regression analyses. Because moderate to strong correlations were found between goal attainment and both POS and NEG emotions, a standard multiple regression was performed to assess the unique contribution of each category in predicting goal attainment. In these analyses, cases with missing values on any variable at one time were deleted from the regression for that time.

Assessment of statistical assumptions. Assumptions of normality, linearity, and homoscedasticity were met, as described for the correlation analyses. An initial regression was performed at each time to check for multivariate outliers, multicollinearity, and outliers in the solution. Multivariate outliers were assessed by calculating Mahalanobis distances. With two degrees of freedom and $\alpha = .001$, the critical value for χ^2 is 13.816. No cases had a value above this, indicating no multivariate outliers

were present in the data. Multicollinearity was also not an issue, as indicated by the high tolerance levels and condition indexes all below 30 (Tabachnick & Fidell, 2007). Finally, the residuals plots at each time were examined for outliers in the solution. At $\alpha = .001$, any standardized residuals greater than an absolute value of 3.3 are considered outliers. Using this criterion, one outlier was detected at Time 3 with a standardized residual of -3.47. A second regression performed with this case deleted indicated only a minor improvement, thus it was decided to keep the case in the analysis.

Results of regression analyses. Tables 11 to 13 summarize the results of the regression at each time. All three regressions had statistically significant multiple correlations, with $R = .73$, $F(2, 100) = 57.84$, $p = .000$ at Time 1, $R = .61$, $F(2, 91) = 27.28$, $p = .000$ at Time 2, and $R = .57$, $F(2, 82) = 20.16$, $p = .000$ at Time 3. The variance in goal attainment predicted by the combination of POS and NEG emotions (R^2) was .54 at Time 1, .38 at Time 2, and .33 at Time 3. Adjusted R^2, which adjusts for overestimation of the population value, was .53 at Time 1, .36 at Time 2, and .31 at Time 3. Using Cohen's (1992) calculation of effect size for squared multiple correlation, all three are considered large effects ($f^2 > .35$).

Examination of the individual predictors revealed statistically significant regression coefficients (B and β) for POS emotions at all times and for NEG emotions at Times 1 and 3 (see Tables 11 to 13). The 95% confidence intervals for each unstandardized regression coefficient (B) supported these results, with only the interval for NEG emotions at Time 2 containing zero. Directions of the statistically significant coefficients indicated that higher levels of POS emotions and lower levels of NEG emotions predicted higher levels of goal attainment. Squared semipartial correlations

(sr^2), which represent the amount of unique variance in goal attainment accounted for by each predictor variable, showed that POS emotions contributed a greater proportion of variance than NEG emotions at all times.

Table 11
Standard Multiple Regression of POS and NEG Emotions on Goal Attainment at Time 1

	B	β	sr^2	*t*	*p*	95% CI for *B*
Variable						
Constant	3.69			3.95	.000	[1.83, 5.54]
POS	.70	.57	.47	6.87	.000	[.50, .91]
NEG	-.28	-.24	-.19	-2.82	.006	[-.47, -.27]
R = .73						
R^2 = .54						
Adjusted R^2 = .53						

Note. n = 103. sr^2 = squared semipartial correlation. CI = confidence interval.

Table 12
Standard Multiple Regression of POS and NEG Emotions on Goal Attainment at Time 2

	B	β	sr^2	*t*	*p*	95% CI for *B*
Variable						
Constant	4.56			5.03	.000	[2.76, 6.37]
POS	.68	.53	.49	5.96	.000	[.45, .90]
NEG	-.20	-.16	-.15	-1.84	.069	[-.41, .02]
R = .61						
R^2 = .38						
Adjusted R^2 = .36						

Note. n = 94. sr^2 = squared semipartial correlation. CI = confidence interval.

Table 13
Standard Multiple Regression of POS and NEG Emotions on Goal Attainment at Time 3

	B	β	sr^2	*t*	*p*	95% CI for *B*
Variable						
Constant	6.06			6.59	.000	[4.23, 7.89]
POS	.49	.44	.41	4.57	.000	[.28, 70]
NEG	-.30	-.24	-.23	-2.50	.015	[-.54, -.06]
R = .57						
R^2 = .33						
Adjusted R^2 = .31						

Note. n = 85. sr^2 = squared semipartial correlation. CI = confidence interval.

Changes in Achievement Emotions and Goal Attainment Over Time

Selection of statistical analyses. To investigate changes in self-reported goal attainment and achievement emotions over time, two repeated-measures analyses were conducted. The first was a repeated-measures MANOVA in which goal attainment, POS emotions, and NEG emotions were dependent variables. In this case, a MANOVA was chosen rather than separate ANOVAs to control for the possibility of increased type I errors due to multiple testing (Tabachnick & Fidell, 2007). The use of MANOVA is not recommended when correlations between the dependent variables are near zero (Tabachnick & Fidell, 2007). Thus, because boredom had a low correlation with the other variables, a separate repeated-measures ANVOA was used for its analysis.

Missing data. Listwise deletion was employed, resulting in deletion of any cases with missing values on one or more variables in either repeated-measures analysis.

Assessment of statistical assumptions. As indicated in the previous section, each of the variables appeared to be normally distributed. Mahalanobis distances were calculated through a regression analysis to look for multivariate outliers in MANOVA. With three variables, critical $\alpha = .001$, and critical $\chi^2 = 16.266$, no multivariate outliers were detected. In repeated-measures univariate analyses with more than one degree of freedom, the assumption of sphericity must also be met (Tabachnick & Fidell, 2007). Mauchly's test of sphericity was not violated at $\alpha = .05$ for any of the variables in the MANOVA or for boredom, indicating that the assumption of sphericity was met.

Results of statistical analyses. The repeated-measures MANOVA showed the main effect for time was significant, $F\ (6, 64) = 3.196$, $p = .008$, partial $\eta^{2} = .231$, suggesting that the combination of measures changed over time with a large effect size

(see Cohen, 1988). Because the omnibus test demonstrated a statistically significant result, univariate repeated-measures ANOVAs were examined for each of the dependent variables. With a Bonferroni correction for conducting multiple analyses, critical alpha was set at .017. No statistically significant results were found for any of the variables. Despite this finding, examination of the means in Table 14 indicates there was a trend in improvement for goal attainment, but not for POS or NEG emotions.

The repeated-measures ANOVA for boredom indicated no statistically significant change over time, F (2, 150) = .522, p = .594. Thus, the hypothesis that goal attainment would increase over time appeared to be supported, but the hypotheses that positive emotions would increase and negative emotions, including boredom, would decrease were not supported.

Table 14
Means Obtained from Repeated-Measures Analyses for Goal Attainment and Achievement Emotions at Each Time

	Time 1		Time 2		Time 3	
	M	*SD*	*M*	*SD*	*M*	*SD*
Goal attainment[a]	7.00	2.29	7.49	2.62	7.93	2.21
POS[a]	6.27	1.83	5.74	2.13	6.26	1.91
NEG[a]	3.87	2.01	3.94	2.14	3.48	1.73
Boredom[b]	5.60	2.51	5.54	2.54	5.26	2.56

[a]n = 70. [b]n = 76.

Additional analysis of emotion consistency over time. The repeated-measures analyses indicated that the mean of students' emotions did not change over time, contrary to initial expectations. Another method of examining the stability of students' emotions is to measure the consistency of students' intensity ratings from one time to the next. Thus, Pearson correlations between the emotions scales were calculated. The results are shown in Table 15. Correlations ranged from .18 to .44, indicating low consistency from Time 1

to Time 2 and from Time 2 to Time 3. This indicates that students were not very consistent in their reports across time, despite the finding of an overall trend of stability.

Table 15
Correlations Between Time Points for Each Emotions Scale

	POS	NEG	Boredom
T1 and T2			
r	.18	.40	.36
n	93	93	92
T2 and T3			
r	.44	.42	.39
n	81	81	80

Note. T1 = Time 1; T2 = Time 2; T3 = Time 3

Chapter 5

Discussion

Emotion Regulation Strategies

The findings with respect to emotion regulation strategies indicated that students used a variety of strategies that tended to align with Gross's (1998) categories but with more distinction among the strategies. Eleven categories were generated from students' responses with the majority of students reporting use of task or goal management strategies, such as making schedules, breaking the task into smaller pieces, or taking breaks, to regulate their emotions. Following this category, students often reported they would attempt to focus on the task and ignore their emotions or finish the task faster to reduce the emotion. The third most frequently used strategy was to engage in the task in a different way. To a lesser extent, students reported strategies such as seeking support from other people, attempting to enhance task knowledge or competence, simply avoiding the task, or changing perceptions about the task. The fewest responses fell into categories pertaining to directly changing the emotional response, doing nothing about the emotion, or managing the study environment. The proportions of strategy use remained relatively consistent across all three time periods with unsystematic minor fluctuations.

When asked to select an emotion that negatively affected their goal progress, the majority of students indicated boredom followed by anxiety at each of the three time points. Using these two predominantly selected emotions, an examination of frequencies of emotional challenge and the use of ER strategy from one time to the next indicated that more students reported (a) the same challenge the second time and (b) a different strategy

the second time. This suggests that when students encountered the same emotional challenge as before they tended to use a different strategy. Frequencies also indicated that more students reported a different strategy even when their emotional challenge was different. Overall, this could be taken as evidence that students were self-regulating by experimenting with strategies. For students that experienced the same emotional challenge, this might indicate their first strategy did not work well so they tried a different strategy the next time, a good sign that students were engaging in self-regulatory behavior. However, to better understand the patterns, more information is needed. For instance, data were not collected from participants about the effectiveness of their strategies or why they chose to use the same or a different strategy from one time to the next.

Achievement Emotions, Goal Attainment, and Academic Achievement

Correlations among variables. It was hypothesized that academic achievement, as measured by term GPA, would relate to goal attainment and achievement emotions; however, correlation analyses revealed extremely weak relations at all three time points during the semester. This finding is not necessarily surprising considering students' ratings were collected at one point in time and specific to one goal on which they were working. GPA is a global measure composed of multiple tasks in multiple courses. In the future, it may be more revealing if ratings are obtained across a variety of tasks and time points. In past studies where a relation between achievement and emotions was found, emotions typically either (a) were assessed through surveys (e.g., Ruthig et al., 2008) which would presumably assess more global measures of emotions, or (b) corresponded with the achievement measure, such as prior to taking a test (e.g., Pekrun et al., 2009).

The assessment of emotions in this study was task specific and the measure of achievement was global which might explain why the results do not mirror those found in past research.

In contrast to the above findings, correlations were moderate to strong between students' self-reported goal attainment ratings and their ratings of both POS and NEG emotions. Because goal-setting is an important component of SRL, the finding that students' task- or goal-related emotions are connected to perceived attainment of their goals implicates a role of emotions in SRL. These results, however, do not provide any information about the causal direction of the relations, which is difficult to determine because students recounted their experiences based on memories of the prior week. It is possible that students' emotion intensity ratings were not accurate accounts of their experiences and were, instead, heavily influenced by their self-reported goal attainment. If students felt they had achieved their goals from the past week, they may have been biased toward recalling positive emotions more so than negative emotions.

To more thoroughly investigate the nature of the relation between achievement emotions and goal attainment it would be better to obtain ratings of emotions before, during, and after students worked on the task. This method may be difficult to implement as stopping to report on emotions may interfere with the experience (Schutz et al., 2006). Nevertheless, following recommendations by other researchers (e.g., Op 't Eynde & Turner, 2006; Schmitz & Wiese, 2006), subsequent research might include real-time tracking of emotions using methods that allow for quick unobtrusive responses. For example, rather than having students go through a list of emotions and rate the intensity, they could simply choose the predominant emotion they are feeling.

The emotion of boredom was not included in the score for negative emotions due to its low correlation with anger, anxiety, shame, and hopelessness. Because boredom was the predominant emotion of those that students selected as negatively affecting goal progress, this emotion was included in the analyses on its own. Despite its apparent importance, however, boredom did not significantly correlate with goal attainment at any time. There may be different reasons for this. For example, it could be the strategies students were using to counteract their boredom were effective. When boredom was selected as negatively affecting goal progress, students often reported employing task/goal management strategies (e.g., breaking the task into smaller chunks and taking breaks) and task engagement strategies (e.g., finding ways to make the material more interesting). These appear to be reasonable methods that would facilitate goal attainment. Alternatively, it could be that boredom is a less detrimental emotion for students than the other negative emotions. Perhaps compared to boredom, emotions such as anxiety and hopelessness have a greater negative impact on progress or become more salient when students fail to achieve their goals.

Regression analyses. Because POS and NEG emotions both correlated well with goal attainment, follow-up regression analyses were performed to determine the contributions of these two variables in predicting goal attainment. These analyses revealed statistically significant multiple correlations for goal attainment at all times, with large effect sizes. Of the two variables, POS emotions had a stronger relation than NEG emotions with goal attainment. This suggests that, although much of the past research has focused on negative emotions, positive emotions are also important to consider. In this

sample of students, positive emotions appeared to be more important than negative emotions in the prediction of goal attainment.

Together, students' ratings of POS and NEG emotions accounted for approximately 53% of the variance in their ratings of goal attainment at Time 1, decreasing to 31% at Time 3. This reduction in variance suggests that students' perceptions of goal attainment became less associated with their emotions and more associated with other factors as the semester progressed. This could be an indication they were learning how to better regulate their emotions, their goal-setting, and/or their task enactment, thus making their emotions less important for goal attainment.

Changes over time. Two repeated-measures analyses were performed to investigate the change over time in goal attainment, POS emotions (enjoyment, hope, pride, and relief), NEG emotions (anger, anxiety, shame, and hopelessness), and boredom. The first, a MANOVA, assessed the combination of goal attainment, POS emotions, and NEG emotions over time. The omnibus result indicated a statistically significant change over time, but none of the variables on their own showed statistically significant changes; however, examination of the means indicated that goal attainment improved slightly. Boredom, assessed with a repeated-measures ANOVA, also did not change over time.

Pearson correlations were calculated for each achievement emotions scale between each time point. The results of this analysis indicated that students did not report their emotions in a consistent manner from one time to the next. Rather, it appears that students were reporting situational emotions related to three different goals at three different times during the semester. The repeated-measures analyses may have masked

this by averaging students' emotions at each time. As a group, students reported similar POS emotions, NEG emotions, and boredom over time, but the low correlations suggest that individual students were experiencing varying degrees of emotions at each time. This supports the notion that emotions are task- and situation-specific and therefore transient states rather than enduring personality traits (Rosenberg, 1998). From a self-regulation perspective, this is a positive sign because it means that students should have the power to change their emotions by altering the context.

Limitations

In addition to the limitations related to retrospective self-reports discussed earlier, other limitations should be acknowledged. First, because students did not attend every lab and did not always fully complete their reflections, this resulted in missing data. It would be desirable to attain a larger sample size to see if the same results occur.

Another limitation was the lack of a control group. The purpose of this study was to examine achievement emotions in the context of self-regulated learning; hence the sample of students came from a course on self-regulated learning. Without a sample of students not enrolled in the course, it is difficult to say if the findings in this study were unique to this group of students. Future research should therefore include students outside of ED-D 101 to attain a more thorough understanding of the effects of self-regulated learning.

Much of the data in this study was analyzed across participants. Although this method is important for revealing general trends and patterns, it may also have the undesirable effect of obscuring important differences among patterns within individuals. As Pekrun (2006) notes, one of the issues with measuring emotions is that correlating

variables across participants makes it difficult to determine the processes occurring within individuals. Thus, examining individual profiles may be more revealing than looking at grouped data. Moreover, it may be that assessing emotions through retrospective reports at only three points in time over the course of an entire semester does not capture the true fluctuations and adaptations that are occurring within these students. Future studies might follow individual students who experience particularly undesirable emotions or examine particular incidents during which students experience strong emotions. This type of research may reveal more about how emotions relate to students' progress as well as how students respond to their emotions at an individual level.

A final limitation to this study was that students were provided with a list of discrete emotions and asked to rate the intensity of these emotions; however, it is not clear if all students interpreted the emotion labels in a similar way. Thus, future research should attempt to discover what students are thinking about when they rate an emotion to enhance the validity of the measures.

Contributions to Theory, Research, and Practice

Despite some of the limitations to this study, the findings offer valuable information for theory, research, and practice. In terms of theory, this study makes a contribution to the research on emotion regulation. It was discovered that students used a variety of ER strategies that aligned to some extent with Gross's (1998) categories, but some of Gross's categories may have been too broad to reveal important differences among strategies in this sample. Furthermore, Gross's strategies were not specific to

educational contexts, whereas the categories created in this study were specifically related to studying and enacting task-specific goals.

The ER strategies also aligned with those proposed in the control-value theory (Pekrun et al., 2007) and those described by Schutz and Davis (2000). Both sets of strategies are similar to each other and to those proposed by Gross (1998), but they are specific to academic contexts unlike Gross's strategies. For example, Pekrun et al. described strategies to alter one's academic competences through the use of learning strategies. In the present study, this is similar to the categories of mastering content (focus on learning or understanding the content in order to change the emotion) and task engagement (alter task enactment by using different strategies). Schutz and Davis described strategies that included attempts to gain, maintain, or regain focus on the task, which is similar to the category of task focus (focus on the task rather than emotion) in the present study. Thus, the strategies generated in the present study support and expand upon those proposed in the literature.

According to control-value theory (e.g. Pekrun, 2006; Pekrun et al., 2002), emotions can be separated into four categories using the dimensions of valence and activation, with specific outcomes associated with one or more of the resulting categories. For example, hopelessness and boredom fall under the category of negative deactivating and it is assumed that these relate to lower performance because the individual is not motivated to act. On the other hand, anger and anxiety are considered to be negative activating emotions. Because these emotions are activating, it is assumed that they may negatively impact performance or, alternatively, motivate the individual to act, potentially resulting in higher performance. In the present study, a scale analysis

indicated no distinction among emotions along the dimension of activation. Relief, a positive deactivating emotion, fit well with the positive activating emotions of enjoyment, hope, and pride. Hopelessness, a negative deactivating emotion, fit well with the negative activating emotions of anger, anxiety, and shame. Boredom, on the other hand, did not fit well with any of the other negative emotions. Moreover, whereas the group of positive emotions and the group of negative emotions correlated with goal attainment, boredom had a weak correlation. These findings suggest that the dimensions used in the control-value theory might need to be revised. However, as this was an exploratory study, more research should be conducted to support this.

With respect to theory about self-regulated learning and Winne and Hadwin's (1998, 2008) model in particular, results of the correlation and regression analyses support the notion that students' emotions play a role in the SRL cycle. Winne and Hadwin (2008) suggest that affect can be either a condition, influencing phases in the model, or a product, resulting from phases in the model. Although it cannot be determined from the data if students' achievement emotions were conditions or products, this study provides evidence that emotions relate to the goal enactment phase of the model. Specifically, students' goal-related emotions were tied to their self-evaluations of goal attainment, which together might lead to subsequent self-regulatory actions. Whether students' emotions contributed to or resulted from their evaluations, this is a good indication that emotions are connected to the cycle. Further research should attempt to better determine the nature of the relations among students' goals, the emotions they experience, and their ability to attain their goals. By obtaining real-time data rather than retrospective data, the causal effects of these different variables might be better

understood and the role of emotions in relations to other processes in the SRL cycle might be elucidated.

As this was an exploratory study, it provides a starting point for future research in this area. In particular, the methods employed in this study can inform the creation of subsequent instruments used for both instructional and research purposes. For instance, one important next step will be to determine how effective students' strategies are in regulating their emotions and accomplishing their tasks. This would be informative not only for research but also for students by helping them to monitor and evaluate their actions.

The data in this study consisted of authentic examples of strategies students use to address emotion-related challenges while studying. With further research in this area, this data might be used to (a) develop teaching modules for students to help them strategically regulate their emotions and (b) provide methods to instructors for the promotion of emotion regulation in any course. This study has been an important first step in a program of research and practice that may help students to attain greater academic success and persist in their education.

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Appendix A

Reflection Containing Achievement Emotions Questions

THINK ABOUT LAST WEEK

1. What goal did you set in your reflection last week? (You can copy and paste from last week's reflection.)

2. How successful were you in achieving your goal from last week? On a scale from 1 to 10, I was... ***(1 = Not very successful to 10 = Very successful)***

3. How did you feel while trying to accomplish your goal last week? Please indicate your rating for ALL of the emotions listed below.

On a scale from 1 to 10, I felt... ***(1 = Not at all to 10 = Extremely)***

a. Enjoyment:
b. Hope:
c. Pride:
d. Relief:
e. Anger:
f. Anxiety:
g. Shame:
h. Hopelessness:
i. Boredom:
j. Other (specify):

4. Select one feeling from above that negatively affected progress toward your goal.

5. How much did that feeling negatively affect your progress? On a scale from 1 to 10, this feeling had... ***(1 = Very little effect to 10 = Extremely negative effect)***

6. How did that feeling affect your motivation to accomplish your goal? On a scale from 1 to 10, this feeling had... ***(1 = Very little effect to 10 = Extremely negative effect)***

7. What did you try to do to change that feeling?

8. What could you try to do next time you experience that feeling?

THINK ABOUT THIS WEEK

8. Name one specific task (e.g. a reading, an assignment, studying, etc.) to focus on this week.

9. Set one good goal for the task you have chosen.

10. What is your goal about? Choose one from the list below (put an X beside it).

a. Learning
b. Behaviour
c. Motivation
d. Feelings
e. Time management/organization

11. How challenging or difficult do you think your goal is this week? On a scale from 1 to 10, my goal is... ***(1 = Not very challenging to 10 = Very challenging)***

12. How confident are you that you will accomplish your goal this week? On a scale from 1 to 10, I am... ***(1 = Not very confident to 10 = Very confident)***

Appendix B

Participant Consent Form

Participant Consent Form

Department of Educational Psychology & Leadership Studies

Technology Integration and Evaluation Research Lab

Evaluating Student Learning and the ED-D101 Course

You are invited to participate in a study entitled *Evaluating Student Learning and the ED-D 101* course that is being conducted by Dr. Allyson Hadwin (Principal Investigator). Dr. Hadwin is a Faculty member in the department of Educational Psychology and Leadership Studies at the University of Victoria. This research is being funded by the Social Sciences and Humanities Research Council of Canada (SSHRC-INE grant), the University of Victoria (LTCDG), and the Canadian Foundation for Innovation (CFI-LOF).

Purpose, Objectives, and Importance of Research

This research project will examine: (a) how students who have taken ED-D101 compare with students who have not according to standard performance indicators collected by Institutional Planning and Analysis, (b) how students self-regulate their learning and use of strategies during the course. Research of this type is important because it will inform: (a) evidence based decision making regarding future offerings, expansion of the course, course content and course activities, and (b) advance theory and research in educational psychology by informing understandings about how students learn to strategically regulate their learning over time.

What does participation in this study involve?

You are being asked to participate in this study because you are enrolled in the course ED-D 101: Learning strategies for University success. All data examined in this research are part of your regular course activities. We are requesting permission only to analyze and review this data for research purposes after the course is completed and your final grades have been submitted. If you agree to voluntarily participate in this research, your participation will include allowing us to analyze for research purposes:

- information you produce as part of your regular course activities (e.g., self-assessment questionnaires, written assignments, computer based discussions)
- course based studying activities when using Moodle and nStudy software to complete course readings and assignments, provided you have agreed to have that information recorded when you first login to use the software
- institutionally collected performance indicators such as entering GPA, yearly GPA, exit surveys, will be examined for the entirety of your undergraduate degree. Data will be made anonymous.

Risks and Benefits

There are no known or anticipated risks to participating in this research. By participating in this research, you will provide invaluable information that will be used to improve the course and its value for future undergraduate students. The potential benefit is that this course evaluation will lead to: (a) improving the course design, (b) making evidence-based decisions about the future of the course, and (c) improving our understandings about how students learn to self-regulate their learning over the course of a semester.

Voluntary Participation

Your participation in this research must be completely voluntary. If you do decide to participate, you may withdraw at the end of the course without any consequences. Consent forms will be made available in paper copy at the beginning of the course, and electronically at the end of the course. At the end of the course you can login in to either add consent that you did not provide at the beginning of the course, or withdraw consent. When you use the software for this course for the first time, you will be asked to indicate if it is ok to record your studying actions. This

type of data is used in usability testing and for researching how students use the software to learn. If you do not consent to participate in the research study by signing this form, we will not access or use any logged data for research purposes. It may only be examined to make improvements to the software.

Anonymity and Confidentiality
Since data consists of course assignments and activities, they will be saved/recorded with identifying information (your name and student number). Therefore data will not be anonymous. However, we will protect confidentiality in the following ways: (1) Data will be summarized and stored in a spreadsheet that will identify participants by a random case number rather than name or student ID. (2) Data reported in publications and presentations will be: (a) summarized across students, or (b) presented using pseudonyms in cases where specific examples are used.

Researcher's Relationship with Participants
Mariel Miller is your course instructor so she will leave the room when you complete the consent forms. Consent forms will be placed in a sealed envelope and delivered directly to the Dean of Education's office where they will be kept until your instructor has submitted your final course grades. Therefore, your instructor will not know if you have or have not consented to participate in the research until she is no longer your course instructor.

Analysis of Data and Dissemination of Results
Data will be analyzed by Dr. Hadwin and collaborators on her research project. Findings from this study will be shared in academic publications and presentations, a web bulletin on the TIE website, graduate student thesis work, and reports to senior administrators and undergraduate instructors. Examples from student work will be used in future ED-D101 course offerings but all identifying information will be removed from those examples.

Disposal of Data
Data from this study will be kept for approximately 10 years as it is part of a longitudinal evaluation of the ED-D101 course and its influence on student performance at University. Paper based data will be stored in a locked filing cabinet in the TIE research lab (A210D MacLaurin) after which it will be shredded. Electronic data will be archived and stored anonymously on a password protected server accessible to the researchers. After approximately 10 years the electronic files will be erased.

Contacts
You may contact the following people if you have further questions, comments, concerns or wish to verify information about the study:
During the course: Dr. Allyson Hadwin (hadwin@uvic.ca), or Dr. Ted Riecken (deaneduc@uvic.ca)
After the course: Dr. Allyson Hadwin (hadwin@uvic.ca)
Human Research Ethics Office at the University of Victoria (250-472-4545 or ethics@uvic.ca).

Your signature below indicates that you understand the above conditions of participation in this study and that you have had the opportunity to have your questions answered by the researchers.

_____	_____	_____
Name of Participant	*Signature*	*Date*

I am willing to be contacted for a follow up interview after the completion of the course and can be contacted as follows:

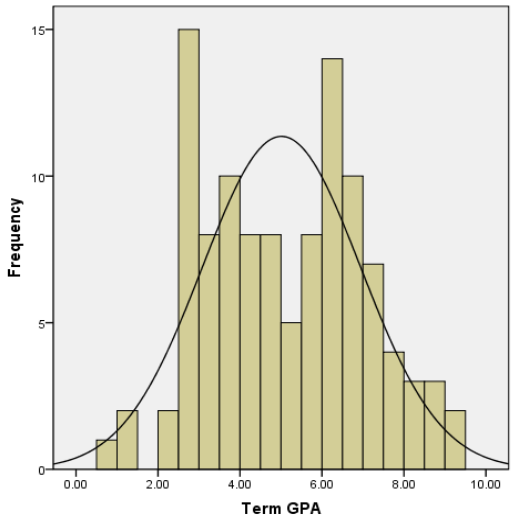
Email: _____

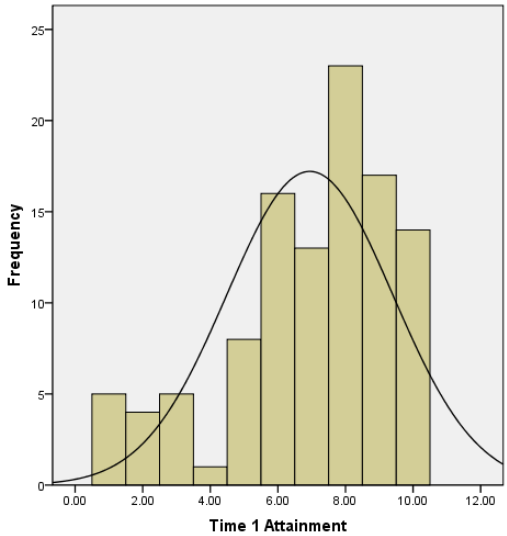
Phone: _____

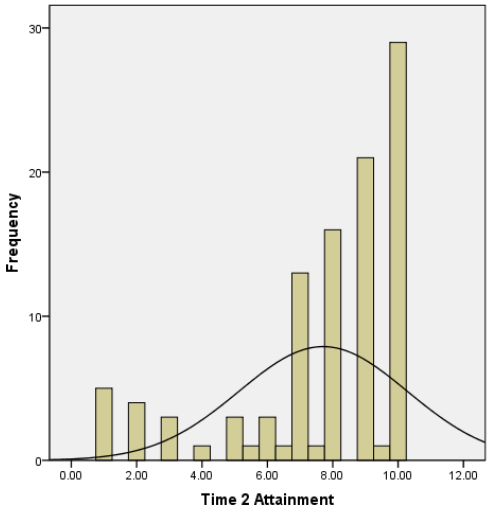
A copy of this consent will be emailed to you and a paper copy will be taken by the researcher.

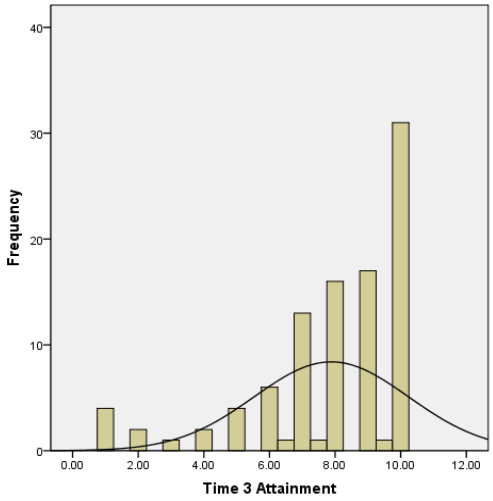
Appendix C

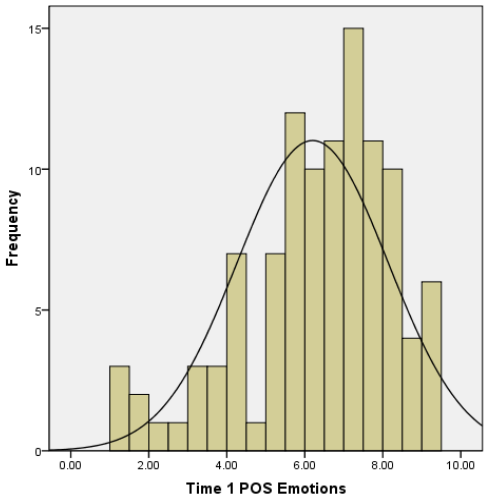
Histograms for Major Variables

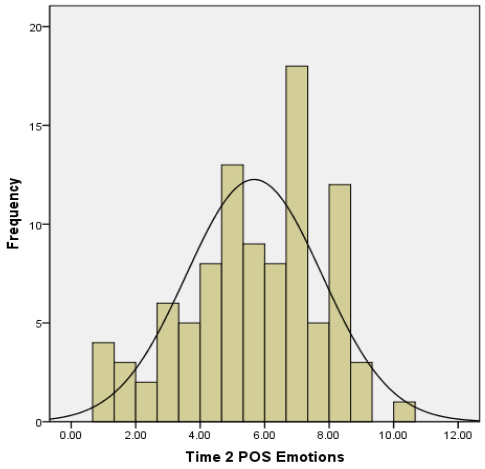


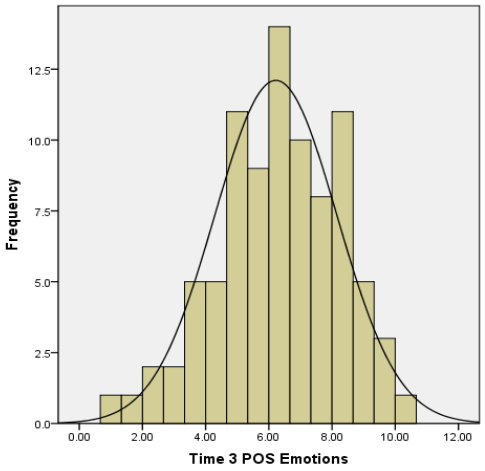


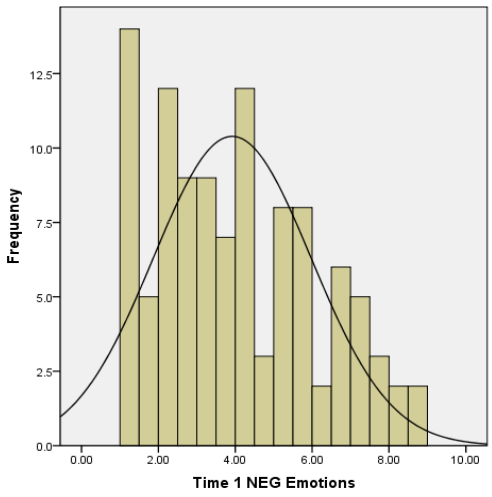


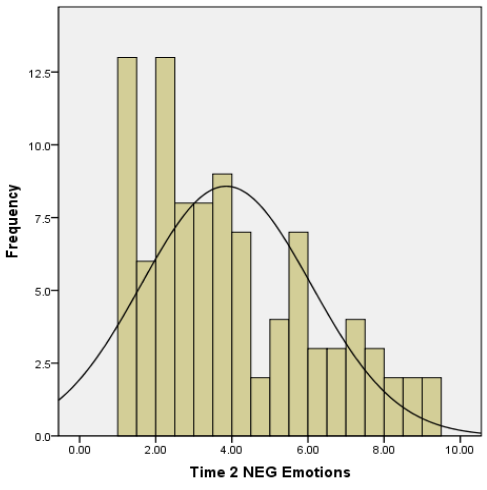

Frequency
Time 3 Attainment

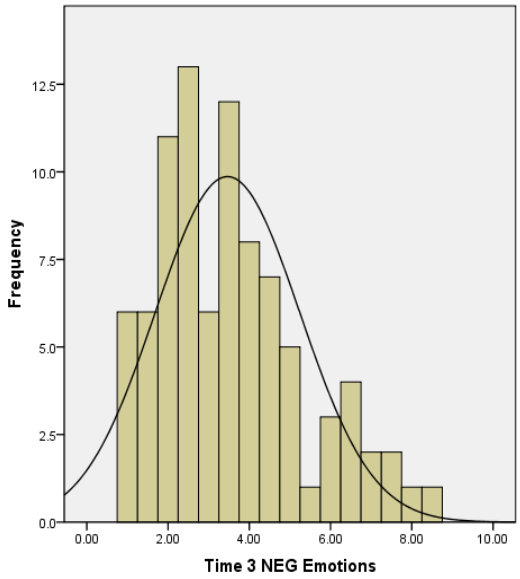

Frequency
Time 1 POS Emotions

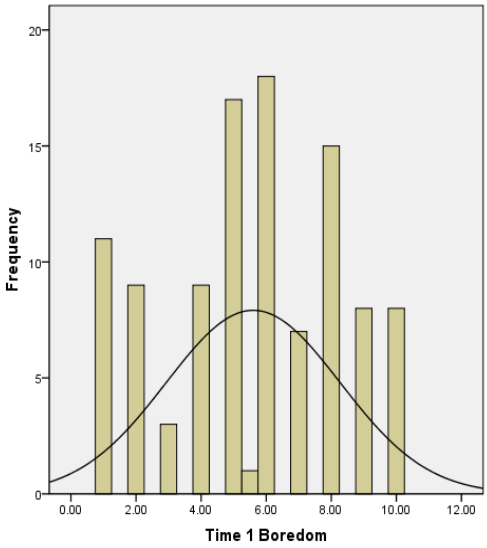

Frequency
Time 2 POS Emotions

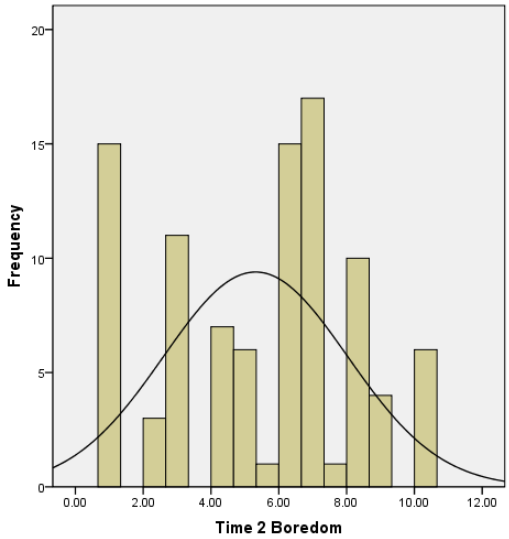

Frequency
Time 3 POS Emotions

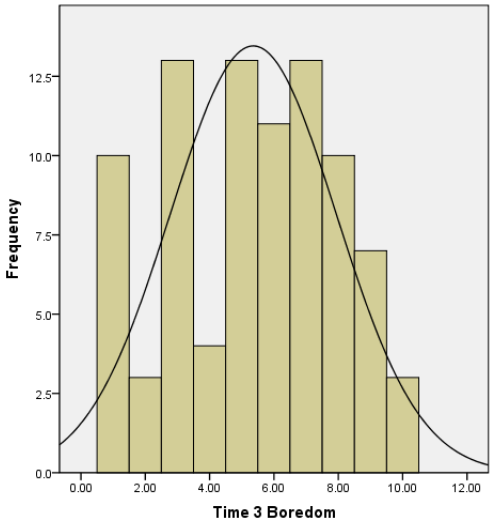

Frequency
Time 1 NEG Emotions


Frequency
Time 2 NEG Emotions


Frequency
Time 3 NEG Emotions

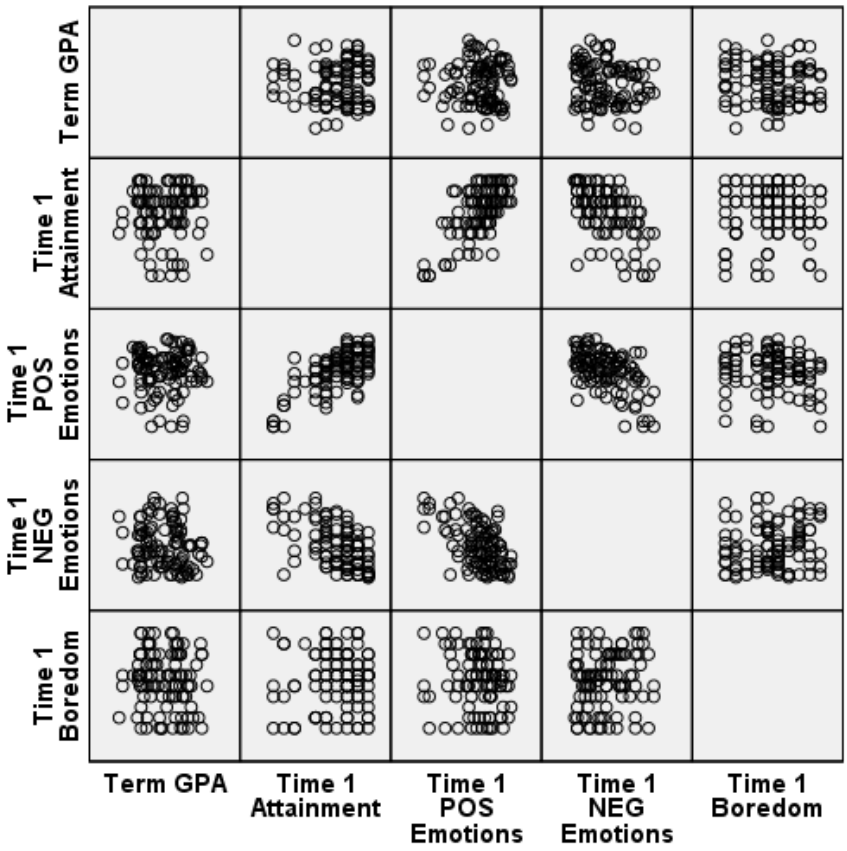

Frequency
Time 1 Boredom

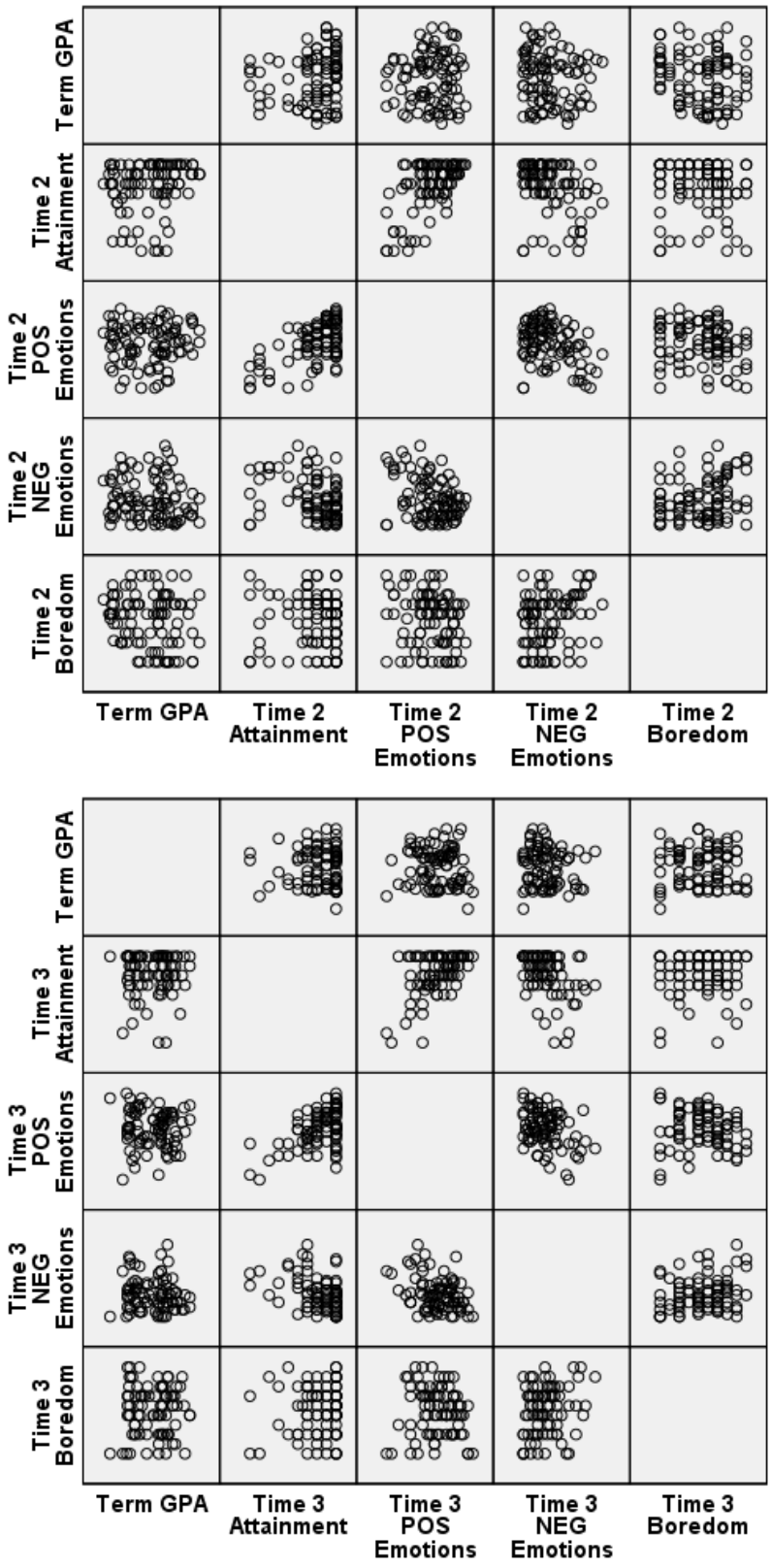

Frequency
Time 2 Boredom


Frequency
Time 3 Boredom

Appendix D

Bivariate Scatterplots for Major Variables




Term GPA
Time 2 Attainment
Time 2 POS Emotions
Time 2 NEG Emotions
Time 2 Boredom
Term GPA
Time 2 Attainment
Time 2 POS Emotions
Time 2 NEG Emotions
Time 2 Boredom
Term GPA
Time 3 Attainment
Time 3 POS Emotions
Time 3 NEG Emotions
Time 3 Boredom
Term GPA
Time 3 Attainment
Time 3 POS Emotions
Time 3 NEG Emotions
Time 3 Boredom