

The Regulatory Capacities of Motivational Constructs: An Examination of  
Academic Motivation and Self-Regulation Toward Academic Success in  
Favorite and Least Favorite Classes

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Dissertation submitted in partial fulfillment of  
the requirements for the degree of Doctor of Philosophy in the Department of  
Psychology and Neuroscience in the Graduate School  
of Duke University

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ABSTRACT

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## **Abstract**

One-hundred and seventy-seven high school students and two-hundred and seventy college students responded to a survey assessing their motivation (goal orientations, expectancies, and values), self-regulation (cognitive, behavioral, and emotional), and academic outcomes (learning processes, academic behaviors, and achievement) in their favorite and least favorite classes. Variable- and person-centered analyses were used to examine multiple pathways to academic success. Overall, as hypothesized, more mediational relations occurred for college students than for high school students. First, variable-centered structural equation modeling was used to examine whether motivation activates self-regulation, which in turn leads to academic outcomes. As hypothesized, the findings support the stance that there are different ways to achieve academic success. Behavior regulation (time planning and environmental regulation) mediated the relations of motivation to learning processes and academic behaviors substantially more for college students than for high school students, though motivation was related to achievement via time planning only for high school students. Surprisingly, motivation was related to emotion regulation in favorite classes more than in least favorite classes, which in turn led to a variety of academic outcomes. In order to capture the multidimensional nature of self-regulation, person-centered analyses investigated how self-regulation capacities combine into profiles using latent class analyses. The findings support the hypothesis that

self-regulation combines into profiles, and that these profiles mediate the relations between motivation and academic outcomes. There was evidence that regulatory profiles differ between high school and college, although for both age groups there was a High Regulation Class and similar specialized regulatory profiles included an Attention Regulation Class and Emotion Regulation (combined reappraisal, rumination, and suppression) or Rumination Class. A Behavior Regulation Class emerged only for college students. Importantly, the profiles that emerged mediated the relations between motivation and academic outcomes. Theoretical implication and support for the Regulatory Capacities of Motivational Constructs model are discussed, as well as practical applications.

## **Dedication**

To my husband, Guy, for giving me wings.

To my kids, Libby and Uria, for showing me that the sky is the limit.

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# 1. Introduction

Regulation is at the heart of the individual's ability to engage, persist, and complete tasks. The ability to adjust and monitor behaviors, cognitions, and emotions related to the task at hand influence successful task completion. Within academic settings, self-regulation has been examined as a determinant of behavior and achievement [Pintrich, 2000; Zimmerman, 1989; Zimmerman, 2006]. A separate line of research has examined motivation as an instigator of actions towards achieving tasks [Atkinson & Birch, 1978]. This approach to motivation was applied to social-cognitive motivational constructs that influence task engagement and completion in achievement settings [Atkinson, 1964; Dweck & Leggett, 1988; Eccles et al., 1983]. There has also been some research on the relations between motivation and self-regulation and subsequent outcomes [Corno, 2001; Kuhl, 1985]. Researchers have examined how cognitive regulation relates to academic outcomes [Pintrich & Garcia, 1991] and theorized about the role that behavior regulation [Pintrich, 2000] and emotion regulation [Tyson, Linnenbrink-Garcia, & Hill, 2009] play in predicting academic outcomes. The present work builds and extends these lines of research by proposing a model of the Regulatory Capacities of Motivational Constructs (RCMC).

According to RCMC (see Figure 1), motivation is thought to activate task-specific self-regulation. Thus, it is important to distinguish between general or trait self-regulation, which refers to a pervasive form of self-regulation that is somewhat stable

across situations, and situation or task-specific self-regulation, situated within the specific context [Baumeister & Vohs, 2004; Boekaerts, Pintrich, & Zeidner, 2000; Hoyle, 2010; Pintrich, 2000; Zimmerman, 1989, 2006]. According to RCMC, task-specific motivational constructs are proposed to activate task-specific self-regulation (i.e., self-regulated learning). As depicted in Figure 1, motivational constructs set self-regulatory capacities in motion [Corno, 1989]. These are maintained through volitional processes [Kuhl, 1984]. When a distracting event occurs, whether internal or external, the quality and quantity of re-engagement is determined by motivation that sets in motion self-regulated learning. This process may occur over an extremely short (e.g., seconds) or long (e.g., months) period of time. However, it is proposed that these dynamics determine achievement outcomes.

Thinking about these processes, it is important to consider different contexts such as specific course subjects (e.g., English or math) or broader contexts such as favorite versus least favorite classes. Prior research has generally focused on examining motivation and self-regulation processes in specific school subjects such as math, English, art, and sports [Eccles, Wigfield, Harold, & Blumenfeld, 1993; Eccles, Wigfield, & Schiefele, 1998; Schunk, Pintrich, & Meece, 2008; Wigfield & Eccles, 2000]. The findings point to important differences in specific domains, such as math versus art [Eccles, Wigfield, Harold, & Blumenfeld, 1993; Eccles, Wigfield, & Schiefele, 1998; Schunk et al., 2008; Wigfield & Eccles, 2000]. However, these studies did not consider

whether students like or dislike the classes they were in. That is, goal orientations, expectancies, and values were considered as they relate to these specific subjects across the board, in relation to gender or different age groups, without any recognition that students who dislike a class might be less motivated and, as a result, require more regulation than those who like the class. The current study builds on previous work considering domain-specific motivation and self-regulation, by further probing for differences in motivation, self-regulation, and related outcomes based on preference. For instance, students who consider math their favorite subject may be motivated and require less self-regulation to succeed than students who consider math their least favorite subject. This is in line with research that suggests that situational demands can influence both motivation and patterns of cognition, affect, and behavior [Ames & Archer, 1988]. It also coincides with studies examining how control and values influence emotions, self-regulation, and other achievement outcomes [Pekrun, 2006; Shell & Husman, 2008]. Students may feel they have more control over situations they prefer than those they dislike. In order to unpack the different relations between motivation and self-regulation, the current study asked students to situate themselves within their favorite and least favorite classes. This approach allows within person comparison of the relation between motivation and self-regulation to subsequent outcomes.

Self-regulation may also be influenced by experience and expertise. While adolescents have developed self-regulatory capacities, they may be considered novice

regulators [Pintrich & Zusho, 2002] as they have relatively little experience harnessing these capacities. On the other hand, young adults are thought to have acquired not only the necessary capacities but the relevant experiences to facilitate higher expertise. College students are considered more expert than high school students in their ability to regulate, as they have had to draw on their regulatory capacities and utilize them more than high school students. In the current study, these different levels of expertise are examined by considering both high school and college students.

Finally, the current study employs a broad lens to examine social-cognitive constructs of academic motivation, drawing from both expectancy-value theory [Eccles et al., 1983] and goal orientation theory [Dweck & Leggett, 1988]. Each theory was developed from a different line of research and taps into disparate motivational constructs. Consideration of these different components affords a holistic approach to the individual, considering the dynamics among these different motivational constructs. This approach is also in line with current work underscoring the importance of considering the interplay among motivational constructs across theories [Hulleman, Schragar, Bodmann, & Harackiewicz, 2010; Shell & Husman, 2008; Wigfield & Cambria, 2010]. Similarly, self-regulation is also conceptualized by building on research about broad and task-specific constructs of academic self-regulated learning [Pintrich, 2000; Zimmerman, 1989] and extending them to include self-regulated emotions. In sum, the current work aims to capture the full breadth and dynamics within a broad array of

processes. Toward this goal, two motivational theories are used to conceptualize achievement motivation, and three forms of self-regulation are considered.

To provide the background for this work, I review two motivational theories, Goal Theory and Expectancy-Value Theory, which comprise seven motivational constructs that are used to examine different aspects of motivation. I also extend the current self-regulated learning framework to include self-regulated emotions. I use this broader framework of self-regulated cognitions, behaviors, and emotions to examine how motivational constructs relate to academic outcomes (learning processes, academic behaviors, and achievement) via different forms of self-regulation. I employ a two-pronged approach for examining the complex relations between motivation and self-regulation toward academic outcomes. First, variable-centered analyses are used to examine different pathways through which self-regulation mediates the relations between motivation and academic outcomes. Second, person-centered analyses are used to group participants into self-regulation profiles, which are proposed to mediate the relations between motivation and academic outcomes. By employing these two sets of analyses, I attempt to elucidate the complex nature of these multiple constructs in high school and college students in their favorite and least favorite classes.

## **2. Theoretical Background**

In this section, I review the literature on academic motivation and self-regulation using a social-cognitive approach. Specifically, two theories of academic motivation are reviewed: achievement goal theory and expectancy-value theory. Each theory grew from a different tradition of academic motivation, thus contributing independent approaches to motivation [Wigfield & Cambria, 2010]. Theories of expectancy-value in achievement motivation focus on the self-evaluations of one's abilities to succeed or fail in the domain or task at hand, as well as valuation of the task [Atkinson, 1964; Eccles et al., 1983; Wigfield & Eccles, 2000]. Goal orientations are the reasons or purpose students have for engaging in the task [Dweck & Legget, 1988]. These motivational constructs are proposed to activate self-regulation. The framework used to examine self-regulation in this paper integrates self-regulated emotion and behavior into the already established cognitive self-regulation [Zimmerman, 1989, 2006]. Finally, these theories of motivation and self-regulation are integrated and developed into the proposed model of motivated self-regulation (Regulatory Capacities of Motivational Constructs - RCMC).

### ***2.1 Expectancy-Value Theory***

Expectancy-value theory grew from Atkinson's recognition that expectancies for success and task value (incentive value) influence individuals' persistence, choices, and achievement [Schunk et al., 2008]. Initially, Atkinson (1964) considered expectancies and value as inversely related in determining the tendency to succeed or fail. As such,

evaluation of one could be deduced from the value of the other. Research by Eccles and others [Battle, 1966; Eccles & Wigfield, 1995] extended Atkinson's theory emphasizing expectancies for success and task value as distinct constructs that influence task related achievement and processes. Contrary to Atkinson, Eccles and her colleagues [Eccles & Wigfield, 1995; Eccles et al., 1998] found that expectancies and value are positively correlated. Eccles et al.'s modern expectancy-value theory is used here. Below I provide a more in-depth description of this theoretical approach.

### **2.1.1 Expectancies**

Expectancies refer to the learner's expectations for success or failure regarding the academic situation or task. Specifically, expectancies answer the question "Am I able to do this task?" Perceived competence, task-specific self-concept, and self-efficacy are similar to expectancies in that they capture how well one thinks one will be able to complete certain tasks [Eccles & Wigfield, 1995; Schunk et al., 2008]. More specifically, Eccles and Wigfield (1995) found that self-concept, self-perceptions of ability, and expectancies for success do not differentiate into separable factors using factor analysis. However, expectancies differ from self-esteem or self-worth, which are broader feeling-based self-evaluations. Expectancies are based on personal attributions of prior experience, cognitive evaluations of ability, and self-concept [Eccles et al., 1983; Weiner, 1985; Wigfield & Eccles, 2000] as well as task related expectations such as the difficulty of the task [Atkinson, 1964].

Additionally, attributions, task difficulty, previous experience, and situational stability influence expectancies. The situation itself is thought to influence expectancies. When there is situational stability, success generally increases expectancies while failure lowers expectancies, especially when attributions for failure are based on ability [Weiner, 1979, 1985]. Task difficulty influences the learner's expectancies as well. Task difficulty increases expectancies for failure, and as a result, students who perceive they are less capable focus on avoiding failure [Atkinson, 1964]. Expectancies may thus influence whether students are focused on learning, succeeding, or avoiding failure, and have been suggested to influence goal endorsement [Plante, O'Keefe, & Théorêt, under review].

The relations of expectancies to regulatory efforts and achievement outcomes are quite consistent. Students with high expectancies show more persistence, effort, and higher achievement [Battle, 1965, 1966; Greene, DeBacker, Ravindran, & Krows, 1999; Wigfield & Eccles, 1992]. This is more true of older students (e.g., high school and college) than younger students (e.g., elementary school) [Wigfield, Eccles, & Pintrich, 1996] since they have more experience in achievement situations. Adolescents and young adults have had more opportunity than younger children to experience failure after lower expectations for success. Older students have likely consolidated an understanding of the predictive value in expectancies. As a result, they may also persist

less, knowing that their effort may not result in success; therefore, more expectancies result in more persistence, which in turn leads to higher achievement.

### **2.1.2 Value**

The second component of expectancy-value theory is value. The value of the task is related to the question “Why do I want to do this task?” The value of an academic situation or task is determined by the characteristics of the task and by the person’s goals, needs, and values [Eccles et al., 1983]. Eccles et al. [1983; Eccles & Wigfield, 1995; Wigfield & Eccles, 2000] distinguish between three kinds of values: interest/intrinsic value, attainment value, and utility value. Interest/intrinsic value refers to the affective-cognitive state of enjoyment. Attainment value refers to the importance of the task for self-identification with the academic domain. Utility value is how useful the academic task is – how it fits into a person’s future plans. These forms of task-value are illustrated in the following example of a student taking a chemistry class for completion of pre-med requirements. The interest/intrinsic value of this task is any positive emotion or curiosity that the student experiences in relation to chemistry. The attainment value of this course is reflected in the student’s belief that knowledge of chemistry is central to the student’s sense of self as a medical doctor. The utility value is that completing this course is one of the student’s entrance requirements. These three reasons for engaging in the academic activity are different, and while one can have all three, not all three need to exist for engagement to occur.

Many studies examining task value have conceptualized task-value as a composite of interest, utility, and attainment value. These studies found that a composite measure of task value was related to a variety of adaptive outcomes such as choice of classes, persistence, engagement, and achievement [Eccles et al., 1983; Wigfield & Eccles, 1992]. In examining the relations of the specific task values to academic outcomes, interest/intrinsic value has been studied the most as an independent construct. Studies on interest generally find that interest is related to adaptive achievement outcomes such as persistence and achievement. Interest has been found to be related to cognitive strategy use and to positive affect [Schiefele, 2001]. The inherent positive affect, attentiveness, and alertness drive the individual to highly engage in the task at hand that contributes to acquisition of knowledge and competence [Renninger, 2009; Schiefele, 2001]. Similarly, studies examining attainment value found that attainment value was linked with choice and persistence [Wigfield & Eccles, 1992].

Only a few studies have examined the different components of value simultaneously (e.g., attainment, utility, and interest) and considered how they differentially predict achievement outcomes. Greene et al., (1999) investigated how goals, expectancies, values, stereotypes, and gender predicted effort and achievement. They found that while expectancies were a positive predictor of achievement and effort, of the values, only interest predicted effort. Updegraff, Eccles, Barber, and O'Brien (1996) examined whether utility and interest values predicted math course enrollment,

and found that only utility predicted such enrollment. Thus, it seems there is some evidence suggesting that the different values are related to different outcomes. Thus, there are theoretical and practical benefits to considering each value separately, as certain task values might be emphasized for certain desired outcomes. The current study examined the individual contribution of each value.

## ***2.2 Achievement Goal Approach***

Similar to task value, achievement goal orientations also relate to the question “Why do I want to do this task?” Goal orientations originated from Dweck’s (1989; Dweck & Legget, 1988) implicit theories of intelligence, according to which individuals view intelligence as fixed (entity beliefs) or malleable (incremental beliefs). Dweck and her colleagues hypothesized that individuals who have entity beliefs of intelligence focus on demonstrating their competence, thus endorsing performance goal orientations. Individuals who have incremental beliefs of intelligence focus on learning and developing, endorsing mastery goal orientations.

Achievement goal orientations are social-cognitive motivational constructs that explain the reasons people have for engaging in certain activities [Dweck & Leggett, 1988]. They activate affective-behavioral-cognitive patterns that shape the type of learning students engage in, and how information is processed. According to achievement goal theory, individuals are generally focused on learning and developing (mastery or task goal orientation) or on demonstrating competence (performance or ego

goal orientation) [Ames, 1992; Dweck & Leggett, 1988; Nicholls, 1984]. Additionally, individuals may approach or avoid these goal orientations [Elliot, 1999; Elliot & McGregor, 2001; Pintrich, 2000]. For example, students either focus on demonstrating competence (performance-approach) or avoiding appearing incompetent (performance-avoidance). Similarly, students may focus on learning and developing skills (mastery-approach) or focus on not misunderstanding (mastery-avoidance) [Elliot, 1999; Pintrich, 2000]. The most commonly used model for studying achievement goal orientations is a trichotomous model [Elliot & Church, 1997], which omits mastery-avoidance goal orientations. This model is employed in the current paper.

Achievement goal orientations are found to be differentially related to academic outcomes [Linnenbrink-Garcia, Tyson, & Patall, 2008; Pintrich, 2000]. Mastery goal orientations are positively related to adaptive outcomes such as academic achievement, positive self-perceptions (e.g., academic self-efficacy and academic self-competence), adaptive help-seeking, self-regulated learning, and positive affect [Bong, 2008; Dweck & Leggett, 1988; Hulleman et al., 2010; Levy-Tossman, Kaplan, & Assor, 2007; Middleton, Kaplan, & Midgley, 2004; Middleton & Midgley, 1997; Pintrich, 2000; Pintrich & Garcia, 1991; Pintrich & Schunk, 1996; Ryan, Hicks, & Midgley, 1997; Shim, Ryan, & Anderson, 2008]. Performance-avoidance goal orientations are consistently linked to maladaptive outcomes such as fear of failure, low competence expectations, procrastination, avoidance of help-seeking, maladaptive patterns of learning, and low achievement and

are negatively related to persistence [Hulleman et al., 2010; Middleton & Midgley, 1997; Ryan et al., 1997; Wolters, 2004]. The findings for performance-approach goal orientations are less consistent; they are either positively, negatively, or unrelated to adaptive and maladaptive outcomes and processes such as persistence, effort, achievement, and avoidance of help-seeking and threat associated with help seeking [Bong, 2008; Harackiewicz, Barron, Pintrich, Elliot, & Thrash, 2002; Hulleman et al., 2010; Linnenbrink-Garcia et al., 2008; Middleton et al., 2004; Middleton & Midgley, 1997; Midgley, Kaplan, & Middleton, 2001; Pintrich, 2000; Pintrich & Garcia, 1991; Ryan et al., 1997; Ryan & Shim, 2008; Wolters, 2004]. Most of these studies examined how goal orientations relate to subsequent outcomes in isolation, without integrating other motivational constructs. The current study crosses this barrier by considering both goal orientations and expectancy-value constructs.

### ***2.3 Inter-relations between Motivational Constructs***

Motivational constructs are thought to be interrelated in different ways. These different approaches to the relations among motivation constructs are considered to be in competition [Plante et al., under review]. However, in RCMC, it is proposed that at any given time, depending on the individual and the context, any of these relations may hold. Therefore, it is important to situate examination of these relations within a specific context, and not necessarily think about them as general relations that occur across situations, individuals, or domains. For example, it might be that for certain individuals

in certain contexts, goal orientations lead to expectancies and values in math [Eccles et al., 1983], while for other individuals expectancies and values lead to goal orientations [Greene et al., 1999]. Critically, these relations would depend on whether math was perceived as a liked or disliked class. For students who like math, interest/intrinsic value might lead to goal orientation endorsement, while for those who dislike math, performance goal orientations might be a stronger predictor of self-regulation and subsequent outcome. Thus, a third approach posits that at any given moment, all of these motivational constructs function in concert, so that each could contribute to self-regulation independently of the others. As such, three main relations between motivational constructs may occur: 1) goals lead to expectancies and values; 2) expectancies and values lead to goals; 3) all motivation constructs function in concert.

In the current study motivational constructs are examined as they function in concert. That is, motivation constructs do not mediate or moderate each other, but function in a constant ebb and flow with each other. At one moment goal orientations might be dominant, while in the following moment expectancies might be more salient [Shah, Hall, & Leander, 2009]. The saliency of motivational constructs changes depending on the instantaneous dynamics of the task and the motivation to continue engagement with the task. These oscillating relations are especially ubiquitous in tasks that require an unprecedented amount of time, such as a novel task or a long term paper. While students might have a good idea of the amount of time such a task might

demand, the long-term nature of these tasks might lead to fatigue, depletion of resources, or boredom that require motivation to reestablish regulation more often than tasks with an evident time limit, such as class attendance. Thus, within a class subject over a longer period of time and across tasks, motivation is thought to work in concert such that lower levels of one form of motivation (e.g., utility) might be buffered by a higher level of another form of motivation (e.g., mastery goal orientations). Students with higher levels of multiple forms of motivation would be more resilient to decrements in motivation and, as a result, be better able to regulate towards successful completion.

### **2.3.1 Development**

By the time adolescents are in high school, the development of academic motivation seems to have somewhat stabilized. As children become adolescents and young adults, their ability to understand, interpret, and learn from the situation is enhanced [Kopp, 1989; Wellman & Liu, 2004]. These abilities also influence self- and other-awareness that determine self-beliefs and the saliency of others' performance. By adolescence, learners are thought to have developed relatively accurate self-perceptions (e.g., expectancies) [Nicholls, 1979], which are related to declines in domain-specific value, ability-related beliefs, and mastery goal orientations [Hidi, Renninger, & Krapp, 2004; Linnenbrink-Garcia & Fredricks, 2007; Parsons & Ruble, 1977; Wigfield & Eccles, 2000]. By high school motivation is generally thought to be stable. The peer group also

becomes important for adolescents, and this continues as high school students transition to college.

The described developmental changes make non-academic factors in school and outside of school more salient. As a result, academic work is threatened by competing demands. Therefore, older children and adolescents require the use of self-regulation to a greater extent in order for adaptive learning to occur. This is presumed to be even more pronounced for college students.

## ***2.4 Self-Regulation***

The current work proposes that there are two forms of self-regulation. One is general self-regulation and can be thought of as broad regulatory processes, dispositions, or traits that influence cognitions, behaviors, and emotions. The second form of self-regulation is task-specific and includes self-regulatory capacities that are aimed at adjusting and monitoring affect, behaviors, and cognitions related to specific tasks. This more specific self-regulation facilitates task related achievements (e.g., task completion or memory) and is the focus of the current study. In academic settings, this second type of task-specific self-regulation has been referred to as “self-regulated learning” [Pintrich, 2000; Zimmerman, 1989].

Many definitions of self-regulation have been proposed, all of which emphasize that individuals strive to maintain optimal levels of functioning [Baumeister & Vohs, 2004; Boekaerts, Pintrich, & Zeidner, 2000; Hoyle, 2010]. In all of these definitions,

individuals are thought to self-regulate by monitoring and adjusting behaviors, cognitions, and affect. Planning has also been included as part of self-regulation, however, it is not necessary for self-regulation to occur. At the same time, planning plays an important role for certain types of cognitive and behavioral self-regulation (e.g., metacognition and time planning, respectively). These forms of self-regulated behaviors and cognitions have been extensively studied. The current study maintains the distinction between self-regulated behaviors and cognitions, while building on and extending previous research. It adds self-regulated emotion to the well-established self-regulated cognition and behavior frameworks. In addition, considering each form of self-regulation allows for understanding and unpacking the different components of self-regulation [Snow, Corno, & Jackson, 1996], though affective, behavioral, and cognitive self-regulation are interrelated. Finally, these forms of specific regulation are differentiated from broader forms of self-regulation such as self-control [Hoyle, 2010; Tangney, Baumeister, & Boone, 2004].

Self-control is different from the more specific self-regulated processes in that it does not aim to adjust specific processes, but is focused on a more general all-encompassing regulatory capacity [Muraven, Shmueli, & Burkley, 2006; Tangney et al., 2004]. Self-control refers to the ability to inhibit or override certain desires, behaviors, or processes that would otherwise interfere with achieving the desired outcome [Muraven et al., 2006]. Like other self-regulation capacities, self-control is especially important in

educational contexts as students experience the ebb and flow of non-task related emotions, cognitions, and behaviors prior to and during task engagement. In examining self-control and academic achievement in college undergraduate students, self-control was positively related to grade point average [Tangney et al., 2004]. This suggests that self-control is important in determining students' persistence on the academic task despite distractions. More specific forms of self-regulation are thought to be just as important, if not more so. These forms of self-regulation are reviewed below. I begin this section with a review of self-regulated behaviors and cognitions, and finally extend this framework to include self-regulated emotion.

### **2.4.1 Self-regulated behavior**

Self-regulated behavior has been recognized as important for achievement, as it permits monitoring and adjusting behavior [Kuhl, 1984; Pintrich, 2000; Xu, 2008; Zimmerman, 2000]. This includes behaviors that allow for an appropriate amount of time and an environment conducive to task engagement. While there are many different kinds of behavior regulation, the current study focuses on two types of self-regulated behavior: environmental regulation and time planning [Pintrich, 2000; Zimmerman, 1989, 2006].

Choosing where to study is referred to as environmental regulation, or the ability to adjust the environment to ensure optimal learning conditions [Zimmerman, 2000,

2006]. Presumably, the type or quality of environmental regulation changes as students gain more independence in college.

While environmental regulation determines where one studies, time planning influences what, when, and for how long learners engage in the different school materials [Pintrich & Garcia, 1991]. Time planning refers to allotting enough time to work on the task with respect to all of the other desired activities. Other activities might include participation in sports, spending time with friends, and family obligations. Time planning is therefore somewhat dependent on accurate identification of sub-tasks and how long each task will take. At the same time, students might need some flexibility, especially with new tasks. Therefore, monitoring and adjusting the time according to actual task progress is crucial and as such, time planning is considered a regulatory capacity.

The interlinked nature of cognitive processes and self-regulated behavior is quite evident. Individuals need to draw on cognitive processes such as accurate self-perceptions, self-reflection, and planning in order to regulate their behavior. In addition, the inter-related nature of self-regulation can lead self-regulated behavior to influence one's experienced emotions and cognitions, thus influencing self-regulated cognitions and emotions. That is, while cognitive processes are involved in determining behavioral self-regulation [Winne & Nesbit, 2010], the enacted behaviors, such as where one studies, may influence the quality and quantity of one's intrusive and adaptive

cognitions or experienced emotions. As such, behavioral regulation may influence the extent to which emotional and cognitive regulation are harnessed for successful task completion.

### **2.4.2 Self-regulated cognition**

Cognitive processes employed during task engagement have long been recognized as important. Metacognition is a highly studied and well-developed self-regulated cognition. It refers to knowledge or thoughts about any cognitive processes such as planning, goal setting, deliberate activation of prior content knowledge, strategy use, and self-instruction [Flavell, 1979; Pintrich, 2000; Winne & Nesbit, 2010; Zimmerman, 2006]. Metacognitive processes include an understanding of how cognition works, an awareness that there are different cognitive processes that facilitate task engagement, and the ability to implement a variety of processes at will. Self-monitoring and self-recording are processes that allow one to mentally track and physically record one's performance, respectively [Zimmerman, 2006]. These processes impact the accuracy of feedback loops and how subsequent behaviors and learning strategies are adjusted in order to perform the desired task. For example, a student who notices that a certain study strategy is not conducive to the task (e.g., memorizing by re-reading) can try a different strategy to facilitate the learning process (e.g., use note cards). By monitoring how this new form of rehearsal and organization influences acquisition, strategies can be readjusted as necessary. In addition, self-evaluative judgments

compare self-observed information with self and other improvement, and allow the student to adjust accordingly. Increases in these comparative processes and adjustments eventually lead to higher levels of knowledge and academic performance [Zimmerman, 2006]. The extent that the learner is aware of these processes determines the deliberate manipulation one can exert [Winne & Nesbit, 2010]. Finally, active and deliberate manipulation of encoding require some knowledge of how information is remembered.

Metacognition has been found to be positively related to academic achievement [Pintrich & De Groot, 1990]. More specifically, self-monitoring was related to deeper levels of processing the learned materials and higher levels of achievement [Lan, 1996]. The present study further examines how metacognition is related to levels of processing and engagement, academic behaviors, and achievement situated within favorite and least favorite classes. It is hypothesized that in least favorite classes, students need to be more planful and monitor their progress in comparison with favorite classes, in which these come more willingly.

It is also crucial to attend to a task while ignoring irrelevant stimuli (Cherry, 1953; Rensink, O'Regan, & Clark, 1997). Another important set of processes related to cognitive regulation is attention regulation. The ability to control and adjust attention is referred to as attention regulation and is considered crucial for task engagement. It is imperative for academic success that students harness attentional processes when necessary, whether deliberately or automatically. The proposed definition for optimal

attention regulation is characterized by the ability to refrain from elaboration of irrelevant thoughts and to refocus attention towards the task at hand. This is especially important as it is highly likely that irrelevant thoughts arise during task engagement, yet the ability to refrain from engaging and ruminating contribute to effective academic regulation. An extreme case of attention regulation occurs during a state of flow [Csikszentmihalyi, 1990], when irrelevant cognitions are automatically terminated. This automatic filtering of relevant and irrelevant stimuli can occur intentionally or automatically, as in a state of flow. While intentional attention regulation is crucial for successful task engagement and completion, many attentional capacities occur automatically. For example, selective attention, change blindness, and attention focusing [Schunk, 2004; Zimmerman, 2000] generally occur at an unconscious level yet influence task engagement. While these attentional processes have been identified as crucial for one's ability to focus on the task at hand despite distractions, to my knowledge, these have not been integrated under a general framework of attention regulation, as proposed here.

There is little research on the relations between attention regulation and academic achievement. Recently, Steinmayr, Ziegler, and Trauble (2010) examined how quality and quantity of sustained attention predicted academic achievement in German high school students. They found that levels of intelligence interacted with sustained attention such that only for students who were above medium/average verbal

intelligence higher quantity of sustained attention was related to grades in German. For students high in quality of sustained attention, numerical intelligence predicted math grades. This finding suggests that the ability to regulate attention and sustain it when necessary is crucial for academic achievement. Indeed, without attending to the learned materials or to the assignment, one cannot engage or complete the assigned task.

In thinking about attention regulation, the inter-related nature of self-regulated behavioral and cognitive learning is easily illustrated. Students who choose to study in an environment that is highly distracting are more likely to require activation of attention regulation. The distractions draw attention away from the intended tasks and therefore result in the need for more activation of attention regulation. This might also occur in obligatory or disliked classes. Students who take a class that they dislike are proposed to have a harder time keeping their focus on the task at hand. In these situations it might be internal distractions (e.g., ruminative thoughts) that influence lack of attention more than external distractions in the context. As such, attention regulation is thought to be activated more in least favorite than favorite classes.

### **2.4.3 Self-regulated emotion**

Emotions are quite pervasive in their influence on behaviors and cognitions, yet little attention has been given to emotional regulation in achievement settings (e.g., Pintrich & DeGroot, 1990). Acknowledging emotions is especially relevant given recent work underscoring the importance of emotions in academic settings [Linnenbrink &

Pintrich, 2002; Meyer & Turner, 2006; Pekrun, 2006; Pekrun & Linnenbrink-Garcia, in press]. Emotions may be especially pertinent in liked versus disliked situations such as favorite and least favorite classes. In favorite classes, students might experience positive emotion before their class, or antecedent positive emotions, that facilitate in-class emotion regulation. In contrast, in least favorite classes, students likely experience negative affect prior to and during class and task engagement, so that emotion regulation is thought to be especially important for successful task completion. Importantly, emotions organize and facilitate other psychological processes such as attention and problem-solving [Cole, Marting, & Dennis, 2004]. The present framework of self-regulated learning incorporates emotional regulation by considering task-specific emotional regulation (i.e., self-regulated emotion). Specifically, of interest are processes aimed at influencing when and how emotion is expressed [Gross, 1998].

Individuals can alter their emotional responses prior to their occurrence or while experiencing the emotion by cognitive appraisals. In fact, emotion regulation is highly influenced by cognition. These cognitive processes involved in emotion regulation occur along a continuum of time [Gross & John, 2003]. Emotion regulation that occurs prior to the experience of the emotion is called antecedent-focused, while regulation that occurs while an emotion is aroused is referred to as response-focused [Gross, 1998]. Antecedent-focused emotion regulation includes behavioral regulation such as situation selection and modification, or cognitive strategies such as attention deployment,

cognitive change, or reappraisal of emotional-stimuli. All of these occur before the emotional cues have reached their fruition via the emotional inclination. Response-focused emotion regulation occurs after the emotional tendencies are triggered and the emotional response is already underway. At this point, suppression is used to inhibit emotion-expressive behaviors. Both reappraisal and suppression are perceived by the individual as successful regulation efforts, however, research suggests that adaptive emotion regulation such as reappraisal is related to adaptive emotional outcomes such as efficacy of negative mood regulation and repair, reinterpretation, authenticity, and academic achievement [Gross, 1998; Gross & John, 2003; Gumora & Arsenio, 2002].

Suppression, on the other hand, is related to undesirable characteristics such as lack of authenticity, rumination, lack of emotional clarity, and lower levels of positive emotions [Gross & John, 2003]. Thus, in general, suppression is not a desired emotion regulatory strategy and seems to contribute more to emotional instability rather than to a positive stable demeanor. In the current study, suppression and reappraisal related to academic tasks are assessed for favorite and least favorite classes in order to examine how these processes might differ when students are situated in contexts they like or dislike. Effective regulators should draw on reappraisal more in least favorite classes, while ineffective regulators will likely employ suppression strategies.

Another form of self-regulated emotion is that of rumination. Rumination refers to incessant thinking and behavioral styles in response to a sad or negative mood,

intended to remedy the situation [Morrison & O'Connor, 2008; Nolen-Hoeksema, Morrow, & Fredrickson, 1993]. However, the focus on the causes and consequences of the negative event is actually detrimental to the person, as it does not focus the person on how other activities might be beneficial in remedying the situation. In applying this to an academic setting, rumination about causes and consequences of a certain task (e.g., upcoming test) will deter the student from actually learning. This is different from planning, as it is feeling-focused and influences one's emotions. In addition, the incessant focus on emotions diverts attention from academic-related thoughts and behaviors. Kuhl (1994) recognized rumination as a form of state-orientation that inhibits individuals from taking action. Indeed, rumination is considered a maladaptive form of emotion regulation that employs cognitive strategy. Individuals who ruminate augment a negative aspect rather than down-regulate negative emotions such as anxiety and stress. A ruminative style can thus immobilize an individual because of the obsession with possible negative effects, thus contributing to a negative attentional bias and maladaptive affect, or to behaviors such as procrastination, anxiety, or depression [Nolen-Hoeksema et al., 1993]. To this end, rumination is similar to a state orientation in which one experiences an inability to escape a mode of control, and initiation of the intended behavior is difficult [Kuhl, 1994]. This maladaptive form of regulation is hypothesized to occur more in least favorite than favorite classes, in which regulation might be automatically activated.

## **2.4.5 Interrelations of self-regulation**

Self-regulated cognitions, behaviors, and emotions are highly intertwined and crucial for engagement in any activity. Over- or under-arousal of affect, behaviors, or cognitions debilitates the individual from taking actions towards accomplishing goals or tasks. Due to the interconnected nature of affective, behavioral, and cognitive processes, presumably, regulation in one domain influences the other domains [Pintrich, 2000; Pintrich & Zusho, 2002; Winne & Nesbit, 2010]. For example, affective over-arousal lures related cognitions and inhibits adaptive behaviors [Nolen-Hoeksema et al., 1993]. Alternatively, the ability to regulate intrusive or pervasive cognitions facilitates adaptive emotion regulation [Gross, 1998; Gross & John, 2003]. In a similar way, regulating behaviors contributes to adaptive cognitions and emotions [Atkinson & Birch, 1978; Zimmerman, 2006]. That is, a student who schedules time for learning predetermines that a behavioral episode will be dedicated to learning, thus reducing the likelihood of interfering cognitions and affect [Pintrich & Garcia, 1991]. In this way, self-regulation sets the stage for the ability to engage and take part in activities [Boekaerts et al., 2000; Kuhl, 1984].

Previous research has focused on the individual contribution of each regulatory capacity by examining it in isolation. While there is great importance to these individual relations, these studies overlook the multidimensionality of self-regulation. Regulatory processes are likely associated in certain ways and group together. It is important to

consider how processes jointly predict outcomes, and there is preliminary research highlighting the utility of a multi-dimensional approach [Shell & Husman, 2008]. As such, a central hypothesis of the current study is that regulatory processes combine into profiles and that this may vary by individuals and contexts. While there may be different combinations of regulatory processes, two extreme profiles are thought to emerge: effective and ineffective regulation. The effective regulation group is hypothesized to be high in all adaptive regulatory capacities, while the ineffective regulation group is hypothesized to be low in all adaptive regulatory capacities. However, it is likely that other profiles may emerge as well. For example, there might be a group of students who are adept at behavioral regulation, and only moderately effective at cognitive and affective regulation. Another profile that might emerge is one that is high in emotion regulation, moderate in cognitive regulation, and low in behavioral regulation. These groups might be effective regulators in that they have high academic achievement, engagement, and cognitive strategy use; however, the ways that they are academically successful differs. This would suggest that there are multiple pathways to achieving academic success. Thus, in the proposed study I consider how motivation is related to profiles of self-regulation, in addition to examining the relations of motivation to individual self-regulatory capacities. Finally, as discussed below, profiles are posited to differ, depending on the students' development.

## 2.4.6 Development

By adolescence, the capacity to regulate is thought to have developed. However, the fact that adolescents are able to self-regulate does not mean that they do.

Adolescents are novice regulators in the sense that they may not know the specific regulatory capacities required for certain tasks [Pintrich & Zusho, 2002]. In contrast, college students have acquired both the capacity to regulate and the expertise to do so. Presumably, there are nuanced differences between how novice high school students and expert college students regulate and how the relations between motivation and self-regulation are related to achievement outcomes.

For college students, certain regulatory capacities might play a more central role than for high school students. College students are afforded higher levels of autonomy and less structure in comparison with high school students. This increased independence requires college students to garner regulatory skills more often than high school students. These skills might be qualitatively different from younger adolescents, who are generally monitored by adults such as parents. For example, environmental regulation is posited to be more crucial for college students as they are more independent and can choose where to study, in contrast to high school students who generally live at home and do not have much choice about where to study.

In terms of how regulatory capacities might consolidate into profiles, it is expected that the profiles of effective regulators in high school and college should differ.

These profiles of effective regulation are hypothesized to mediate the relations between motivation and academic outcomes differently for college versus high school students. This may occur because high school students are constrained by their schedules, surroundings, and the autonomy afforded to them by their primary caregiver. That is, high school students have to go to school at a certain time, participate in specific after school activities, and live in a given location with spatial limitations. They have little control or choice in terms of where and when to study. As a result, they will be less able to regulate as a whole and consequently, their motivation may not predict the types of regulation measured in this study.

## ***2.5 Achievement Outcomes***

Many different achievement outcomes seem to be important indicators of academic and later career success. The foci in this study are academic achievement (grades), learning processes, academic engagement, and academic behaviors. Each of these academic outcomes has been studied in relation to goal orientations, expectancies, and/or values. However, they have not been considered in terms of how the relations between the motivation constructs influence all of these outcomes, and how the relations between motivation and self-regulation influence their attainment.

Achievement has traditionally been included as an outcome of interest because these are the standards by which students are evaluated. Achievement is thought to reflect comprehension and retention of the learned materials, as well as the potential for

future success. Additionally, achievement reflects criteria for assessments that can be incorporated into one's feedback loop for how well one is learning and progressing [Schunk, 2001]. As such, achievement can be thought of as teacher's observations.

Unlike achievement, academic engagement refers to one's commitment, focus, and persistence on a task. Academic engagement has been thought of in terms of its behavioral, emotional, and cognitive components [Fredricks, Blumenfeld, & Paris, 2004]. In the current study, engagement is conceptualized broadly as students' participation and involvement in the class as well as investment of thoughtfulness and willingness to exert effort in order to comprehend complex ideas [Assor, Kaplan, & Roth, 2002; Fredricks et al., 2004]. Without engaging in class, learning and task completion are impeded.

Related to both academic achievement and engagement are the behaviors the student employs. That is, one's behaviors are thought to be indicative of one's level of engagement and influence actual academic achievement. Specifically, indications such as the amount of time spent on classwork, how often one misses or how regularly one attends class, and whether assignments are turned in on time are thought to be behaviors especially important for academic success. Students who do not spend too much time on their classwork or who miss class regularly are likely to miss out on activities and information transmitted during class time. In the end, academic

achievement would suffer decrements as students miss out on behaviors related to their evaluations (e.g., achievement) and levels of processing the learned materials.

Academic tasks require different cognitive strategies such as memory and information processing capabilities that occur automatically or deliberately. These learning processes can be thought of as surface and deep depending on the level of cognitive engagement that they require [Pintrich & Garcia, 1991]. In general, surface processing is considered less beneficial because it involves finishing the task (e.g., reading) by focusing on facts and details through use of simple cognitive strategies such as rehearsal. Deep processing is comprised of more elaborative cognitive strategies such as paraphrasing or summarizing, identifying the author's goals, and focusing on the meaning and organization of the academic materials (e.g., text). The quality and quantity of memory is thus influenced by surface and deep processing.

The focus of the current study is on rehearsal, elaboration, and organization strategies [Pintrich & Garcia, 1991]. Rehearsal strategies refer to saying words out loud while reading or reciting items to be learned and can be done in a rather passive and unreflective manner. Rehearsal strategies help the student attend to information and keep it active in working memory; however, they are not effective in incorporating the new information into existing long-term memory. As such, rehearsal is considered a less effective form of processing.

Deeper forms of processing include elaboration and organization, and are more useful in integrating and connecting new information with previous knowledge.

Organization refers to actively interacting with the academic materials by changing its initial organization, such as selecting the main idea from the text, outlining learned materials, and/or selecting ideas from the material by specific techniques such as sketching a network or map. Elaboration refers to the different methods used to integrate and connect new information with previous knowledge. For example, paraphrasing, summarizing materials, creating analogies, explaining the learned ideas to someone else, or asking and answering questions. Deep processing (e.g., organization and elaboration) is generally related to higher levels of achievement outcomes, although recent work suggests that surface processing (e.g., rehearsal) could be beneficial for simple unchallenging tasks.

Both deep and surface processing are influenced by affective states. Affect highly influences memory processes such as initial encoding, long-term storage, and retrieval; positive affect facilitates and negative affect detracts from adaptive processing [Linnenbrink & Pintrich, 2004]. These findings underscore the importance of considering the interlinked nature of affect, behavior, and cognition and their regulation. Indeed, in academic settings, the ability to express learned information through tasks such as writing papers and taking exams is crucial [D. Schunk, 2004]. Retrieval processes that

tap into stored knowledge and coherent behavioral expression even determine how teachers evaluate the learner.

Presumably, achievement outcomes are influenced by the ability to regulate cognitive processes such as attention, behavior, and affect. Motivation is thought to impact the self-regulation that is harnessed towards these achievement outcomes. The following section ties self-regulation and motivational constructs together in presenting the proposed relations between motivation and self-regulation in academic settings.

## ***2.6 Theoretical Model and Research Questions***

### **2.6.1 The Regulatory Capacities of Motivation Constructs (RCMC) Model**

The current study is an initial examination of the Regulatory Capacities of Motivation Constructs (RCMC) Model (see Figure 1). According to RCMC, within specific contexts and tasks, motivation influences the self-regulatory capacities that are used toward task completion and related outcomes. These regulatory capacities are maintained through volition until interrupted by a distraction. This distraction could be internal (e.g., thought) or external (e.g., phone ringing). Regardless of the reason for this disruption, when a disruption occurs and self-regulation is interrupted, motivation reactivates self-regulation once the individual is ready to re-engage in the task. The motivational constructs thus determine to what extent certain self-regulatory capacities are used.

Self-regulation determines achievement, learning, and academic behaviors. Certain forms of self-regulation are more beneficial for certain outcomes. For example, behavior regulation is purported to be most influential on subsequent behaviors. On the other hand, it may be that cognitive regulation most readily influences how students process the learned materials. Motivation for the task or subject is thought to activate certain forms of regulation. A student who is focused on learning and developing as a means for high achievement (mastery goal orientation) might regulate cognitions more than one who is focused on not appearing incompetent (performance-avoidance goal orientation). Thus, while motivation may directly influence the academic outcome, it also determines the types of regulation that are activated toward accomplishing this outcome.

### **2.6.2 Relations between Motivation and Self-Regulation**

The relation between motivational constructs and task-specific self-regulation is thought to be complex and somewhat context-specific. In situating the student within the classroom, those who favor their class will not need to harness self-regulation as much as those who do not favor their class. As such, self-regulation is hypothesized to be activated by motivational processes more in least favorite classes. In both situations, whether in favorite or least favorite classes, motivation is thought to lead to similar self-regulatory activation. However, levels of motivation are presumed to be higher in favorite classes. Following is an explanation of the expected relations between each

motivational construct and self-regulatory capacities. The hypothesized relations are presented in Table 1.

#### **2.6.2.1 Expectancies**

In hypothesizing about how expectancies are related to regulation, an important finding to consider is that students who expect to do well exhibit more adaptive patterns of learning [Harter, 1988; Wigfield & Eccles, 2002]. Students high in expectancies for success experience antecedent positive affect that shapes their general approach to the task at hand. They experience fewer negative emotions, more positive emotions, are less concerned with others' performance, and are more focused on the task [Harter, 1988; Wigfield & Eccles, 2002]. Their positive outlook facilitates garnering self-regulation toward academic work, especially because of the expected reward of successful task completion. Specifically, the heightened positive affect should help prepare students to engage in the task both cognitively and behaviorally. Expectancies are hypothesized to be positively related to self-regulation, including self-regulated emotion. That is, expectancies are predicted to be negatively related to maladaptive forms of emotion regulation (rumination and suppression) and positively related to adaptive cognitive and emotion regulation (metacognition, attention regulation, and reappraisal), as presented in Table 1. However, no specific predictions are made with regard to behavior regulation, as expectancies may be positively or negatively related to behavior regulation. Students with high expectancies may highly regulate their behaviors in order

to reach their full potential. At the same time, students who expect to do well may not be as concerned with their progress because they are confident that they will succeed. As a result, these students may not allot enough time or consider where to study.

Expectancies are also posited to be positively related to academic achievement and engagement. It is not hypothesized that there will be differences between favorite and least favorite classes in terms of the valence of the relations, although expectancies may be more strongly related to self-regulation in least favorite classes. Last, expectancies are hypothesized to be related to profiles of high self-regulation.

#### **2.6.2.2 Task-value**

Task-value is also predicted to influence self-regulation. Differential relations are hypothesized for each of the three types of value, as each value is inherently distinct in a few aspects that likely influence the activation of self-regulation (Eccles et al., 1983).

First, both utility and attainment value emphasize the practical aspects of task completion, regardless of how one feels about this task. In contrast, intrinsic/interest value generates positive affect related to the task [Ainley, 2006]. Another important distinction is that attainment value emphasizes the importance of the task to the self, thus highlighting the threat one faces upon impaired completion. As a result, when attainment value is salient, maladaptive forms of self-regulation may be activated.

Utility value emphasizes the long-term importance of task completion. This focus on the

practical benefits of attainment should focus the individual on the cognitive and behavioral aspects of task completion.

While these three task values are different, they are all hypothesized to activate metacognition, attention regulation, time planning, and environment regulation as they focus the individual on the value of the task (see Table 1). The nuanced differences between the three values should emerge in emotional regulation. Specifically, while intrinsic and utility values are hypothesized to be positively related to adaptive emotion regulation (reappraisal) and negatively related to maladaptive forms of emotion regulation (suppression and rumination), attainment value may be positively or negatively related to these due to the focus on the importance of the academic task to self-identity, thus making threat to the self more salient. This might make negative affect more salient and could result in maladaptive affect regulation. Therefore, positive or negative relations are hypothesized for attainment value and reappraisal, suppression, and rumination. Interest/intrinsic value is hypothesized to activate adaptive forms of regulation. Because interest is an affective-cognitive state [Ainley, 2006] that results from the interaction with the context [Hidi & Renninger, 2006], it is presumed to be a potent regulator, especially of adaptive forms of affective and cognitive processes. These relations should be augmented in least favorite classes, in which motivation is thought to play an especially important role in determining self-regulation and subsequent outcomes.

Motivation is also thought to influence profiles of self-regulation. Due to the exploratory nature of grouping participants into profile groupings, it is difficult to make specific hypotheses as I am not sure which profiles will emerge.

### **2.6.2.3 Goal orientations**

Similar to values, goal orientations are thought to be differentially related to self-regulation (see Table 1). In considering mastery goal orientations, the endorsement of mastery goal orientations is thought to instigate adaptive affective, behavioral, and cognitive regulation [Pintrich, 2000]. Studies show that mastery goal orientations elicit adaptive strategies: seeking challenging tasks; monitoring progress, time, and behaviors; maintaining effective striving under failure; exerting more effort and persistence; and procrastinating less [Dweck & Leggett, 1988; Pintrich & Garcia, 1991; Wolters, 2004]. This is posited to occur because mastery goal orientations focus the individual on internal processes by encouraging development and learning [Dweck & Leggett, 1988]. The learner uses self-set or self-referential standards and orients the monitoring processes to cues that show progress in learning and improving [Ames, 1992; Pintrich, 2000]. As a result, students endorsing mastery goal orientations are more likely to become highly attentive to the task at hand, as they are concerned with deeper learning and understanding of the materials regardless of whether they like or dislike the class. Consequently, the student is highly engaged, experiences positive emotion, and becomes somewhat immersed in the task [Linnenbrink & Pintrich, 2002; Pintrich, 2000].

In addition, self-regulation may occur automatically without the learner's awareness, especially in favorite classes. This automaticity in self-regulatory processes is effective because it does not tax consciously active resources and allows deeper cognitive processing related to the task because cognitive capacities are freed [Linnenbrink & Pintrich, 2002]. Accordingly, mastery goal orientations are predicted to activate adaptive forms of self-regulation and be negatively related to suppression and rumination, which are maladaptive forms of emotion regulation, in both favorite and least favorite classes. Additionally, mastery goal orientations are posited to activate profiles of effective self-regulation.

In terms of performance goal orientations, performance-avoidance goal orientations have been consistently linked with maladaptive processes such as procrastination and avoidance of help-seeking, and negatively related to persistence [Ryan et al., 1997; Wolters, 2004]. This suggests that students meet difficulties in regulating their affect and cognitions, and exhibit maladaptive forms of behavior regulation. A performance-avoidance oriented learner is focused on avoiding failure, which highlights the proximity to failing in an attempt to prevent failing. The focus on avoidance of failure has been consistently related to maladaptive processes [Weiner, 1985] and strategies that decrease involvement in academic tasks. More specifically, performance-avoidance goal orientations are negatively related to metacognition, cognitive strategy use, and persistence, and are positively related to disorganization

[Elliot & McGregor, 2001; Wolters, 2004]. As such, endorsement of performance-avoidance goal orientations is hypothesized to be negatively related to metacognition, attention regulation, and reappraisal, and positively related to suppression and rumination (see Table 1). In an attempt to avoid failure, students may be highly concerned with planning what and where to study as a tactic to decrease negative emotions or monitor contact with peers, therefore a positive relation with time and environment regulation is hypothesized for favorite classes. However, the avoidance of failing might be related to lack of time planning in least favorite classes, thus contributing to self-impairment (e.g., self-handicapping). Over-thinking, ruminating, and forms of intrusive and perseverating thoughts are frequently associated with an impaired ability to initiate a change of behavior [Kuhl, 1994]. This immobilizes the individual and therefore is related to maladaptive processes and outcomes. The focus on avoiding failure in a disliked class might instantiate a state-orientation to the extent that environmental regulation is also hampered, whereas in a liked class the focus on avoiding failure might be a catalyst for time and environment regulation. For similar reasons, students who endorse performance-avoidance goal orientations are likely to activate profiles of ineffective self-regulation.

In contrast to performance-avoidance goal orientations, the findings for performance-approach goal orientations suggest that there may be benefits to endorsing performance-approach goal orientations with respect to achievement [Harackiewicz et

al., 2002; Hulleman et al., 2010; Linnenbrink-Garcia, Tyson, & Patall, 2008; Wolters, Yu, & Pintrich, 1996]. Performance-approach goal orientations are related to both adaptive and maladaptive forms of engagement and achievement outcomes [Pintrich & Garcia, 1991]. These inconsistent findings might be explained by individual differences in how learners self-regulate [Tyson et al., 2009] in specific contexts. Students who endorse performance-approach goal orientations are focused on three main evaluations: 1) self-evaluations, 2) other evaluations, and 3) comparison of self with others. These multiple levels of comparison require constant shifts of attention and social comparison processes. As with performance-avoidance goal orientation endorsement, cognitive processes related to academics are interrupted by this self and other evaluation and comparison, which is likely to result in detrimental affective-cognitive processes such as rumination. While these processes are likely to detract from adaptive forms of cognition, affect, and behavior, the strong drive to outperform others might lead to high levels of self-control and attentional regulation during a learning episode. Based on previous inconsistencies in findings, performance-approach goal orientations and regulatory processes are hypothesized to yield positive, negative, or null relations (indicated by an empty cell in Table 1). Because of the multiple levels of regulation, performance-approach goal orientations are hypothesized to be positively related to attention regulation. Students high in performance-approach goal orientations are likely deliberately shifting their attention from self to others to the task in order to ensure their

competence is high in relation to others, especially in least favorite classes. In least favorite classes, performance-approach may also be positively related to reappraisal and behavioral regulation, as students are focused on outperforming others. To a certain extent, performance-approach might serve as a catalyst for adaptive regulation in least favorite classes, but be somewhat more detrimental in favorite classes.

In addition, performance-approach goal orientations are hypothesized to be related to self-regulation profiles that will be comprised of only some adaptive regulatory processes, but not others. For example, a student who is performance-approach oriented might be an effective behavioral regulator (e.g., time, content, environment), but poor in cognitive and affective regulation. Alternatively, another student who is performance-approach oriented might be an effective emotion and attention regulator, yet choose a place to study which might not be conducive to learning but allows for social comparison (e.g., studies wherever his classmates do).

### **2.6.3 Motivation and Self-Regulation to Achievement Outcomes**

In RCMC, the relations between motivation and self-regulation are presumed to determine achievement outcomes. In this sense, self-regulation is presumed to mediate the relations between motivation and learning processes, academic behaviors, and achievement. Motivation alone cannot actuate desired outcomes, as it is a cognitive-affective construct. Motivation needs to translate into actual actions in order for it to result in any outcome – whether behavioral or cognitive. That is, without initiation of

cognitions and behaviors, motivation is a desire that cannot reach fruition. In the absence of regulation of these cognitions and behaviors, desired outcomes cannot be reached. It is therefore important to consider how motivation influences regulation, and how these relations determine achievement outcomes.

In general, the relations between mastery goal orientations, expectancy, interest, and utility value are thought to be positively related to achievement outcomes via adaptive forms of self-regulation. Performance-avoidance and attainment value may be related to maladaptive forms of regulation which would lead to diminished achievement levels and learning processes. Performance-approach may be related to achievement outcomes via adaptive or maladaptive forms of regulation, depending on the outcome and the class context. In favorite classes, endorsement of performance-approach goal orientations may lead to maladaptive self-regulation that leads to poor achievement outcomes, whereas in least favorite classes, performance-approach goal orientation endorsement may actually serve as a catalyst for self-regulation towards adaptive outcomes. That is, in subjects that students dislike, some social comparison on how one is doing might actually lead to heightened regulation towards achievement and learning. The current study was designed to examine these complex relations between motivation and self-regulation, and outcomes.

## ***2.7 Current Study***

The current study aims to unpack the role that self-regulation plays in mediating the relations between motivation and achievement outcomes in a classroom setting. To do this, I administered a survey assessing motivation, self-regulation, learning processes, and academic achievement and behaviors to high school and college students. A developmental perspective was employed by examining high school and college sophomores and juniors. This cross-sectional study is a first step in trying to understand how the association between motivation and self-regulation influences academic outcomes. This is important because qualitative and quantitative changes are expected in students' regulatory capacities as they transition from high school to college and become more independent. For college students, certain regulatory capacities might play a more central role than for high school students. College students are afforded more autonomy and less structure in comparison with high school students. This increased independence requires college students to garner regulatory skills more often than high school students. These skills might be qualitatively different from younger adolescents, who are generally monitored by adults such as parents. For example, environmental regulation is posited to be more crucial for college students as they are more independent and can choose where to study in contrast to high school students, who generally live at home and do not have much choice about where to study.

It is likely that older students are more knowledgeable and metacognitively aware of their abilities to influence their learning. They should be able to garner self-regulation prior and during their learning episode more effectively than high school students.

The current study therefore examines how motivation activates self-regulation in high school and college students. A central hypothesis is that there will be differences between high school and college students in the extent to which motivation activates self-regulation related to outcomes. That is, the hypothesized valence and direction of the relations between motivation and self-regulation should be similar for high school and college students, but the relations will be augmented for college students as their social-academic environment affords them more freedom, which requires more regulation. Additionally, college students are more expert at deliberately activating motivation and harnessing self-regulation. Finally, these relations are hypothesized to be more pronounced in least favorite classes.

In addition to the developmental perspective, academic motivation and self-regulation were assessed in favorite and least favorite classes/subjects to allow comparison between situations in which academic motivation is high versus low. Presumably, in favorite classes students are highly motivated and garner self-regulation towards academic success more easily than in least favorite classes. Self-regulation likely occurs automatically without the need for deliberate activation in situations that are

preferred, versus those that are not preferred but might be obligatory. In contrast, in least favorite classes, motivation and self-regulation are hypothesized to be more salient and determine achievement outcomes. In addition, as described earlier, motivational constructs that may be maladaptive in favorite classes might have a positive influence in least favorite classes (e.g., performance-avoidance).

The possibility that there may be different forms of adaptive motivation and self-regulation was addressed by Research Question 1: Are there multiple pathways to academic success? A central aim of this study is to identify multiple pathways to academic success. According to RCMC, motivation constructs activate different regulatory processes that lead to achievement outcomes. Self-regulatory processes are deemed to be activated by the motivation construct that is salient at the moment of intent to engage. For example, a student high in mastery goal orientations will activate different self-regulatory processes than a student whose task value is the main motivator for task engagement. However, both of these paths may be equally beneficial for academic success. Indeed, there may be multiple pathways to academic achievement and the different motivation constructs are hypothesized to be related to academic outcomes via self-regulation in different ways, especially in different contexts (e.g., favorite versus least favorite classes). In order to answer this question, a fully saturated model with motivation as the independent variable, self-regulation as the mediation variable, and achievement outcomes (learning processes, academic behaviors,

achievement) will be examined. The hypothesized model that will be tested is presented in Figure 2.

In order to further examine how different pathways may be adaptive, the relations between motivation and self-regulation toward achievement outcomes is examined in favorite and least favorite subjects separately. A comparison between these two situations allows us to distinguish which regulatory capacities are important for academic success and which ones are especially crucial for situations when academic tasks are not inherently attractive to the student. In least favorite subjects, it is hypothesized that learners need to actively garner self-regulatory capacities, whereas for favorite subjects self-regulation might occur automatically and as a result not be garnered as actively. Additionally, the regulatory capacities harnessed may change somewhat as individuals become more expert regulators, thus high school and college students are examined separately.

In addition to examining how varying levels of each motivational construct relate to self-regulation, a second question inquired about the synergistic effect of different self-regulatory components. This was addressed by Research Question 2: How do self-regulation capacities work in concert and combine into profiles that mediate the relations between motivation and achievement outcomes? The multidimensional nature of self-regulation suggests that for certain people, specific regulatory capacities group together, while for other individuals a different combination of regulatory capacities

might be at work. These combinations or “profiles” might vary depending on the situation. That is, whether it is a favorite or least favorite class might determine different combinations of self-regulatory profiles. In order to answer this question, a latent class analysis was used to determine classes or profiles of self-regulation. The main hypothesis was that there will be variation in the classes that emerge. While class analyses are somewhat exploratory in nature, two extreme, encompassing profiles were predicted to emerge: high regulators who report actively garnering adaptive self-regulatory processes, especially in least favorite subjects; and low regulators who report low levels of adaptive self-regulatory processes. While it is difficult to predict what the other groups will look like, it is expected that profiles will emerge with students who garner different combinations of self-regulation in between these two extreme groups who are either high or low on self-regulatory capacities. For example, one group might be high in cognitive-emotion regulation in that they will report high levels of emotion regulation and low or moderate levels of other types of regulation. Another group might be more behaviorally oriented; their profile will be most dominated by time planning and environmental regulation, while their emotion and cognitive regulation will be low to moderate. Certain regulatory capacities might compensate for the lack of others.

Developmentally, regulatory profiles should be somewhat different for high school and college students. Because college students are more expert regulators, they may be more specialized in the regulatory capacities on which they draw. For example,

aside from high and low regulators, additional profiles may emerge that are high on emotion regulation but low on behavior and cognitive regulation, one that is high on behavior regulation but low on emotion and cognitive regulation, and a final profile high on cognitive but low on emotion and behavior regulation.

In thinking about how these profiles mediate the relations between motivation and achievement outcomes, a number of profiles may be adaptive. While the high regulator class is hypothesized to be adaptive across outcomes and contexts and the low regulator class maladaptive, specialized latent classes may be beneficial for specific achievement outcomes in specific situations. For example, in favorite classes, membership in any of the latent classes except the low regulator class, may be an adaptive mediator of motivation to outcomes. In least favorite classes, high regulation class membership and emotion regulation class membership may be an adaptive mediator of motivation to outcomes, but membership in the behavior regulation class may not. Mastery goal orientation, expectancies, and the three task values are hypothesized to be positively related to adaptive regulation profiles, while performance-avoidance goal orientation endorsement is hypothesized to be positively related to maladaptive profile membership. Performance-approach goal orientations may be either positively or negatively related to either high or low regulation profile membership.

In summary, the current study employs two forms of structural equation modeling as a first step to examining the RCMC model. Specifically, variable- and

person-centered approaches are used to examine whether motivation activates self-regulation towards academic success. In addition to examining how these processes differ across age groups, students are situated within favorite and least favorite classes in order to detect nuanced differences in self-regulation and the relations between motivation and self-regulation.

## **3. Method**

### ***3.1 Participants***

One-hundred and seventy-seven high school students and two-hundred and seventy college students from the southeastern United States comprised the sample. Of the high school students, 64% were female and of the college students 46% were female. The college students were 81% sophomores and 19% juniors, and the high school students were 42% sophomores and 58% juniors; 28% of the high school students were 15 years old, 45% were 16 years old, and 17% were 17 years old. The college student sample was more diverse in age, with 3% 18 years old, 53% 19 years old, 34% 20 years old, 7% 21 years old, one participant was 23 years old, and one participant was 25 years old. The high school sample was somewhat diverse, with the majority of participants (55%) reporting their race as White/Caucasian, 19% as African-American/Black, 4% as Asian-American/Asian, and 3% as Latino. One participant reported Native American, and 6% reported Mixed or Other. The college sample was more ethnically diverse. Twelve percent of the students were African-American/Black, 27% Asian-American/Asian, 47% White/Caucasian, 7% Latino, 1% Native American, <1% Middle Eastern. The rest of the participants were either “mixed” or “other”; 3% did not report their race.

High school students were recruited from local schools in two counties. In order to equate for the competitive selection process of the college participants, only high

school participants who were recognized as “college bound” by their school were recruited. Twenty-nine percent of the students were from a prestigious private school in one county. This school has a 100% graduation rate [Swain, personal communication]. The rest (71%) of the sample were from four different public high schools in a nearby county. The high schools in this county have a 65.3% graduation rate compared to the state-wide 74.2% graduation rate [NC Schools Report Cards]. Therefore, the students from these schools had to have attended at least one honors class in order to participate in the study. There were no socio-economic data available on the participants, although in the public schools 39.57% of students are considered “economically disadvantaged” by State standards. Students in the private school receive financial aid based on a number of factors and there was no public data regarding the economic status of these students [Patterson, personal communication]. There is no data available for the total number of high school students eligible to participate in the study. However, based on the general information obtained from school administrators and teachers about the approximate number of eligible high school students (e.g., college bound students), the participation was around 35% participation rate. While this raises some questions regarding the generalizability to the larger population, such rates are typical of much of survey research. The college students were recruited through the Department of Psychology and Neuroscience subject pool at a prestigious private university ranked in the top 10 in the U.S.

Data were collected over the course of two semesters. During the spring of 2010 19% of the college and 29% of the high school data were gathered, with the rest collected during the Fall of 2010.

Sophomores and juniors from local high schools and colleges were targeted because, unlike freshmen, by sophomore year most students have presumably acclimated to the demands of their new academic context. Freshmen are thought to be novice regulators in a new context, so these students' reports might be confounded with the experience of adjusting to a new setting and a new set of rules. High school seniors were not included because they are usually absorbed in the process of submitting college applications. Similarly, college seniors were not included as they are usually in the process of considering job or graduate school applications. High school and college seniors may be less focused on their current academic demands, especially towards the end of the year when their future is less inchoate.

### ***3.2 Procedures***

Students were recruited through their academic institution. For high school students, consent forms and fliers about the study were posted and distributed at their school. Two options for parent consent and survey completion were offered to high school students: paper or online. Only students who received parental consent for their participation in the study were allowed to give assent and participate. Students were allowed to complete the survey at their leisure and no instructional time was used for

survey completion. Seventy-four percent of the high school surveys were completed online and the rest were paper surveys. High school participants were compensated \$10 for their participation.

For college students, recruitment occurred through the university psychology subject pool. College students signed up to participate online and answered an online survey. College students received one subject pool credit for participation.

The survey consisted of three sections, the first two queried students about their favorite and least favorite classes. These sections were identical except that the first focused on favorite classes and the second on least favorite classes. For the first part of the survey, students were asked to identify their favorite class. The class that they nominated as favorite was the class that this part of the survey referred to. For the second part of the survey students were asked to think about and identify their least favorite class. The survey that followed was identical to that for the favorite class, except that all of the questions in this part of the survey referred to the class they designated as their least favorite class. The final part of the survey assessed demographic information. The favorite class part of the survey always appeared first. This was done because completion of the least favorite part first was thought to prime negative affect, thoughts, and dispositions, and perhaps influence responses and participation negatively.

### ***3.3 Measures***

With the exception of achievement among high school students, all measures were self-reported. Unless otherwise indicated, all survey items were measured using a 5-point Likert scale from 1- Strongly Disagree, to 5 – Strongly Agree. A complete list of all survey items is presented in Appendix A. All measures have been validated for use with a variety of ages, ranging from elementary school through college students. To further validate the measures for use with high school and college students, confirmatory factor analyses (CFA) and reliability analyses were conducted for each set of measures (e.g., for motivation, self-regulation, and outcomes separately). As will be described later when each set of measures is presented, the motivation variables were submitted to one CFA, the self-regulation measures to an additional CFA, and the outcome measures to a separate CFA. Fit indices (CFI, TLI, and RMSEA) for all of the CFAs for the measurement models are presented in Table 2. Following is a brief description of each measure.

#### **3.3.1 Motivation variables – independent variables**

Seven motivation constructs were assessed. The items assessing the seven constructs were intermixed among each other. CFA analyses suggest that the seven motivation variables were distinct from each other in both favorite and least favorite subjects for high school and college students, despite the high correlation between performance-approach and performance-avoidance goal orientations ( $r = .72, p < .001$ ; See

Tables 3 & 4 for correlations) as well as mastery goal orientations with the value measures (see Table 2 for fit statistics and Figure 3 for the measurement model). Please refer to the Appendix for all the scale items.

Mastery goal orientations were assessed using the Patterns of Adaptive Learning Survey (PALS) [Midgley et al., 2000]. This scale assesses a student's focus on learning and developing using 5 items. Sample items include: "It's important to me that I thoroughly understand my class work in (favorite/least favorite)." and "It's important to me that I improve my academic skills in class." Reliability for the items was high (High School Favorite  $\alpha = .82$ ; High School Least Favorite  $\alpha = .88$ ; College Favorite  $\alpha = .83$ ; College Least Favorite  $\alpha = .92$ ).

Performance-approach goal orientations were also assessed using PALS [Midgley et al., 2000]. This scale measures a student's focus on appearing competent using 5 items. Sample items include: "It's important to me that other students think I am good at (favorite/least favorite)," and "One of my goals is to show others that I'm good at (favorite/least favorite)." Reliability for these items was also high (High School Favorite  $\alpha = .85$ ; High School Least Favorite  $\alpha = .93$ ; College Favorite  $\alpha = .84$ ; College Least Favorite  $\alpha = .89$ ).

Performance-avoidance goal orientations were assessed using the PALS [Midgley et al., 2000] as well. This scale assesses a student's focus on not appearing incompetent using 4 items. Sample items include: "It's important to me that I don't look

stupid in class,” and “One of my goals is to keep others from thinking I’m not smart in (favorite/least favorite).” Reliability for the items for the scale was fair (High School Favorite  $\alpha = .71$ ; High School Least Favorite  $\alpha = .83$ ; College Favorite  $\alpha = .70$ ; College Least Favorite  $\alpha = .84$ ).

Expectancies for success assesses students’ self-evaluations of their likelihood to complete the class successfully. Expectancies were assessed with four items, each with a different 5 point scale, based on the measures developed by Eccles, Wigfield, Harold, and Blumenfeld (1993). Sample items include: “How well do you think you will do in (favorite/least favorite) this term?” (1=very poorly, 3=about the same, 5= very well), and “If you were to order all the students in your (favorite/least favorite) class from worst to the best, where would you put yourself? (1= the worst, 3= in the middle, 5 = the best). Reliability for the items for this scale was excellent (High School Favorite  $\alpha = .85$ ; High School Least Favorite  $\alpha = .92$ ; College Favorite  $\alpha = .89$ ; College Least Favorite  $\alpha = .94$ ).

Task value refers to beliefs students have about the task or domain of study. Three forms of task value were measured using the Eccles et al. (1993) measure: 1) interest/intrinsic task value, 2) attainment value, and 3) utility value. Interest/Intrinsic value is one’s inherent positive affect and desire to partake in activities related to the subject at hand. This was assessed using 6 items. Sample items include: “I enjoy (favorite/least favorite),” and “ In general, I find working on assignments in (favorite/least favorite) class...” (very boring, not boring and not interesting, very

interesting). Reliability for these items was also high (High School Favorite  $\alpha = .90$ ; High School Least Favorite  $\alpha = .92$ ; College Favorite  $\alpha = .86$ ; College Least Favorite  $\alpha = .92$ ). Attainment value refers to one's identity with the subject. Five items were used to assess attainment value including: "It is important for me to be a person who reasons or thinks like someone in the field of (favorite/least favorite)," and "Being good in (favorite/least favorite) is an important part of who I am." Reliability for these items was high (High School Favorite  $\alpha = .79$ ; High School Least Favorite  $\alpha = .85$ ; College Favorite  $\alpha = .78$ ; College Least Favorite  $\alpha = .87$ ). Utility value measures how useful one perceives the domain to be. This was measured with 5 items. Sample items include: "Concepts, ideas, or knowledge from (favorite/least favorite) are valuable because they will help me in the future," and "Being good in (favorite/least favorite) will be important for my future (like when I get a job)." The reliability for the items in this scale was high (High School Favorite  $\alpha = .86$ ; High School Least Favorite  $\alpha = .91$ ; College Favorite  $\alpha = .88$ ; College Least Favorite  $\alpha = .90$ ).

### **3.3.2 Self-regulation variables**

Self-regulation constructs were assessed using both established scales and scales that were created for the purpose of this study. The initial CFA using the intended scales showed very poor fit of the measurement model. Therefore, the scales were modified based on MPlus modification indices, exploratory factor analyses (EFA) examining all the items simultaneously, and the face validity of the items as they related to the

measured construct. This resulted in some of the cross-loading items from one scale being grouped with items from another scale. Items with high pattern coefficients on a different factor than intended were either dropped or retained based on the face validity of the item for the factor and the reliability analyses. For example, an item that was originally from the Motivated Strategies for Learning Questionnaire [MSLQ; Pintrich, Smith, Garcia, & McKeachie, 1993] Metacognitive Self-Regulation Scale had a large pattern coefficient on the factor comprised of the Attention Regulation Scale items. This item was retained because it fit with the attention regulation factor and improved the reliability of the item scores for that factor. Therefore, the final scales were composed of a mix of some items from the different scales, as was deemed appropriate based on the theoretical definition of the construct, the EFAs, and the CFAs (see Figure 4). The final measurement model had good fit based on the fit statistics for both high school and college in favorite and least favorite classes (see Table 2). Below is a description of each scale and items.

Metacognitive Regulation was assessed using a subset of 5 items from the Metacognitive Self-Regulation Scale from the MSLQ [Pintrich et al., 1993]. One item was dropped because the item had large pattern coefficients on the attention regulation scale. Based on the fit indices from CFAs and reliability analyses, six additional items were dropped. The final scale was comprised of 5 items. One item assesses active cognitive use to facilitate focusing “When reading or studying for my (favorite/least favorite)

class, I make up questions to help focus my reading or studying.” One item assesses planning “I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying.” And three items assess monitoring, for example: “If class materials are difficult to understand, I change the way I read or study the material.” (Please refer to the Appendix A for all the scale items.) Thus the combination of attention, planning, and monitoring that was originally intended in the design of the MSLQ Metacognitive Self-Regulation Scale was maintained. Reliability for the items was fair (High School Favorite  $\alpha = .75$ ; High School Least Favorite  $\alpha = .83$ ; College Favorite  $\alpha = .65$ ; College Least Favorite  $\alpha = .77$ ).

Attention Regulation refers to students’ ability to maintain their focus on the current task. This scale was created for this study. The final scale was comprised of 5 items, three original items, one that was originally from Tangney et al.’s scale “I have trouble concentrating in (favorite/least favorite) class. (Reverse coded)” and one item originally from the MSLQ [Pintrich et al., 1991] “During class time I often miss important points because I’m thinking of other things (like daydreaming). (Reverse coded).” Three items were created for this study. All of the items were reverse coded so that a higher score is indicative of higher levels of attention regulation. Reliability of the items was high (High School Favorite  $\alpha = .85$ ; High School Least Favorite  $\alpha = .89$ ; College Favorite  $\alpha = .87$ ; College Least Favorite  $\alpha = .89$ ).

Time Planning assesses students' ability to regulate their academic behaviors related to their course by planning and monitoring their time use. This scale was comprised of five items. Sample items include: "I set a plan for how to go about completing my assignments in (favorite/least favorite)," and "I make lists for work that needs to be accomplished or finished in (favorite/least favorite)." Reliability for the items was high (High School Favorite  $\alpha = .80$ ; High School Least Favorite  $\alpha = .82$ ; College Favorite  $\alpha = .84$ ; College Least Favorite  $\alpha = .87$ ).

Environmental Regulation assesses students' capability to regulate their behaviors by choosing and adapting their place of study. The scale, created for this study, was comprised of three items. Sample items include: "I usually study in a place where I can concentrate on my work in (favorite/least favorite)," and "I go to study at a place where I know the noise level will not disrupt my work." While the original intention of the scale was to assess not just planning but also monitoring of the context, the items that assess monitoring either had large pattern coefficients with other scales or weakened scale reliability. Therefore, 4 items were not included in the final scale. The items on the final scale were highly reliable (High School Favorite  $\alpha = .86$ ; High School Least Favorite  $\alpha = .90$ ; College Favorite  $\alpha = .81$ ; College Least Favorite  $\alpha = .91$ ).

Rumination is a form of maladaptive emotion regulation and was assessed using an adapted version of Nolen-Hoeksema's Rumination scale [Nolen-Hoeksema, Morrow, & Fredrickson, 1993]. This scale assesses students' rumination in relation to their course

work. One item was dropped because it contributed to poor model fit and lowered reliability. The final scale was comprised of six items from the original scale, which were used to assess rumination. Sample items include: "I think "Why can't I get going?" to complete work for (favorite/least favorite)," and "I think about a task in my (favorite/least favorite) class, wishing it had gone better." A high score is indicative of high rumination, which is a maladaptive form of emotion regulation. Reliability for the items of this scale was high (High School Favorite  $\alpha = .82$ ; High School Least Favorite  $\alpha = .89$ ; College Favorite  $\alpha = .84$ ; College Least Favorite  $\alpha = .89$ ).

Suppression assesses a maladaptive form of emotion regulation in which individuals do not express their emotion. This was assessed using Gross's [1998; Gross & John, 2003] measure. However, due to heavy cross-loading of one of the items, only three items were used. Sample items include: "I control my emotions by not expressing or showing them in (favorite/least favorite) class," And "When I am feeling negative emotions (such as sadness or anger), I make sure not to express them in (favorite/least favorite) class." High scores on this scale are indicative of high levels of suppression and are considered a maladaptive form of emotion regulation. Reliability for the items was acceptable (High School Favorite  $\alpha = .82$ ; High School Least Favorite  $\alpha = .82$ ; College Favorite  $\alpha = .75$ ; College Least Favorite  $\alpha = .79$ ).

Reappraisal assesses an adaptive form of emotion regulation whereby the individual recognizes and adjusts his/her emotion. This scale was based on the Gross

scale [1998; Gross & John, 2003] and was composed of 6 items. Sample items include: “When I want to feel more positive emotion related to (favorite/least favorite) (such as joy or amusement), I change the way I’m thinking about the situation,” and “When I want to feel less negative emotion related to (favorite/least favorite) (such as sadness or anger), I change the way I’m thinking about the situation.” A high score on this scale is indicative of high reappraisal – an adaptive form of emotion regulation. Reliability for the items was high (High School Favorite  $\alpha = .88$ ; High School Least Favorite  $\alpha = .92$ ; College Favorite  $\alpha = .90$ ; College Least Favorite  $\alpha = .92$ ).

Self-Control Scale assesses a general disposition to regulate oneself in general. This scale was based on Tangney et al. (2004); however, only four items from the original scale were retained. One item heavily cross-loaded on the attention regulation scale and the other seven items decreased reliability, contributed to poor model fit, and/or were cross-loading with other factors without a specific pattern, suggesting that they were simply not measuring any specific capacity. Sample items include: “I say inappropriate things in (favorite/least favorite) class. (Reverse coded),” and “Sometimes I can’t stop myself from doing something in (favorite/least favorite) class, even if I know it is wrong. (Reverse coded)” All items were reverse coded so that a high score is indicative of adaptive self-control. Reliability for the items of this scale was acceptable (High School Favorite  $\alpha = .77$ ; High School Least Favorite  $\alpha = .79$ ; College Favorite  $\alpha = .70$ ; College Least Favorite  $\alpha = .72$ ).

### 3.3.3 Learning processes variables

Learning processes were assessed using established scales that were adapted based on exploratory and confirmatory factor analyses and reliabilities. Specifically, four constructs were of interest: organization, rehearsal, elaboration, and academic engagement. The elaboration items cross-loaded with the organization and academic engagement scales. As described below, the final scales are a combination of the original scales and the cross-loaded items. The final fit of the final scales was good based on CFAs (See Table 2, Figure 5). Please refer to the Appendix for all the scale items.

Organization refers to students' organizing of the materials in a way that facilitates learning. One item from the original organization scale was dropped, as it contributed to poor model fit and lowered reliabilities. The final scale consisted of four items; three from the original MSLQ organization scale and one from the elaboration scale. A sample item from the original organization scale was: "When I study for (favorite/least favorite) class, I outline the material or readings to help me organize my thoughts." The item from the MSLQ elaboration scale was "When I study for (favorite/least favorite) class, I write brief summaries of the main ideas from the readings and the concepts from the lectures." Reliabilities for the items were acceptable (High School Favorite  $\alpha = .80$ ; High School Least Favorite  $\alpha = .79$ ; College Favorite  $\alpha = .74$ ; College Least Favorite  $\alpha = .82$ ).

Rehearsal refers to surface processing of the learned materials. This is generally thought to be a less adaptive form of learning. The final scale was based on the MSLQ Rehearsal scale and consisted of four items. Sample items included: "When I study for (favorite/least favorite), I practice saying the material to myself over and over," and "I memorize key words to remind me of important concepts or ideas in (favorite/least favorite)." Reliability for the items was fair (High School Favorite  $\alpha = .76$ ; High School Least Favorite  $\alpha = .78$ ; College Favorite  $\alpha = .73$ ; College Least Favorite  $\alpha = .80$ ).

Elaboration refers to a deeper form of processing the materials whereby students think about how the learned materials are related to their everyday life and across contexts. Of the original six-item scale, one item had large pattern coefficients on organization and a second item had large pattern coefficients on engagement. Thus, the final scale was comprised of four items from the MSLQ Elaboration scale. Sample items include: "When I study for (favorite/least favorite), I pull together information from different sources, such as class time (lectures or discussions) or readings." and "I try to relate or connect ideas in this subject to those in other classes whenever possible." Reliability for the items was acceptable (High School Favorite  $\alpha = .81$ ; High School Least Favorite  $\alpha = .84$ ; College Favorite  $\alpha = .76$ ; College Least Favorite  $\alpha = .78$ ).

Academic Engagement refers to students' involvement with the learned materials and the class. The final scale included seven items, six items are the original scale from Assor, Kaplan, and Roth (2002) and one item from the MSLQ elaboration

scale. Sample items include: "I pay attention and try to follow what the teacher says in (favorite/least favorite) class." and "I often go through the motions in (favorite/least favorite) class, but I'm really not paying attention. (reverse coded)." as well as the item from the MSLQ elaboration scale "I try to apply or use ideas from class assignments or readings in other class activities such as lecture, discussion, or group work." Reliability for the items was acceptable (High School Favorite  $\alpha = .75$ ; High School Least Favorite  $\alpha = .70$ ; College Favorite  $\alpha = .71$ ; College Least Favorite  $\alpha = .80$ ).

### **3.3.4 Academic Behavior Variables**

Academic behaviors were based on self-reports of time spent on homework, class attendance, and handing in assignments on time. Because only two items were used for each scale, CFAs could not be conducted.

Time spent was assessed using two items: "During a typical week, about how much time do you spend on class work or assignments for your (least) favorite class?" (the answer was in hours) and "During a typical day, about how much time do you spend on class work or assignments for your (least) favorite class?" (the answer was in minutes). The mean of the standardized values for these two answers was used to indicate the time spent on work related to class. (High School Favorite  $\alpha = .99$ ; High School Least Favorite  $\alpha = .99$ ; College Favorite  $\alpha = .80$ ; College Least Favorite  $\alpha = .76$ ).

Attendance was assessed using two items: "During a typical month, how many times did you miss your (least) favorite class?" (Reverse) and "I attend my (least)

favorite class on a regular basis.” The mean of the standardized values for these two items was used to indicate attendance, with a high score reflecting regular attendance and a low score reflecting lack of attendance. (High School Favorite  $\alpha = .67$ ; High School Least Favorite  $\alpha = .50$ ; College Favorite  $\alpha = .82$ ; College Least Favorite  $\alpha = .92$ ).

Assignment Completion measured students’ tendency to turn in assignments on time. Assignment completion on-time was assessed using two items: “During a typical week, how often did you turn in your assignments on-time in your (least) favorite class?” and “During a typical week, how often did you turn in your assignments late in your (least) favorite class?” (Reverse). The mean of the standardized values for these two items was used to indicate on-time assignment completion, with a high score reflecting regularly handing in assignments on-time and a low score reflecting late submission. (High School Favorite  $\alpha = .72$ ; High School Least Favorite  $\alpha = .63$ ; College Favorite  $\alpha = .69$ ; College Least Favorite  $\alpha = .82$ )

### **3.3.5 Achievement**

Academic achievement in favorite and least favorite classes were collected in different ways from high school and college students. For high school students, grades were collected through school records. For college students, emails were sent at the end of the semester asking about the grades students received in the two classes they nominated. Phone numbers were obtained through public records for students who did not reply to emails. A second email was then sent to participants who did not reply to

the first email and were not reached by phone. For participants who did not respond to either email or phone inquiry grades were considered missing data. The final grades were converted to a similar scale for all participants with 13 indicating an A+, 12 indicating an A, and so on, with a 1 indicating an F. The scale used appears in the Appendix.

Missing grades were treated differently than from the other variables. While a grade was missing at random for a few high school students, it seemed that missingness was not random for the college students. Eighty of the two-hundred and eighty college students did not respond to emails or phone. The students who did not report their grades were higher on performance-avoidance in their favorite class (no grade  $M = 3.10$ ,  $SD = .82$ ; grade  $M = 3.01$ ,  $SD = .67$ ), lower on interest in their favorite class (no grade  $M = 4.12$ ,  $SD = .44$ ; grade  $M = 4.27$ ,  $SD = .53$ ) and mastery goal orientations in their least favorite class (no grade  $M = 3.21$ ,  $SD = 1.12$ ; grade  $M = 3.36$ ,  $SD = .97$ ). These differences between the two groups of students suggest that the data are not missing at random and therefore participants who did not report their grades were not included in the analyses with grades as the outcome.

### ***3.4 Missing Data***

Except for achievement, maximum likelihood was used to estimate missing values at the scale level. At the item level, it appears that items were missing completely at random with no specific pattern across the participants. Therefore, at the item level,

scales were computed based on at least 60% of the amount of items that comprise the full scale. For scales that are 4 items or less, scale scores were based on an average of at least 3 items. For 5 and 6-item scales, no more than 2 missing items were allowed and for 7 and 8-item scales no more than 3 missing items were permitted.

## 4. Results

A two-pronged approach was used in order to examine how the relations of motivation to academic outcomes are mediated via self-regulation. To this end, two main forms of analyses were conducted: variable- and person-centered analyses. Each analysis corresponded to the more specific research questions framing this study. The variable-centered analyses were used to answer Research Question One: Are there multiple pathways to academic success? Person-centered analyses were employed to answer Research Question Two: How do self-regulation capacities work in concert and combine into profiles that mediate the relations between motivation and achievement outcomes?

The variable-centered analysis examined a fully saturated model in which all the motivation variables lead to the emotion, behavior, and cognitive regulation variables, which predict achievement outcomes (see Figure 2). In addition, direct paths for all motivational variables to achievement outcomes were included. A schematic presentation of this model is presented in Figure 2 with the learning processes outcomes. However, a similar model was used with academic behaviors and achievement.

The person-centered analyses were used to examine how the combined effects of self-regulation mediate the relations between motivation and outcomes. For these person-centered models, latent-class analyses were employed to determine the class of the individual based on naturally occurring patterns in the data (see Figure 6). These

groups were used to test a model of how motivation leads to profiles of self-regulation, which in turn lead to learning processes (see Figure 7). Similar models were tested for academic behaviors and academic achievement. Before describing these models, I begin with a description of the types of favorite and least favorite classes and the reasons that students gave for selecting classes.

#### ***4.1 Characteristics of Favorite and Least Favorite Classes***

The selection of favorite and least favorite classes varied between high school and college students (see Table 5). In high school, the most frequently nominated favorite class was English (26%) followed by History (15.8%) class. High school students' least favorite class was math, nominated by approximately 29%, although it was nominated as a favorite class by 14% of high school students. Given the range of possible subjects in college, there was greater variability in the nominations. College students tended to favor psychology (approximately 30% of all nominations), but also nominated it as one of their least favorite classes (approximately 18% of all nominations). Over the course of the study, there were a number of psychology classes that could have been taken with different professors, so it is likely that different students might like or dislike the same subject taught by a different professor. The second most disliked classes in college were foreign language classes, such as German or Chinese.

The reasons for choosing these classes as favorite or least favorite also varied somewhat. Table 6 presents the coding scheme used to code the answers to the question

“Why is \_\_\_\_ your (least) favorite class?” Because some students provided multiple reasons, there is no statistical test that can be conducted to compare across high school, college, and class type. However, these data can be used to provide an indication of the basis on which students selected their courses as favorite or least favorite. As presented in Figure 8, for high school students, nominations were largely based on the instructor for the course. For college students, the instructor and how interesting the class was were frequent reasons given for selecting a course as a favorite class. Nominating a class as least favorite was chosen based on the instructor, learning subject, and lack of a stimulating environment in both high school and college students.

#### ***4.2 Mean Level Differences Based on Development, Class Type, and Gender***

Mean differences between favorite and least favorite classes, high school and college students, and males and females were examined using five MANOVAs. One MANOVA examined all the motivation variables, one compared differences in self-regulation, one examined learning processes, and a fourth examined academic behavior. Similarly, an ANOVA was used to examine differences in academic achievement. While there was no specific hypothesis regarding a gender difference, mean level difference were examined to see whether females and males differ in their motivation, self-regulation, and outcomes and whether they varied across classes. This was especially interesting, as research suggests that females tend to be more mastery oriented while

males tend to be more performance oriented (Ryan et al., 1997). Additionally, females tend to ruminate more than males and may use emotion regulation more than males in general (Nolen-Hoeksema & Corte, 2004; Papadakis, Prince, Jones, & Strauman, 2006). For each MANOVA, gender and development (high school versus college) were entered as between-subject variables and class type (favorite versus least favorite) was entered as within-subject variables.

Overall, the means for motivation differed between favorite and least favorite classes ( $F(7, 412) = 213.53, p = .000$ ), with students reporting a higher level of motivation for favorite classes than least favorite classes (see Table 7). There were also mean differences between high school and college students ( $F(7, 412) = 9.77, p = .000$ ) and females and males ( $F(7, 412) = 3.17, p = .003$ ) (see Tables 8 and 9, respectively). Of most interest was the class type by developmental stage interaction ( $F(7, 412) = 2.63, p = .011$ ), which qualified the developmental and class type effects.

To better understand these overall effects, follow-up univariate analyses examining the specific motivation constructs were conducted for the effects that were significant at the multivariate level. Investigating the univariate analyses for the class types revealed that in general, all forms of motivation were higher in favorite classes than least favorite classes (see Table 7 for means and standard deviations). These findings are in line with the hypothesis that motivation is higher in favorite classes. Univariate analyses examining developmental differences in motivation between high

school and college students revealed that, in general, high school students had higher levels of performance-approach (High School M = 3.16, College M = 2.85;  $F(1, 418) = 19.62, p = .000$ ), performance-avoidance (High School M = 3.24, College M = 2.98;  $F(1, 418) = 12.66, p = .000$ ), and expectancies (High School M = 3.89, College M = 3.53;  $F(1, 418) = 32.82, p = .000$ ), but lower levels of interest (High School M = 3.17, College M = 3.29;  $F(1, 418) = 4.08, p = .044$ ). Finally, univariate analyses examining the significant gender differences found that females reported higher levels of mastery goal orientations (Female M = 3.83, Male M = 3.64;  $F(1, 418) = 9.92, p = .002$ ) and interest (Female M = 3.30, Male M = 3.17;  $F(1, 418) = 5.30, p = .022$ ) (see Table 9), which is consistent with prior research.

Last, univariate analyses examining the class type by development interaction revealed an interaction for expectancies ( $F(1, 418) = 9.60, p = .002$ ). The interaction involves a large difference in expectancies between high school and college students in least favorite class versus favorite classes (see Figure 9). High school and college students have more similar expectancies in their favorite than their least favorite classes.

A similar MANOVA and follow-up univariate analyses were conducted for self-regulation. Contrary to the hypotheses, higher levels of self-regulation were reported in favorite versus least favorite classes ( $F(8, 405) = 60.64, p = .000$ ) (see Table 7). There were also significant developmental ( $F(8, 405) = 4.19, p = .000$ ) and gender differences ( $F(8, 415) = 4.66, p = .000$ ) (see Tables 10 & 9, respectively). Interestingly, there was a class type

by developmental stage interaction ( $F(8, 405) = 3.54, p = .001$ ), which qualified the development and class type main effects.

An examination of the specific univariate analyses revealed that there were significant differences between all of the self-regulation across class type except for suppression (see Table 7 for F-values). Specifically, metacognition, attention regulation, time planning, environmental regulation, and reappraisal were higher, and rumination was lower in favorite than least favorite classes (means are presented in Table 7). These findings are in line with the hypotheses that there would be higher levels of adaptive and lower levels of maladaptive (i.e., rumination) forms of regulation in favorite versus least favorite classes in favorite classes.

In terms of developmental differences, high school students had higher levels of reappraisal than college students (High School  $M = 3.17$ , College  $M = 3.01$ ;  $F(1, 412) = 4.75, p = .030$ ) but college students had higher levels of time planning than high school students (High School  $M = 3.37$ , College  $M = 3.59$ ;  $F(1, 412) = 10.439, p = .001$ ) (see Table 10). College students were hypothesized to be better regulators than high school students. Thus, the finding that reappraisal was higher for high school students is contrary to the hypotheses, while college students' higher levels of time planning is in line with the hypothesis. There were also overall gender differences ( $F(8, 415) = 4.66, p = .000$ ), with females reporting higher levels of self-control (Female  $M = 3.70$ , Male  $M =$

3.52;  $F(1, 412) = 7.93, p = .005$ ) and metacognition (Female  $M = 3.29$ , Male  $M = 3.10$ ;  $F(1, 412) = 10.56, p = .001$ ) (see Table 8).

Of most interest was the class type by developmental stage interaction, which was statistically significant at the univariate level for rumination ( $F(1, 412) = 16.67, p = .000$ ) and suppression ( $F(1, 412) = 7.49, p = .006$ ). For both rumination and suppression (see Figures 10 and 11, respectively), college students reported lower levels than high school students in their favorite class, but higher levels than high school students in their least favorite class. Both rumination and suppression are maladaptive forms of regulation. While, as hypothesized, college students regulate more than high school students in their least favorite classes, it is somewhat surprising that they are employing a maladaptive form of emotion regulation. At the same time, the finding that, in favorite classes, college students draw on maladaptive forms of self-regulation less than high school students is in line with the hypothesis that college students are more adept at regulation.

In a similar investigation of learning processes, overall MANOVAs revealed a difference between the means for learning processes between favorite and least favorite classes ( $F(4, 414) = 61.80, p = .000$ ) (see Table 7). There were also differences between high school and college students ( $F(4, 414) = 18.84, p = .000$ ), as well as gender differences ( $F(4, 414) = 7.30, p = .000$ ) (see Table 11 & 9, respectively). There was a

significant class type by developmental stage interaction ( $F(4, 414) = 5.20, p = .000$ ), which qualified the development and class type main effects.

Further analyses examining the univariate effects found that, as hypothesized, students reported higher use of learning processes in their favorite classes than in their least favorite classes (see Table 7). Univariate analyses comparing high school and college students revealed developmental differences for elaboration ( $F(1,417) = 5.440, p = .018$ ), engagement ( $F(1,417) = 12.207, p = .000$ ), and organization ( $F(1,417) = 17.719, p = .000$ ) (see Table 11). College students reported higher levels of elaboration (High School  $M = 3.43$ ; College  $M = 3.60$ ), but high school students reported higher levels of organization (High School  $M = 2.79$ ; College  $M = 3.09$ ) and engagement (High School  $M = 3.88$ ; College  $M = 3.63$ ). In terms of the univariate effects for gender, higher levels of all learning processes were reported by females versus males (See Table 9 for means).

The only significant univariate effect for the class type by development interaction was for engagement ( $F(1, 417) = 18.336, p = .000$ ). The interaction involved a large difference in engagement between high school and college students in least favorite class versus favorite classes (see Figure 12). High school and college students engage at similar levels in their favorite classes, but differ quite substantially in their least favorite classes.

A similar MANOVA and univariate analyses were conducted for academic behaviors. Surprisingly and contrary to the hypotheses, there were no significant

differences between favorite and least favorite classes ( $F(3, 412) = .42$ , n.s.). However, there were significant differences between high school and college students ( $F(3, 412) = 12.83$ ,  $p = .000$ ) and between females and males ( $F(3, 412) = 3.33$ ,  $p = .019$ ) (see Table 11 & 9, respectively). A significant interaction between class type and development ( $F(3, 412) = 3.34$ ,  $p = .019$ ) qualified these main effects.

Follow-up univariate analyses were conducted to further examine how academic behaviors differed across development and gender. High school students reported higher level of attendance in classes than college students (High School  $M = .19$ , College  $M = -.105$ ;  $F(1, 414) = 14.30$ ,  $p = .000$ ) (see Table 11). However, college students reported higher levels of assignment completion on time than high school students (High School  $M = -.145$ , College  $M = .092$ ;  $F(1, 414) = 9.32$ ,  $p = .002$ ). The only significant univariate effect for gender was for attendance. Females reported more regular class attendance than males (Female  $M = .153$ , Male  $M = -.069$ ;  $F(1, 414) = 8.78$ ,  $p = .003$ ) (see Table 8).

Most interesting was the interaction between development and class type. High school students reported higher levels of class attendance in least favorite classes whereas college students reported higher levels of attendance in their favorite class ( $F(1, 414) = 6.44$ ,  $p = .012$ ) (See Figure 13). Thus, high school students seem to persist more and attend class even if they dislike it.

Last, an ANOVA examining achievement revealed only a significant difference for type of class ( $F(1, 340) = 66.68, p = .000$ ). Students had higher levels of achievement in their favorite classes (see Table 7).

### ***4.3 Research Question 1: Are there different pathways to academic success?***

A central research question was related to the different pathways there might be to achieve academic success. To answer this question, variable-centered analyses were employed to examine a fully saturated mediational model in which all of the motivational variables predicted the self-regulation and outcome measures, and the self-regulation measures also predicted the outcome measures (see Figure 2). This simultaneous inclusion of different variables allowed the examination of the unique contribution that one construct has over the others. The mediating role self-regulation has in the relations between motivation and learning processes, academic behaviors, and achievement, was examined using MacKinnon's (2008) guidelines for testing mediation. Indirect and direct paths were examined based on MacKinnon's (2008; p. 55) assertion that "a mediated effect may exist whether or not there is a statistically significant effect of the independent variable on the dependent variable." That is, in order for a mediation to occur, there need to be two significant relations: 1) between the independent variable (motivation) to the mediator (self-regulation); and 2) between the mediator (self-regulation) and the dependent variable (academic outcomes). The overall indirect effect

(independent variable to mediator X mediator to dependent variable) need not be significant, as there may be a situation in which path 1 is positive and path 2 is negative, resulting in a small non-significant indirect path. However, mediation is occurs through the mediator. The use of structural equation modeling facilitates detection of such mediational effects, especially in the complex models that are tested in the current study. A separate mediation model was examined for each of the academic outcomes (learning processes, academic behaviors, and achievement), in the different class types (favorite and least favorite classes) for high school and college students, for a total of 12 models.

The analyses are presented for high school and college students separately. In the first part of the model (between the motivation to self-regulation measures), the beta coefficients were quite similar regardless of the outcome measure. Therefore, this part of the model is presented first, followed by the self-regulation to learning processes (organization, rehearsal, elaboration, and engagement), the motivation and mediation effects to learning processes, the self-regulation to academic behaviors (time spent on coursework, attendance, and handing in of assignments), the motivation and mediation effects to academic behaviors, self-regulation to achievement, and motivation and mediation to achievement.

Given the relatively high correlations among several of the exogenous variables, the beta coefficients from this model were compared to the bivariate correlations to detect possible statistical suppression due to multicollinearity between exogenous

variables. In order to determine whether statistical suppression occurred, a model excluding the potentially suppressing exogenous variable was conducted and beta coefficients were compared. These cases are noted in the appropriate places.

### **4.3.1 High School**

#### **4.3.1.1 Motivation to Self-Regulation**

The relations between motivation and self-regulation were similar for learning processes, academic behaviors, and achievement in favorite and least favorite classes, as presented in Tables 12, 13, and 14. In general, contrary to the hypotheses, motivation was related to self-regulation more in favorite than least favorite classes. While mastery goal orientations were positively related to metacognition, time planning, and environment regulation in both favorite and least favorite classes, there was greater magnitude in the relations observed in least favorite classes. This is in line with the hypothesis that activation would be stronger in least favorite classes. In addition, mastery goal orientations were positively related to reappraisal and suppression only in favorite classes. This is contrary to the hypothesis that more regulation would occur in the least favorite classes. The relation of mastery goal orientations to suppression was surprising, since suppression is a maladaptive form of emotion regulation.

Based on the discrepancy between the bivariate correlation and the beta coefficient, the relations of mastery goal orientations to environment regulation in least favorite classes ( $\beta = .45, p < .001; r = .51, p < .001$ ) and to suppression in favorite classes

( $\beta = .24, p < .05; r = .06, p < .001$ ) were examined for statistical suppression. Only the relation between mastery goal orientations and suppression seemed to result from statistical suppression with task value, therefore this finding should be interpreted with caution as these findings may be due to multicollinearity of mastery goal orientations with task value.

Interestingly, performance-approach goal orientations were not significantly related to any form of self-regulation, though performance-avoidance goal orientations were positively related to rumination. Both of these findings are in line with the hypotheses and previous research that has found performance-approach to be unrelated to positive or negative outcomes, and performance-avoidance to be positively related to maladaptive outcomes (Linnenbrink-Garcia et al., 2008).

As hypothesized, both expectancies and interest were positively related to attention regulation in both favorite and least favorite classes (see Tables 12, 13, & 14). However, while expectancy was negatively related to rumination in both favorite and least favorite classes, interest was negatively related to rumination only in favorite classes. These findings are in line with the hypothesized relations. Additionally, the magnitude of the association between expectancy and rumination was greater for least favorite classes, suggesting that motivation plays a more important role in activating self-regulation in least favorite classes, as hypothesized. Finally, attainment value was positively related to rumination. However, this finding might be a result of statistical

suppression due to the high correlation between attainment and the other values, and therefore should be interpreted with caution.

#### **4.3.1.2 Self-Regulation to Learning Processes**

In terms of self-regulation, behavior regulation (time planning) played an important role in predicting learning processes (organization, rehearsal, and elaboration) for favorite and least favorite classes (See Table 15), whereas cognitive regulation (metacognition and attention regulation) seemed to be central in predicting learning processes in least favorite classes. Specifically, metacognition predicted all four learning processes in least favorite classes and organization in favorite classes, and attention regulation was positively related to engagement in both favorite and least favorite classes. Interestingly, and contrary to the hypothesis, emotion regulation was positively related to learning processes in both favorite and least favorite classes; reappraisal predicted rehearsal and elaboration in favorite classes and engagement in least favorite classes. Surprisingly, rumination was positively related to engagement in favorite classes. It is important to note the magnitude of these effects was smaller for emotion regulation than cognitive regulation, suggesting that cognitive regulation plays a more central role than emotion regulation. There was no evidence of statistical suppression.

#### 4.3.1.3 Main and Mediational Effects to Learning Processes

In order to examine whether there are multiple pathways to academic success, a more specific question regarding how motivation instigates self-regulation towards academic success was presented. Of interest was how the relations between motivation and learning processes were mediated by self-regulation. All of the mediational relations and the indirect effects are listed in Table 16. In general, as hypothesized, there were more significant indirect effects between motivation to learning processes via self-regulation in least favorite than favorite classes.

Before discussing these mediational effects, I consider main effects as they determine whether a full or partial mediation occurred. Mastery goal orientations were positively related to engagement in favorite and least favorite classes (see Table 15), with a larger magnitude observed in least favorite classes. As expected and in line with previous research, performance-avoidance was negatively related to organization in favorite classes. However, contrary to prediction, performance-avoidance was positively related to elaboration in least favorite classes, suggesting that there may be some advantage to avoiding appearing incompetent in disliked yet obligatory situations. Also surprising was the finding that expectancy was negatively related to organization in least favorite classes – especially because there was no significant bivariate correlation ( $r = .02$ , n.s.) between these two variables. However, because there was no multicollinearity between expectancy and other motivational variables, I could not further examine these

relations to rule out statistical artifacts. At the same time, interpretation of this finding should be done with caution. Similar to mastery goal orientations, interest was positively related to engagement but only in favorite classes.

A most unusual finding was the negative relation between attainment value and engagement in favorite and least favorite classes, though the correlations were positive (Fav  $\beta = -.23$ ,  $p < .05$ ; LFav  $\beta = -.22$ ,  $p < .01$ ; Fav  $r = .26$ ,  $p < .01$ ; LFav  $r = .38$ ,  $p < .001$ ). These relations persisted for favorite classes without mastery goal orientations in the model and became non-significant for least favorite classes. However attainment value no longer predicted engagement when utility and interest values were not included in the model. This suggests that the finding is due to suppression and therefore these relations will not be interpreted.

The variety of mediations that were found lend strong support to the hypothesis that there are multiple pathways to academic success. Table 16 presents a list of the mediations and the indirect effects. Cognitive (metacognition and attention regulation) and behavior (time planning) regulation mediated mainly the relations between motivation (mastery goals, expectancies, and interest) and organization, rehearsal, and elaboration in favorite and least favorite classes, while emotion regulation mediated the relations between motivation and engagement. In general, the mediation paths for mastery goal orientations to self-regulation and subsequent learning processes was positive, and the relations were fully mediated for organization, rehearsal, and

elaboration in favorite and least favorite classes. The relations between mastery goal orientations and engagement via metacognition were partially mediated; mastery goal orientations have a direct effect in addition to the mediation through metacognition to engagement. In line with the hypotheses, there were no pathways for performance-approach goal orientations. Interestingly, the relations between expectancies and interest to engagement were mediated through attention for both favorite and least favorite classes.

The relations between motivation (performance-avoidance goals, expectancy, and interest) to engagement via emotion regulation (rumination and suppression) is somewhat more complex. In general, expectancies and interest were negatively related to rumination, but rumination was positively related to engagement in favorite classes – resulting in a non-significant small effect. In least favorite classes, expectancy was negatively related to rumination and rumination was negatively related to engagement, suggesting that rumination is a maladaptive mediator for motivation and engagement in least favorite classes, whereas it is a positive mediator in favorite classes.

#### **4.3.1.4 Self-Regulation to Academic Behaviors**

There were no significant relations between self-regulation and academic behaviors (see Table 17). This was in line with the hypothesis that students in high school do not have freedom regarding their schedules and where they can study. High school students have fewer opportunities to regulate their behavior or time related to

studying; they often have to study when they have time to do so. High school students' fixed pre-determined schedules do not afford much autonomy and may result in a "taking the medicine" attitude, whereby students do what they have to do without much feeling or concern.

#### **4.3.1.5 Main and Mediational Effects to Academic Behaviors**

Due to the lack of significant relations between self-regulation and academic behaviors, there were no mediational effects. While there was no mediation between motivation to academic behaviors via self-regulation, there were a few significant main effects between motivation and academic behaviors in high school students (see Table 17). Specifically, in least favorite classes, expectancy predicted attendance and interest predicted handing in of assignments. Interestingly, attainment value was negatively related to handing in of assignments in least favorite classes, but this relation became non-significant when mastery goal orientations were not included in the model. In addition, the positive (though non-significant) correlation between attainment and assignment completion suggests that this finding is a result of statistical suppression and should be interpreted with caution.

#### **4.3.1.6 Self-Regulation to Achievement**

The findings for the relations between self-regulation and achievement were surprising. As can be seen in Table 14, only time planning was related to academic achievement in favorite classes. This was contrary to the hypothesis that self-regulation

would be related to achievement more in least favorite than favorite classes. One explanation for this might be that students actively engage in allotting time for completing work they like, whereas in their least favorite class they just get it done when they can without thinking or planning on when to complete the work.

#### **4.3.1.7 Main and Mediation Effects to Achievement**

In both favorite and least favorite classes, achievement was predicted by expectancies. As hypothesized, the magnitude of this effect was larger in least favorite classes, suggesting that motivation plays a more important role in predicting achievement in least favorite than in favorite classes.

Surprisingly, and contrary to the hypotheses, there was no mediation in least favorite classes. The lack of mediation was due to no significant effects between self-regulation to achievement. In favorite classes, the relations between mastery goal orientations and achievement were mediated by time planning (see Table 14). Specifically, mastery goal orientations were positively related to time planning, which was positively related to achievement. High school students who endorse mastery goals regulate their behaviors through time planning and this, in turn, leads to higher levels of achievement.

## 4.3.2 College

### 4.3.2.1 Motivation to Self-Regulation

As with high school students, the relations between motivation and self-regulation were similar across models, with only slight differences for the achievement model. Therefore, the following discussion addresses the models for learning processes, academic behaviors, and achievement (see Tables 18, 19, and 20). As hypothesized, motivation activated more self-regulatory capacities in college than in high school students, although overall the pattern of findings is similar across both groups. Specifically, mastery goal orientations were positively related to cognitive (metacognition and attention regulation) and behavioral (time planning and environmental regulation) regulation, with higher magnitudes of relations for least favorite classes in all but environmental regulation, in which the relations were slightly stronger for favorite classes (see Table 18, 19, and 20). The only significant relation for performance-approach was negative with emotional suppression in favorite classes ( $\beta = -.23, p < .05; r = -.03, n.s.$ ), however, when performance-avoidance was not included in the model, this relation decreased substantially and became non-significant ( $\beta = .001, n.s.$ ), suggesting that this was a result of statistical suppression. On the other hand, performance-avoidance was positively related to emotion regulation in both favorite (suppression) and least favorite (reappraisal, rumination, and suppression) classes.

Expectancy was positively related to attention regulation and behavioral (time planning and environmental regulation) regulation only in favorite classes, and positively related to metacognition and negatively related to rumination in both favorite and least favorite classes. Interest was positively related to attention in both favorite and least favorite classes, and negatively related to rumination in favorite classes. Additionally, interest was related to metacognition and reappraisal in least favorite classes.

Unlike high school students, utility value negatively predicted attention regulation in least favorite classes, however, the beta decreased and became non-significant when mastery goal orientations were not included in the model ( $\beta = -.08$ , n.s.) while the correlation was positive and significant ( $r = .20$ ,  $p < .01$ ), suggesting statistical suppression. Similarly, attainment value was negatively related to time regulation in least favorite classes though the correlation was positive ( $r = .25$ ,  $p < .01$ ), however this value also decreased and became non-significant when mastery goal orientations were not included in the model ( $\beta = -.007$ , n.s.), suggesting statistical suppression. Finally, attainment was positively related to rumination – a finding unique to college students and supporting the hypothesis that attainment value might be related to maladaptive forms of regulation.

#### **4.3.2.2 Self-Regulation to Learning Processes**

In terms of self-regulation, cognitive regulation was positively related to all forms of learning processes, although differently for favorite and least favorite classes (see Table 21). Specifically, metacognition was positively related to all forms of learning processes in both favorite and least favorite classes, except for organization and engagement in favorite classes. Attention regulation was positively related to elaboration and engagement in favorite classes, and engagement in least favorite classes. This suggests that the ability to control and adjust one's attention influences engagement, however, only in favorite classes does this facilitate making connections across contexts and domains. In terms of behavior regulation, time planning was related to organization and engagement in both favorite and least favorite classes, and rehearsal in least favorite classes. Most interesting is the role that environmental regulation plays in predicting learning processes in college students. Whereas this form of regulation was not significantly related to any of the outcomes for high school students, for college students it was related to rehearsal, elaboration, and engagement in favorite classes and to elaboration in least favorite classes. This finding is consistent with the hypothesis that college students need to regulate where they study more than high school students do. Finally, emotion regulation predicted more learning processes in college than in high school students. Specifically, rumination was positively and suppression was negatively related to organization in favorite classes. Rumination was positively related to

elaboration in both favorite and least favorite classes and negatively related to engagement in least favorite classes. The more one ruminates, the more one thinks about how the learned content relates across contexts, yet at the same time, less resources are free to engage in disliked materials. Another maladaptive form of emotion regulation, suppression, was negatively related to engagement, however this was in favorite classes. Surprisingly, not expressing one's emotions in favorite classes actually decreased engagement.

#### **4.3.2.3 Main and Mediational Effects for Learning Processes**

In terms of the main effects, surprisingly mastery goal orientations only predicted elaboration and engagement in least favorite classes (see Table 21). For high school students, mastery goal orientations predicted engagement in both favorite and least favorite classes. Among college students, performance-approach predicted engagement in favorite classes. Interest was positively related to elaboration and engagement only in favorite classes for college students, whereas it did not predict any outcomes for high school students. Finally, attainment was negatively related to rehearsal in least favorite and engagement in favorite classes, although the correlations were positive ( $r = .16, p < .01$ ;  $r = .29, p < .001$ , respectively). These relations decreased and became non-significant ( $\beta = -.05$ , n.s. for rehearsal and  $\beta = -.11$ , n.s. for engagement) when mastery goal orientations were not included in the model, suggesting statistical suppression. Therefore these findings should be interpreted with caution.

In examining the mediational paths, as hypothesized, college students' learning processes were predicted by motivation and self-regulation more than high school students' learning (see Table 14 for high school and Table 22 for college). The relations among motivation, self-regulation, and learning processes were more complex in college than in high school students. The following results are discussed by the outcome.

In examining the findings for organization, the only similarity across high school and college students was that the relations between motivation and organization were mediated by metacognition and time in least favorite classes. However, for college students, mastery goal orientations, expectancy, and interest activated regulation for least favorite classes, whereas only mastery goal orientations played an active role for high school students in least favorite classes. For college students, in favorite classes, behavior (time) and emotion (rumination and suppression) regulation mediated the relations between motivation and organization. Whereas mastery goal orientations were positively related to time planning, expectancy and performance-avoidance predicted rumination towards organization.

Similar to high school students, the relations between motivation (mastery goal orientations and expectancy) and rehearsal was mediated through time and metacognition for least favorite classes. However, in favorite classes, metacognition and environment regulation mediated the relations between motivation and rehearsal for college students.

The relations between motivation and self-regulation to elaboration were more complex for college students than for high school students. In both favorite and least favorite classes, metacognition, environment and rumination mediated the relations between motivation and elaboration, with stronger relations for least favorite classes. However, attention also played a mediating role only in favorite classes (see Table 22).

Last, motivation was related to engagement via self-regulation. These relations were quite complex, with many different pathways to academic engagement. The relations between mastery goal orientations and expectancy to engagement were mediated through attention regulation, time planning, and environment regulation, and for interest through attention regulation in favorite classes. Metacognition, attention regulation, time planning, and rumination played a mediating role between motivation (mastery goal orientations, performance-avoidance goal orientations, expectancies, attainment value, and interest) and academic engagement in least favorite classes. Thus, as hypothesized, the relations of motivation to engagement via self-regulation are more complex in least favorite classes.

#### **4.3.2.4 Self-Regulation to Academic Behaviors**

Consistent with the hypothesis that college students would need to harness regulation more than high school students would, there were more significant relations predicting academic behaviors for college than for high school students (see Table 23).

In terms of self-regulation, attention regulation and time planning predicted attendance in least favorite classes. Additionally, environmental regulation was positively related to time spent on work in favorite classes. Surprisingly, rumination was also positively related to time spent on work in favorite classes. Completion of assignments on time was predicted by time regulation in least favorite classes, and was negatively related to rumination in favorite classes.

#### **4.3.2.4 Main and Mediation Effects for Academic Behaviors**

There were also more relations between motivation and academic behaviors for college than for high school students. Specifically, expectancy positively predicted attendance in favorite classes and handing in assignments on time in least favorite classes (see Table 23). Surprisingly, interest was negatively related to time spent on homework and handing in assignments on time in least favorite classes. Utility was also negatively related to handing in assignments on time, however, this negative relation became non-significant ( $\beta = -.13$ , n.s.) when mastery goal orientations were not included in the model and there was no correlation between utility and assignment completion ( $r = -.00$ , n.s.), suggesting statistical suppression.

In terms of the mediational relations, only rumination mediated the relations between motivation (expectancy, attainment, and interest) and academic behaviors (time spent on class work and handing assignments on time) in favorite classes. As presented in Table 19, expectancy and interest were both negatively related to rumination, whereas

attainment was positively related to rumination. Rumination was positively related to time spent on homework and negatively related to assignment completion. Thus, high levels of expectancies and interest lead to low levels of rumination. However, if one ruminates, this rumination leads to more time spent on classwork though less likelihood of handing assignments in on time. The finding that attainment is negatively related to rumination is in line with the hypothesis that attainment might raise threats to the self, which in turn lead to higher levels of rumination.

In least favorite classes, the relations between motivation (mastery goals and interest) and attendance in class were mediated by attention regulation and time planning, whereas handing in of assignments was mediated only by time planning. Mastery goals and interest were positively related to attention and time planning, which in turn predicted attendance in class and handing in assignments.

#### **4.3.1.6 Self-Regulation to Achievement**

Surprisingly, there were no significant relations between self-regulation and achievement. This was contrary to the hypothesis that self-regulation would be related to academic achievement in both favorite and least favorite classes (see Table 20).

#### **4.3.1.7 Main and Mediation Effects to Achievement**

Achievement was predicted by expectancy in both favorite and least favorite classes. Interest was also positively related to achievement, but only in favorite classes (see Table 20). Contrary to the hypothesis, there was no mediation of motivation to

achievement via self-regulation because self-regulation was not related to achievement. Most surprising are the null relations between goal orientations and achievement.

### **4.3.3 Summary**

Overall, the findings lend support to the hypothesis that there are multiple pathways to academic success. The relations between motivation to academic outcomes via self-regulation were found to be quite complex. First, in line with the hypotheses, self-regulation mediated the relations between motivation and academic outcomes more for college students than high school students. As hypothesized, behavior regulation (time planning and environmental regulation) mediated the relations of motivation to learning processes and academic behaviors substantially more for college students than for high school students. Surprisingly, motivation related to emotion regulation in favorite classes more than in least favorite classes, which in turn led to a variety of academic outcomes. Another unexpected finding is the lack of main and mediation effects to achievement. Although for high school students, time planning mediated the relations between mastery goals and achievement, this was the only significant finding. In order to capture the multidimensional nature of self-regulation, the next set of analyses investigated how self-regulation capacities combine into profiles using latent class analyses.

#### ***4.4 Research Question 2: How do self-regulation profiles mediate the relations between motivation and outcomes?***

To answer research question 2, person-centered analyses were conducted. There are a couple of steps in this analysis. First, latent class mixture modeling analysis (see Figure 6) was used to group participants into self-regulation classes or profiles, based on how self-regulation variables naturally combined. The standardized z-scores for metacognition, attention regulation, time planning, environmental regulation, rumination, reappraisal, and emotional suppression were the grouping variables. Analyses were run separately to group participants into 2, 3, 4, and 5 latent classes. The number of groups that was ultimately chosen as the best solution was determined based on theory, the number of participants in each class, as well as on how differentiated the classes were.

After determining class membership, I used structure equation modeling to investigate how motivation relates to self-regulation profiles (class membership) and consequently to learning processes (Figure 7). These structural equation modeling analyses were conducted separately for learning processes, academic behaviors, and achievement in favorite and least favorite classes for college and high school students.

As with the variable-centered analyses, in order to rule out suppression due to multicollinearity between exogenous variables, a model excluding the potentially suppressing exogenous variable was conducted and betas were compared. Specifically, performance-approach and performance-avoidance were potentially suppressing each

other, as well as mastery goal orientations with task value components. These cases are noted in the appropriate places.

#### **4.4.1 High School**

In high school, four classes emerged for favorite classes (see Figure 14) and three classes emerged for least favorite classes (see Figure 15). As depicted in Figure 14, the four classes for favorite subjects were quite distinct in their combination of the regulatory capacities. In order to examine the differences in the regulation capacities used to create the classes, a multivariate analysis of variance (MANOVA) was conducted, where class membership was the between-subjects variable and the regulatory capacities were the dependent variable. As expected, the MANOVA confirmed a significant difference between classes on the grouping variables for favorite (Wilks' Lambda = .087,  $F(21, 454.241) = 29.025$ ,  $p = .000$ ) and least favorite (Wilks' Lambda = .175,  $F(14, 298) = 29.617$ ,  $p = .000$ ) classes.

Follow-up univariate analyses showed that there were statistically significant differences in each of the regulation variables between classes in favorite subjects (see Table 24). Students in the High Regulators Class were moderate to high in all of their regulatory capacities including low levels of rumination, which is adaptive emotion regulation. High regulators had higher levels of regulation than all of the other classes, except for similar levels of attention regulation and suppression to students in the Attention Regulation Class. High regulators were also similar in their high reappraisal

levels to the Emotion Regulation Class and low rumination levels to the Low Regulation Class. Students in the Attention Regulation Class were low to moderate on all regulatory capacities except attention regulation, which was high. However, they were similar to the Low Regulation Class in metacognition, and to both the Low Regulation and Emotion Regulation Classes in suppression. The Emotion Regulation Class consisted of students who were quite high in rumination, but this was accompanied by moderate-high levels of reappraisal and low levels of suppression, suggesting that they invested in regulating their emotions more than their cognitions and behaviors. The students belonging to the Emotion Regulation Class may not be adept at regulation in general, as they had similar low levels of attention and environmental regulation to the Low Regulation Class. In the Low Regulation Class, students did not regulate very much, though they did engage in moderate levels of rumination, which is a maladaptive form of regulation. As a broader check of self-regulation, to examine how self-control related to class membership, a MANOVA confirmed that the four groups were different in their levels of self-control ( $F(3, 171) = 32.29, p = .000$ ), with the High Regulators reporting higher levels of self-control than the other groups ( $M = .57, SE = .11$ ), followed by the Attention Regulation Class ( $M = .33, SE = .12$ ). The lowest levels of self-control were reported by the Emotion Regulation ( $M = -.63, SE = .12$ ) and the Low Regulation Classes ( $M = -.69, SE = .14$ ), who did not differ in their levels of self-control.

Similar follow-up univariate analyses for least favorite classes showed that there were statistically significant differences in each of the regulation variables between class membership (see Table 25). Consistent with the favorite classes, there was a High Regulation Class in which all of the regulatory capacities were higher than the other classes, except for suppression, which was similar across all classes, and attention regulation, which was the same level as that of the Attention Regulation Class. Students in the Attention Regulation Class were low on most of the regulatory capacities in comparison to the High Regulation Class, except for attention, in which they were just as high. Attention Regulators did not differ significantly from Ruminators in their low levels of reappraisal. In contrast to the favorite classes, a Ruminators Class emerged, in which students were moderate to low on all forms of regulation but moderately high in rumination. Their rumination levels were higher than students in the High Regulation or Attention Regulation Classes. Again, self-control was used as a broader check for these three groups. These three groups were also different in their levels of self-control ( $F(2, 156) = 14.73, p = .000$ ). Specifically, the High Regulation Class ( $M = .54, SE = .13$ ) and the Attention Regulation Class ( $M = .15, SE = .18$ ) were not significantly different in their levels of self-control, whereas Ruminators had the lowest levels of self-control ( $M = -.35, SE = .10$ ).

In order to address the question of how class membership mediated the relations between motivation and learning processes, academic behaviors, and achievement, a

mediational model was conducted. To facilitate interpretation of the findings, classes were dummy coded using the High Regulation Class as the reference group at -1. Therefore, a negative beta from a motivation variable to a class dummy code is interpreted as the difference between the target group in comparison to the High Regulation Class. It is important to note that because the mediating variable is a categorical dummy variable, the unstandardized regression coefficient is used to determine the relations between motivation to class membership and class membership to the outcome variable. It is not possible to calculate a mediation coefficient because of the nature of the effects. At the same time, by using dummy coding, I can deduce how belonging in one group compares to a reference group (High Regulation Class). The mediation analyses therefore focus on how motivation leads to a likelihood of belonging to a certain latent class in comparison to the High Regulation Class (reference group), and in turn, how membership in the High Regulation Class versus that certain latent class influences the outcome.

A similar model was examined separately for learning processes, academic behaviors, and achievement. An example of this model is presented in Figure 16. The model was fully saturated to allow testing of all possible relations and comparison of the relations that emerged across favorite and least favorite classes in high school and college separately. For learning processes, academic behaviors, and achievement models, the motivation variables predicted class membership in a similar way, therefore,

a general presentation of this section of the model is discussed first, followed by the model for each group of outcomes separately.

#### **4.4.1.1 Motivation to Class Membership**

In examining how motivation related to class membership, a negative beta signifies that High Regulation Class membership is beneficial in relation to the regulation class (see Tables 26 & 27 for favorite classes and 28 & 29 for least favorite classes). Mastery goal orientations were related to membership in the High Regulation Class in favorite subjects, in comparison with all regulation classes. In least favorite subjects, students who endorsed mastery goal orientations were more likely to belong to the High Regulation Class versus the Attention Regulation Class, but not the Rumination Class. In favorite classes, higher expectancies related to belonging to the High Regulation Class in comparison to the Emotion Regulation Class. However, students who endorsed interest were more likely to belong to the Attention Regulation Class rather than the High Regulation Class. In least favorite classes, expectancy and attainment were related to membership in the High Regulation Class versus the Rumination Class. Thus, expectancy seems to be related to higher regulation profiles in comparison to students who tend to regulate their emotions or ruminate, for both favorite and least favorite classes.

#### **4.4.1.2 Class Membership to Learning Processes**

In examining how class membership predicted learning processes, membership in the High Regulation Class rather than the Low Regulation Class was related to learning processes in favorite subjects (see Table 26). This is in line with the variable-centered analyses in which higher levels of self-regulation predicted higher levels of learning processes. High Regulation Class membership in comparison to Attention Regulation Class membership was related to organization. That is, for rehearsal, elaboration, and engagement, there was no difference between students who had attention regulation or high regulation profiles. Only in organization, the likelihood of belonging to the High Regulation Class versus the Attention Regulation Class was related to higher levels of organization. Interestingly, there was no benefit for having a high regulation profile versus an emotion regulator for any of the learning processes.

In terms of least favorite classes, membership in the High Regulation Class versus belonging to the Attention Regulation Class was beneficial for organization, rehearsal, and elaboration but not for engagement (see Table 28). Students who were more likely to belong to the High Regulation Class versus the Rumination Class had higher levels of engagement.

#### **4.4.1.3 Direct and Mediational Relations to Learning Processes**

In considering how motivation influences one's regulatory profile, which in turn influences learning processes, I first consider the main effects from motivation to

learning processes followed by the mediational effects. In terms of the relations between motivation and learning processes, interest was positively related and attainment was negatively related to engagement in favorite classes, however, without mastery goal orientation in the model, these relations became non-significant, suggesting statistical suppression. In least favorite classes, mastery goal orientations were positively related to rehearsal, elaboration, and engagement. Surprisingly, performance-avoidance was positively related to elaboration. Expectancy was also positively related to engagement.

Of interest was how the tendency to belong in a certain class mediated the relations between motivation and learning processes. The most consistent finding was that students who were more likely to belong to the High Regulation Class versus the Low Regulation Class mediated the relations between mastery goal orientations and learning processes (organization, rehearsal, elaboration, and engagement). Additionally, membership in the High Regulation Class versus the Attention Regulation Class mediated the relations between mastery goal orientations and interest to organization. The focus on developing and learning as well as cognitive-affective enjoyment led to high regulatory profiles and subsequent better organization of the learned materials. To a certain extent, these findings are in line with the variable-centered analyses, which found that higher regulation is positively related to higher levels of learning processes.

In least favorite classes, the relations between mastery goals and rehearsal and elaboration were partially mediated through membership in the High Regulation Class

versus the Attention Regulation Class. The relations between expectancy and engagement were partially mediated through membership in the High Regulation Class versus the Rumination Class. These findings are in line with the variable-centered analyses in which rumination mediated the relations to engagement. There were no signs of suppression for any of these results.

#### **4.4.1.4 Class Membership to Academic Behaviors**

In examining the relations between class membership to academic behaviors, class membership only related to handing in assignments in favorite subjects (see Table 26). Specifically, the students who were more likely to belong to the High Regulation Class versus the Low Regulation Class tended to hand in assignments on time more often.

#### **4.4.1.5 Direct and Mediational Relations to Academic Behaviors**

There were more relations between motivation and academic behaviors in least favorite versus favorite classes. Specifically, in favorite classes, only expectancy was positively related to turning in of assignments on time (see Table 26). In least favorite classes, interest was positively related and attainment was negatively related to handing in of assignments on time (see Table 28). In addition, expectancy was positively related to class attendance only in least favorite classes.

There were also a number of mediational effects. The relations between mastery goal orientations and turning in assignments on time were mediated by the likelihood of

belonging to the High Regulation Class versus the Low Regulation Class. In turn, students who were more likely to belong to the High Regulation Class versus the Low Regulation Class were more likely to turn in assignments on time.

In least favorite classes, there were only main effects of motivation to academic behaviors. These results are in line with the variable-centered analyses in which there were no significant relations between self-regulation and academic behaviors. The relations between motivation and academic behaviors were not mediated by class membership, as there were no significant relations found between class membership and behaviors.

#### **4.4.1.6 Class Membership to Achievement**

Surprisingly, class membership was not related to achievement in favorite classes (see Table 27 for favorite classes and Table 29 for least favorite classes). The only significant relations between class membership and achievement was for attention regulation in least favorite classes. Specifically, membership in the High Regulation Class versus membership in the Attention Regulation Class was positively related to achievement in least favorite classes. This finding is different from the variable-centered analyses, in which attention regulation was not related to achievement. It seems that when attention regulation is the main form of regulation, without other forms of regulation being highly salient, then it is actually detrimental to achievement. This is

contrary to the hypothesis that attention regulation may be able to overcome other regulatory deficiencies.

#### **4.4.1.7 Direct and Mediational Relations to Achievement**

There were more relations between motivation and self-regulation in least favorite than favorite classes, as hypothesized. Though some relations were predicted for favorite classes, contrary to the hypotheses, motivation and self-regulation were not significantly related to achievement in favorite classes. In least favorite classes, performance-approach was negatively related to achievement. Similar to the variable-centered analysis, expectancy was positively related to achievement.

Of interest, the positive relations between mastery goal orientations and achievement were mediated through the High Regulation Class versus the Attention Regulation Class. Most surprising is the finding that membership in the Rumination Class did not differ significantly from membership in the High Regulation Class. At the same time, examining the combination of regulatory capacities adds to the variable-centered analyses as there were no significant relations between self-regulation and achievement in the variable-centered analyses. In line with the hypotheses, examining how regulation combines into distinct profiles reveals a different picture than when examining their independent contributions.

#### 4.4.2 College

In college, four classes emerged for both favorite and least favorite classes (see Figures 17 and 18, respectively). In favorite classes, the classes that emerged were similar to those in high school favorite classes. In order to examine the differences in the regulation capacities used to create the classes, a multivariate analysis of variance (MANOVA) was conducted where class belonging was the between-subjects variable and the regulatory capacities were the dependent variable. As expected, the MANOVA confirmed a significant difference between classes on the grouping variables (Wilks' Lambda = .10,  $F(21, 752.873) = 43.175$ ,  $p = .000$ ). Follow-up univariate analyses showed that there were statistically significant differences in each of the regulation variables (see Table 30). Students in the High Regulation Class were moderate-to-high in all of their regulatory capacities including low levels of rumination, which reflects an adaptive form of emotion regulation. The High Regulation Class was higher than all of the other classes on the cognitive (metacognition and attention regulation) and behavioral (environmental regulation and time planning) regulation capacities. However, the High Regulation Class had high levels of reappraisal similar to the Emotion Regulation Class, was not significantly different from the Attention or the Low Regulators in rumination, and had levels of suppression similar to all of the other classes. In the Attention Regulation Class students were low-to-moderate on all regulatory capacities except attention regulation, which was high. However, attention regulation in the High

Regulation Class was actually higher than in the Attention Regulation Class. In addition, Attention Regulators were similar to all other classes in suppression and were significantly different in rumination from the Emotion Regulators. The Emotion Regulation Class consisted of students who were quite high in rumination, but this was accompanied by moderate-high levels of reappraisal and low levels of suppression, suggesting that they invested in regulating their emotions more than their cognitions and behaviors. In fact, Emotion Regulators were highest in rumination amongst the latent classes, but were no different from the High Regulators in reappraisal. They were, however, lower than the High and Attention Regulation classes and higher than the Low Regulation Class in metacognition, environment regulation, and time planning. While they were lower in attention regulation than the High and Attention Regulation Classes, they did not differ in attention regulation from the Low Regulation Class. In the Low Regulation Class, students were generally low on all of the regulatory capacities, with a few exceptions. Specifically, they were not significantly different in rumination or suppression from the High or Attention Regulation Classes, or in attention from the Emotion Regulation Class.

As a broader check, these four groups were submitted to a MANOVA predicting self-control. There were significant differences among the classes ( $F(3, 273) = 30.43, p = .000$ ), with the High Regulation Class having the highest levels of self-control ( $M = .37, SE = .09$ ) and the Emotion Regulation Class having the lowest levels of self-control ( $M = -$

.98, SE = .12). The Low Regulation Class also had low levels of self-control ( $M = -.13$ , SE = .19). However, levels of self-control were not significantly different between the Attention Regulation Class, the Low Regulation Class, and the High Regulation Class ( $M = .19$ , SE = .09),

A different composition of self-regulation capacities emerged for college students in least favorite classes. In order to examine the differences in the regulation capacities used to create the classes, a multivariate analysis of variance (MANOVA) was conducted where class belonging was the between-subjects variable and the regulatory capacities were the dependent variable. As expected, the MANOVA confirmed a significant difference between classes on the grouping variables (Wilks' Lambda = .10,  $F(21, 747.130) = 42.87.143$ ,  $p = .000$ ). Follow-up univariate analyses showed that there were statistically significant differences in each of the regulation variables (see Table 31). Consistent with the favorite classes, there was a High Regulation Class and a Low Regulation Class which differed on all of the regulatory capacities with the High Regulation Class, reporting higher levels of self-regulation across all regulatory capacities, though they were not significantly different from the Behavior Regulators in reappraisal, from the Moderate-Low Regulators in rumination, or from both the Moderate-Low and Behavior Regulation Classes in suppression. There was also a group of students who were moderately high in their behavior regulation, while low or moderate on the other regulatory capacities and therefore this group was named the

Behavior Regulation Class. Behavior Regulators were lower than the High Regulators on all of the regulatory capacities, except for suppression and reappraisal, in which they did not differ. They were significantly higher in attention and rumination than the Low Regulation Class. Finally, there was a Moderate-Low Regulation Class that was moderately low on all of their regulatory capacities. In general, the Moderate-Low Regulators were lower than the High Regulators but higher than the Low Regulators in their regulatory capacities.

Again, a broader check revealed that these classes varied in their levels of self-control ( $F(3, 270) = 34.02, p = .000$ ). Specifically, High Regulators were highest in self-control ( $M = .94, SE = .11$ ) whereas Low Regulators were lowest on self-control ( $M = -.71, SE = .26$ ). The Moderate-Low Class ( $M = -.46, SE = .10$ ) was lower than High Regulators and the Behavior Regulators ( $M = -.10, SE = .08$ ), but no different than the Low Regulators in self-control.

In order to address the question of how class belongingness mediated the relations between motivation and outcomes, a mediational model was examined. The same approach that was used for the high school students was employed for the college students. In order to allow for interpretation of the findings, classes were dummy coded using the High Regulation Class as the reference group at -1. Therefore, a negative beta from a motivation variable to a class dummy code is interpreted as the difference between the target class in comparison to the High Regulation Class. A similar model

was examined separately for learning processes, academic behaviors, and achievement. An example of this model is presented in Figure 16. The model was fully saturated to permit testing of all possible relations, and comparison of the relations that emerged across favorite and least favorite classes in high school and college. In general, the motivation variables similarly predicted class membership across all three outcomes (learning processes, academic behaviors, and achievement). In fact, the results were identical for learning processes and academic behaviors. Therefore, a general presentation of this section of the model is discussed first, followed by the specific motivation to class membership to outcome model. Statistical suppression was examined by running similar models with and without possible suppressors: performance-approach, performance-avoidance, mastery goal orientations, and the values. The effects of statistical suppression are noted where appropriate.

#### **4.4.2.1 Motivation to Class Belonging**

The relations between motivation to class belonging was similar for learning processes and academic behaviors (see Table 32 for favorite classes and Table 34 for least favorite classes) and only slightly differed for achievement (see Table 33 for favorite classes and Table 35 for least favorite classes). The patterns reported are generally consistent across all of these models, though slight discrepancies can be noticed in the tables. In favorite subjects, mastery goal orientation endorsement was related to the likelihood of belonging to the High Regulation Class versus the Low Regulation and the

Emotion Regulation Classes. Expectancy was related to likelihood of belonging to the High Regulation Class versus membership in the Low Regulation and the Attention Regulation Classes. In addition, in the learning processes and the academic behavior models, expectancy was related to the likelihood of belonging to the Emotion Regulation Class versus High Regulation Class membership, whereas these relations flipped for the achievement model such that expectancy was related to higher likelihood of High Regulation Class Membership versus the Emotion Regulation Class. Interest predicted High Regulation Class membership versus membership in the Emotion Regulation Class. In addition, in the learning processes and academic behaviors model, interest predicted High Regulation Class membership versus membership in the Attention Regulation Class. Overall, these relations are in line with those found for the variable-centered analyses.

A different pattern emerged for the least favorite classes. This pattern was consistent across the three models (learning processes, academic behaviors, and achievement). In least favorite subjects, mastery goals and interest similarly predicted High Regulation Class membership versus membership in the Low and the Moderate-Low regulation classes, but only interest predicted the likelihood of belonging to the High Regulation Class versus Behavior Regulation Class membership. Finally, as hypothesized, utility predicted the likelihood of Behavior Regulation Class membership versus High Regulation Class membership.

#### 4.4.2.2 Class Membership to Learning Outcomes

In favorite subjects, High Regulation Class membership versus Low Regulation Class membership related to all learning processes (organization, rehearsal, elaboration, and engagement) (see Table 32). As hypothesized, membership in the Attention Regulation Class was positively related to engagement, and actually benefited individuals more than having a High Regulation profile. Interestingly, the likelihood of belonging to the Emotion Regulation Class versus the High Regulation Class was related to organization and rehearsal. However, High Regulation Class membership but not Emotion Regulation Class membership predicted engagement. These findings are in line with the hypothesis that there could be specialized profiles of self-regulation that could be adaptive. At the same time, it is somewhat surprising that high regulation profiles are not universally related to adaptive outcomes.

Similar to favorite subjects, in least favorite subjects, the likelihood of belonging to the High Regulation Class versus Low Regulation Class membership was related to all learning processes (see Table 34). Similarly, the likelihood of belonging to the High Regulation Class versus the Moderate-low Regulation Class related to engagement. Interestingly, belonging to the Behavior Regulation Class versus High Regulation Class membership was related to organization, rehearsal, and elaboration but not to engagement. Thus, there are benefits to having a behavior regulator profile over a high regulator profile for certain learning processes.

In general, these findings are in line with the hypothesized relations. They also reiterate the variable-centered findings in that behavioral regulation plays a more active role in regulating towards learning processes. In addition, the specialized profiles seem to be adaptive for college students more so than for high school students.

#### **4.4.2.3 Direct and Mediational Relations to Learning Processes**

Similar to the variable-centered analyses, in favorite classes, performance-approach and interest predicted engagement, and interest was also positively related to elaboration. Again, similar to the variable-centered analyses, in least favorite classes, mastery goal orientations predicted elaboration and engagement, whereas attainment was negatively related to rehearsal and engagement. However the relations of attainment to rehearsal and engagement is likely due to statistical suppression, as these relations became nonsignificant without mastery goal orientations in the model ( $B = -.02$ , n.s.;  $B = -.04$ , n.s., respectively).

As hypothesized, the relations between motivation to learning processes was mediated by group belonging more in college than in high school students. In favorite subjects, the relation of mastery goal orientations and expectancy to learning processes was mediated by the likelihood of belonging to the High Regulation Class versus the Low Regulation Class. Additionally, the likelihood of belonging to the Emotion Regulation Class rather than the High Regulation Class mediated the relations between interest and organization and rehearsal. However, the reverse was true of engagement.

Likelihood of belonging to the High Regulation Class versus the Emotion Regulation Class mediated the relations between mastery goal orientations and engagement. These findings lend more weight to the idea that different combinations of regulatory profiles can be beneficial.

Similarly, in least favorite subjects, the relations between mastery goal orientations and interest to learning processes were mediated through membership in the High Regulation Class rather than the Low Regulation Class. Mastery goal orientations and interest also related to engagement via likelihood of belonging to the High Regulation Class versus Moderate-low Class. Yet, the relations of interest and utility values to organization, rehearsal, and elaboration were mediated through Behavior Regulation Class membership versus the High Regulation Class. These findings support the hypothesis that there are benefits to being a specialized regulator, i.e., behavior regulator, rather than a generally high regulator in least favorite classes. The importance of behavior regulation for college students, particularly in least favorite classes, reiterates the variable-centered analyses and underscores the importance of behavior regulation (environmental regulation and time planning) for college students.

#### **4.4.2.4 Class Membership to Academic Behaviors**

In favorite classes there was some differentiation in the relations of class membership to academic behaviors. The likelihood of belonging to the High Regulation Class versus Low Regulation Class membership predicted time spent on homework,

whereas High Regulation Class membership versus Emotion Regulation Class membership predicted handing in assignments on time. This suggests that being an emotion regulator can actually be detrimental to getting the work done. This is similar to the negative relations found between rumination and assignment completion in the variable-centered analyses. These findings are contrary to the hypothesis that there could be benefits to specific forms of regulation.

Contrary to the hypotheses, there were the same amount of regulatory relations for least favorite classes as there were for favorite subjects. Specifically, the likelihood of belonging to the High Regulation Class versus the Moderate-Low and Behavior Regulation Class predicted handing in of assignments on time. This is in contrast to the learning processes for which behavior regulation profiles were positively related to learning processes.

#### **4.4.2.5 Direct and Mediational Relations to Academic Behaviors**

In favorite classes, performance-approach goal orientations were negatively related to handing in assignments on time, though this is likely due to statistical suppression; without performance-avoidance goal orientations these relations became nonsignificant ( $b = -.10$ , n.s.) (see Table 32). Expectancy was related to attendance and assignments, while interest was negatively related to time spent on work. The relation between interest and time spent on homework is also likely due to statistical suppression with mastery goal orientations, as this relation became nonsignificant when

mastery goals were not included in the model ( $b = -.08$ , n.s.). As hypothesized, motivational processes predicted more of the academic behaviors in least favorite classes (see Table 34). Mastery goal orientations were positively and expectancy was negatively related to time spent on homework, whereas expectancy was positively and interest was negatively related to assignments being handed in on time.

In examining the mediational role of regulatory profiles, the likelihood of belonging to the High Regulation Class versus the Low Regulation Class mediated the relations between mastery goal orientations and expectancy to time spent on classwork in favorite classes. The likelihood of belonging in the High Regulation Class versus the Emotion Regulation Class mediated the relations between motivation (mastery goal orientations and interest) to completion of assignments. Complex relations were found for the mediating role of group membership in the relations between expectancy and completion of assignments on time. Interestingly, expectancy was related to the likelihood of belonging to the Emotion Regulation Class versus the High Regulation Class, however, belonging to the High Regulation Class versus the Emotion Regulation Class was related to assignment completion in favorite classes. This suggests that expectancy is related to emotion regulation profiles, and that these relations predict lower levels of assignment completion.

A different picture emerges in least favorite classes. The likelihood of belonging to the High Regulation Class versus the Moderate-Low Regulation Class mediated the

relations between motivation (mastery goal orientations and interest) to assignment completion. As hypothesized, there were benefits to having a specialized profile. Specifically, in least favorite classes, membership in the Behavior Regulation Class versus the High Regulation Class mediated the relations of motivation (interest) to assignment completion.

#### **4.4.2.6 Class Membership to Achievement**

Contrary to the hypothesis, membership in Regulatory Classes did not relate to achievement (see Tables 33 & 35).

#### **4.4.2.7 Direct and Mediational Relations to Achievement**

In both favorite and least favorite classes, expectancy and interest were positively related to achievement. Contrary to the hypotheses, class membership did not mediate the relations between motivation and achievement due to the lack of significant relations between group membership and achievement.

#### **4.4.5 Summary**

Overall, the findings lend support to the hypothesis that self-regulation combines into profiles, and that these profiles mediate the relations between motivation and academic outcomes. In addition, specialized regulatory profiles emerged. Specifically, the Attention Regulation Class and Emotion Regulation (combined reappraisal, rumination, and suppression) or Rumination Class emphasized the importance that these forms of regulation play across both high school and college

samples. In addition, there was evidence that regulatory profiles differ between high school and college. First, more types of regulatory profiles emerged for college students. In addition to the Attention and Emotion Regulation Classes, there was a group of college students who were Behavior Regulators in that they were dominant in behavior regulation. Importantly, the profiles that emerged mediated the relations between motivation and academic outcomes. These mediational relations occurred more for college students than for high school students.

## 5. General Discussion

The current study aimed to examine the mechanisms by which motivation leads to a variety of academic outcomes. The findings lend support to the proposed model, Regulatory Capacities of Motivational Constructs (RCMC). The RCMC model was used as a framework to understand how motivation instigates task-specific self-regulation. This model builds on research that links motivation and self-regulation [Corno, 1993; Kuhl, 1984; Pintrich, 2000; Zimmerman, 1989, 2006] and extends it to include emotion regulation. A second goal of the current study was to examine the role of self-regulated emotion in addition to self-regulated behaviors and cognitions. A broad emotion regulation approach [Gross1998; Gross & John, 2003] was adapted and integrated into the already established self-regulated framework for cognitions and behaviors [Pintrich, 2000; Zimmerman, 1989, 2006].

Importantly, two methods were used to determine how self-regulation mediates the relations between motivation and learning processes, academic behaviors, and achievement. By using both variable-centered and person-centered analyses, a more in-depth understanding of the mediating role of self-regulation was obtained. While variable-centered analyses are useful in assessing how certain constructs are independently related, a person-centered approach investigates how different self-regulation capacities strategically combine. This approach allows for a more holistic

interactionistic approach according to which the interactions among processes are irreducible wholes that cannot be decomposed [Magnusson, 2003].

Last, the comparison between favorite and least favorite classes situated this complex web of processes within desired versus disliked situations and further unpacked how individuals might find different paths to reach similar academic outcomes. Previous research focused on specific subjects (e.g., art or math) without considering the student's preference for the class [Eccles et al., 1993; Eccles et al., 1998; Schunk et al., 2008; Wigfield & Eccles, 2000]. Across high school and college students, the findings support the hypothesis that mean level differences in motivation, self-regulation, and academic outcomes differ, based on students' liking of the class. Specifically, as predicted, students who are more motivated have higher levels of learning processes, behaviors, and achievement in their favorite class. Contrary to the hypothesis, higher levels of self-regulation was reported in favorite classes. These mean level differences lend support to the notion that there are important differences that go unnoticed when preference for the class is not considered. In order to examine how the relations among the different variable differ, separate analyses were conducted for favorite and least favorite classes.

### ***5.1 Research Question 1: Are there different pathways to academic success?***

A first line of inquiry investigated whether there are multiple pathways to academic success using variable-centered structural equation modeling. Of interest were the relations of goal orientations, expectancy and values, to learning processes, academic behaviors, and achievement via self-regulation. As hypothesized, the findings suggest that there is more than one way that students reach their desired outcomes. For example, there are many roads that lead to academic engagement. For high school students, attention mediated the relations between expectancy and interest to engagement in favorite classes. However, in least favorite classes metacognition mediated the relations between mastery goal orientations and engagement, attention regulation mediated the relations of expectancy and interest to engagement, and emotion regulation (rumination and suppression) mediated the relations between expectancy and engagement. Thus, there is no one “gold standard” by which motivation is related to learning processes such as engagement (Linnenbrink & Pintrich, 2000; Pintrich, 2000).

Different situations require the individual to cope differently, depending on their available resources. It is likely that students approach their favorite class with a positive outlook. As a result of this antecedent positive mood, they require less regulation to reach a state in which they are able and ready to take part in the class. Their resources are “freed up” and they can be more involved in their learning. In contrast, in least favorite classes antecedent cognition, emotions, and behaviors require more regulation

for the student to get involved with the learned material. Students are more susceptible to temptations as they are obligated to take part in this situation. Therefore, students require more regulation in least favorite classes.

Contrary to the hypotheses, emotion regulation was found to play a central role in favorite classes more than in least favorite classes. It was hypothesized that because students have more antecedent positive emotion in favorite classes, there would be less emotion regulation. However, it could be that students feel positive emotions in their favorite class and they actively protect these positive emotions by emotion regulation (Gross & John, 2003). Resources are invested in maintaining the positive mood associated with attending a favorite class through reappraisal, an adaptive form of self-regulation. Contrary to the hypotheses, rumination (a maladaptive form of emotion regulation) was found to mediate the relations between motivation to academic behaviors in favorite classes. Most surprising was the finding that rumination predicted time spent on class work. How and why would rumination be beneficial? Most research points to the detrimental effects of rumination, especially as it relates to sadness and depression (Nolen-Hoeksema & Corte, 2004). One explanation might be that students ruminate on ways to improve their work. They likely expect their favoring of the class to facilitate involvement with the materials and completion of work, and therefore think about ways that they can “get going” and “handle things better.”

In obligatory disliked situations such as a least favorite class, individuals expect to feel negative emotion. They do not attempt to alter these negative emotions, as they have come to terms with unpleasant experiences. It is important to note that the current study was conducted mid-semester after students had already consolidated their coping strategies in their classes. Measuring emotion regulation from the beginning of the semester might reveal that earlier on, students do attempt to regulate their emotions but through learned helplessness, have come to terms with the negative affect. They may reason that if they cannot change the situation, they may as well acquiesce and wait for the time to pass. Thus, negative emotions may be tolerated in least favorite classes, whereas it is actively attenuated in favorite classes.

The relations between motivation and self-regulation toward academic outcomes were stronger in least favorite classes for both high school and college students, as hypothesized. This suggests that individuals not only draw on more regulatory processes in order to complete tasks that they do not necessarily like versus those they may prefer, but that motivation plays a greater role in activating regulatory processes in least favorite classes than in favorite classes.

In sum, the form of regulation that is harnessed to adjust and monitor cognitions, behaviors, and emotions is influenced by the motivation for the specific class, as described in RCMC. The numerous mediational paths by which motivation was related to academic outcomes suggest that it is important to consider individual differences

both when investigating achievement and when guiding students in how to succeed.

This finding is in line with the current trend to identify individual differences that might influence the way these processes interact [Leary & Hoyle, 2009]. In order to investigate individual differences, students were grouped into self-regulation profiles.

### ***5.2 Research Question 2: How do self-regulation profiles mediate the relations between motivation and outcomes?***

A second line of inquiry investigated the multidimensional aspect of self-regulation. Specifically, self-regulation was combined into profiles using person-centered analyses. Across development and class type, a High Regulation Latent Class emerged in which students reported high levels of self-regulation. As hypothesized, there were a number of specialized profiles. These consisted of students who were dominant in their attention regulation, emotion (or rumination) regulation, and behavioral regulation. This approach to examining the combined effects of self-regulation is similar to that recently used by Shell and Husman (2008). They found three dimensions (similar to profiles) of canonical correlations: a focus on strategy use, a knowledge-building strategy, and learned helplessness. While they used a different framework for conceptualizing self-regulation, they also examined the ways in which self-regulation and strategy use combine for different individuals.

The findings of the latent class structural equation models lend support to the hypothesis that regulatory profiles mediate the relations between motivation and

academic outcomes. Furthermore, these findings reveal a different, though somewhat similar, picture to those found in the variable analyses. There was evidence that regulatory profiles differ between high school and college. First, more types of regulatory profiles emerged for college students. Similar to the variable-centered analyses, mediational relations occurred more for college students than for high school students, lending support to the proposed relations between motivation and self-regulated learning proposed in the RCMC. That is, not only does motivation activate specific self-regulatory capacities as revealed by the variable-centered analyses, but certain forms of motivation tend to be related to certain regulatory profiles, which in turn influence academic outcomes. Most interesting are the developmental differences in the latent classes that emerged. In college and high school students, High Regulation, Attention Regulation, and Emotion Regulation Classes emerged. However, only for college students there was a group of students dominant in their behavior regulation. These findings reiterate the relations found in the variable-centered analyses and emphasize the importance of behavior regulation for college versus high school students.

### ***5.3 Development***

In examining differences between high school and college students, the findings support the developmental hypothesis that there would be more diversity in the routes that college students use to reach these academic outcomes (learning, behaviors, and

achievement) versus high school students. That is, for college students, the relation between motivation and self-regulation is mediated by a greater variety of self-regulation, resulting in more mediational paths. Additionally, the findings that college students regulate more are in line with the hypothesis that college students will draw on more regulatory capacities more often than high school students. There are two possible and related explanations for these findings. First, college students are afforded more autonomy than high school students. In comparison to high school students, college students' schedules are less structured. They generally live away from home and any supervision, construct their own schedule by choosing when to attend classes or other commitments, and thus have more control over their schedule, affording them more flexibility. This autonomy requires college students to harness self-regulation more often than high school students, who are somewhat confined by their predetermined daily schedules.

A second and related explanation for these findings is the higher level of expertise of college students' self-regulation. College students are "expert" regulators in relation to high school students. Although high school students have generally developed the capacity to regulate [Kopp, 1989], they are novice regulators [Pintrich & Zusho, 2002]. That is, high school students do not have enough practice in regulating on their own. They may be more accustomed to co-regulation whereby their parents or teachers guide them as to when, where, and how to accomplish different tasks. As a

result, high school students are not required to actively draw on self-regulation as often as college students. Even if high school students are able to identify which self-regulatory capacity would be beneficial, they may not know how to garner it and need scaffolding to accomplish this. That is, identification of the regulatory capacity would be a first step, while its activation would be a second step in regulating toward learning, task completion, or achievement. Perhaps high school is a time when self-regulation can be shaped and students can be taught when and how to use it. In this regard, it could be that adolescents who are more independent earlier actually develop an expertise in self-regulation prior to adolescents who experience co-regulation by trusted adults. It would be worthwhile to examine whether adolescents who are given adult responsibilities at home are more adept at self-regulation than those who are not forced to be independent adolescents. In fact, it is possible that two groups of students would emerge – those that become adept regulators and somewhat resilient, versus those that develop maladaptive forms of regulation due to lack of scaffolding and are “at risk”. An extension of the current study would be to examine self-regulation toward academic success in at-risk versus typically developing students, taking into account a broader lens of individual students’ cultural milieu [Bronfenbrenner & Ceci, 1994].

In line with the explanation that college students are afforded more autonomy, college students also drew on behavioral regulation more than high school students. According to both the variable-centered and the person-centered analyses, behavior

regulation mediated more relations between motivation and academic outcomes than for high school students. That is, because college students have control over where (environmental regulation) and when (time planning) they study, motivation shapes how behavior regulation influences their learning and academic behaviors. It was therefore surprising that behavior regulation did not mediate the relations between motivation and achievement for college students but did mediate these relations for high school students. Surprisingly, for high school students, time planning mediated the relations between mastery goal orientations and achievement. It could be that high school students who plan to study within the time that they have, achieve at higher levels. These findings are in line with the literature on self-regulated learning identifying self-regulated behaviors as crucial in determining task completion [Zimmerman, 1989, 2006].

Overall, behavior regulation plays an important role for college students more than it does for high school students. This was evidenced by the finding that a Behavior Regulation Latent Class emerged in the person-centered analyses only for college students. For certain college students, behavior regulation is the dominant form of regulation, especially in least favorite classes. When the situation is not preferable, students focused on completing the work rather than on tending to their emotions or cognitions. The goal seems to be getting the job done quickly, without much thought or feeling.

Moreover, the finding that behavior regulation was not activated in high school students is consistent with the hypothesis that there would be less regulation in high school students than college students. High school students do not have the freedom to choose where and when to study. Their schedules are generally fixed by the school day, after-school and extra-curricular activities, and parents' scheduling. In this sense, high school students are somewhat other- or co-regulated. There is little room for high school students to self-regulate, in comparison with college students who are afforded more freedom with regard to their schedules and places of study.

Self-regulated behavior also played an important role in determining college students' learning processes. While environmental regulation was not significantly related to any of the outcomes for high school students, among college students it was related to rehearsal, elaboration, and engagement in favorite classes, and to elaboration in least favorite classes. In addition, there was evidence that membership in the Behavior Regulation Class was adaptive. This finding is in line with the assumption that college students need to regulate their environment more than high school students do. College students can more readily choose where they prefer to study and consequently need to adjust their place of choice to make sure it is conducive to working. It is therefore not surprising that environmental regulation is positively related to elaboration. Interestingly, environmental regulation was not related to rehearsal or engagement in least favorite classes. This might be because students have specific places they go to in

order to complete work for classes they dislike, whereas they choose their place of study for classes they like based on the actual task. To my knowledge, this is the only study that empirically investigates the role of self-regulated behavior [Zimmerman, personal communication]. These findings suggest that there could be great value in assessing behavioral processes in academic settings.

Aside from the fact that high school students are novice regulators in comparison with college students, another reason that there were more significant relations and distinct profiles in college students could be the consolidation of regulatory capacities. That is, self-regulation may not be solidified yet in high school, and therefore measurement of these capacities would result in more error. High school students may not be aware of the strategies they use, or they may use many different kinds of strategies as they try to figure out which one works best.

#### ***5.4 Gender Differences***

While there were not specific hypotheses regarding gender differences, there was some evidence that females and males differ in their self-regulation and motivation. In general, females employed emotion regulation more than males, evidenced by higher means. This was especially true in favorite and least favorite classes in high school but was also found for college students in least favorite classes. These findings were consistent with previous research in which females were found to ruminate more than males [Nolen-Hoeksema, & Corte, 2004]. Further research should examine how females

use self-regulatory capacities differently from males, and whether their emotional experiences within the classroom differ from males.

Another interesting finding that may illuminate the gender differences in self-regulation is the higher levels of mastery goal orientations and interest reported by females. This finding replicates previous research in which females reported higher levels of mastery goal orientations [Ryan et al., 1997]. While the current study did not include measures of emotions, research has found that mastery goal orientations and interest are positively related to positive affect [Ben-Eliyahu & Linnenbrink-Garcia, in preparation; Tyson et al., 2009]. It is therefore reasonable to deduce that females, who are higher in mastery goal orientations and interest, may experience more positive affect. As a result, females might attempt to protect these positive emotions by employing more emotion regulation than males, and therefore they report higher levels of emotion regulation. The current study did not examine whether processes function differently for males and females. However, given these overall mean level differences, it would be important to ask whether these processes function differently for females and males. That is, do motivational constructs activate self-regulation similarly for males and females, and does self-regulation relate to academic outcomes similarly across the genders?

## ***5.5 Interplay of Motivation***

Finally, it is imperative to acknowledge that the present model examined only the possibility that all motivational constructs work in concert. However, there may be other relations among motivation. In Eccles' original formulation of expectancy-value theory, goals were thought to influence task value and expectancies [Eccles et al., 1983]. Eccles et al.'s (1983) expectancy-value model proposed that goals influence task value, self-concept, and task perceptions. Self-concept and task perceptions were thought to influence expectancies and task value. Specifically, they posited that goals lead to task value. The proposition that goal orientations lead to values and expectancies has received some support [Linnenbrink & Pintrich, 2000; Hulleman et al., 2010; Friedel, Cortina, Turner, & Midgley, 2007]. Friedel et al. (2007) found that students' goal orientations are related to their expectancies, as measured by self-efficacy beliefs, and Hulleman et al. (2010) found that goal orientations predicted intrinsic and utility value in academics and sports. In summary, it may be that goals lead to expectancies and values, which in turn activate self-regulation towards task completion.

Another relation that has been proposed is that expectancies and values lead to goal orientations [Dweck & Legget, 1988; Elliot & Thrash, 2002; Greene et al., 1999; Hulleman et al., 2010]. While Eccles et al.'s original formulation of expectancy-value theory proposed that goals influence task value and expectancies [Eccles et al., 1983]. Later, Wigfield and Eccles (1992) proposed that value influences goals, and that based on

the research evidence, the original expectancy-value theory might be revised. Specifically, they posited that attainment value and utility value would lead to performance goals, whereas interest/intrinsic value would lead to mastery goals. They also posited that multiple values and subsequent goals could be endorsed. For example, a combination of utility and interest values would lead to the endorsement of both performance and mastery goals. Thus, value was posited to influence goals, which influence achievement behaviors such as choice and persistence. However, they did not describe the specific goals and mechanisms by which endorsement of multiple goals occurs. According to Shah (2005) the importance of a goal will determine its activation. In thinking about these ideas in terms of Goal Theory and Expectancy-Value Theory, the importance of a task (or attainment value) influences the goal orientations one endorses. This is in line with Plante et al.'s (under review) findings that expectancies and values lead to goal orientations. In their study, goal orientations mediated the relations between expectancies and a composite measure of intrinsic and utility values to academic achievement and aspirations. While the mastery goal orientations mediation was generally positive, and work avoidance was generally negative, a notable finding is that performance-approach goals were not related to any of the achievement outcomes. This finding might be related to the fact that motivation was assessed in specific domains without considering whether individuals like or dislike these domains. Therefore, future research should address the possibility that the interplay among the motivation variables influences the self-regulation

capacity. Future research should further investigate how the interrelations between motivational constructs activate self-regulation, and consider how expectancies may predict goal orientations and how these in turn predict regulation. On a similar note, target goals may play a different, though similar, role that goal orientations play in determining self-regulation. The specific goals students endorse within the classroom might interact or shape their goal orientations.

### 5.5 Limitations

There are several limitations to the current study. First, except for high school students' achievement, all of the measures were self-reported at a single time. There are no observational data or reports by significant others such as teachers, parents, and peers. Such reports and observations would introduce a more objective form of evaluating the students' self-regulation, academic behaviors, and achievement outcomes. Another issue is that this is a one-time measurement. Ideally, self-regulation would be studied using methods that could tap into nuanced daily and contextual fluctuations, such as diary studies. Methodologies such as diary studies enable a more direct assessment of self-regulation as it occurs and reveal a more accurate picture. While the current study lends support to the notion that motivation leads to self-regulation, as proposed in RCMC, it is likely that there are reciprocal relations between self-regulation and motivation. It would be possible to empirically test such reciprocal relations with methodologies that examine changes over small increments of time. Thus,

future research should consider using different methodologies to measure motivation and self-regulation. In addition, examining how these processes fluctuate over time and their reciprocal nature would contribute to a more nuanced understanding of these processes.

The current study focused on college students and “college-bound” high school students. These are highly able individuals who might not be representative of the general population of students. These students, identified as successful by their teachers, are not an example of the typical high school population, which includes drop-outs and students who do not attend college. In addition, the college students attend one of the top ten universities in the United States. The samples in this study are considered to be highly successful in their academics and may exemplify an association between motivation and self-regulation that we could strive for. That is, the specific participant sample could be thought of as an exemplary standard and therefore not necessarily generalizable to the general population.

Although there are limitations in the current study, the findings suggest that there is value in considering cognitive, behavioral, and emotional self-regulation in classroom settings. Employing a cross-sectional design revealed that there are certain regulatory capacities that play an important role for college students versus high school students. College students draw on behavioral regulation more than high school students. While it is likely that higher levels of autonomy afford college students

behavior regulation that is restricted for high school students, there are alternative explanations. It may be that high school students do not draw on behavioral regulation as often. Indeed, time planning, a form of behavior regulation, predicted achievement only for high school students. It may be the case that high school students need to be guided on how to use regulation to their benefit. Teaching regulatory skills as students transition into college may be especially important.

Importantly, self-regulation mediated the relations between motivation and academic outcomes. While motivation is undoubtedly an important construct that should be fostered in schools, scaffolding self-regulation seems to be a crucial component in determining academic success. It is plausible that curricula can be designed to teach students how to self-regulate. Behavior regulation may be taught in high school as preparation for college transition. Self-regulation could also be taught as a form of resiliency training for at-risk students. While there are socio-economic factors that influence dropping out of high school, supporting adaptive forms of self-regulation may be used as preventative measures for students who are struggling. Teachers can work self-regulation techniques into the curriculum. Certain regulatory capacities may be more easily encouraged by emphasizing motivation. For example, the finding that utility value was related to the likelihood of belonging to the Behavior Regulation Class over the High Regulation Class suggests that there is a specificity in the relations between motivation and regulation. That is, when individuals are focused on the

usefulness of taking a class, emphasis on behavior regulation has benefits, even for those who are high regulators in general.

The current study not only generates questions that may be addressed by future work, it also underscores the importance of considering the mechanisms by which motivation is related to academic outcomes. In fact, this initial investigation of the RCMC model suggests that self-regulation is one of the primary processes by which motivation is related to a variety of academic outcomes.

## 6. Conclusion

This study employed a cross-sectional design to investigate the intricacies of motivation, self-regulation, and academic outcomes (learning processes, academic behaviors, and achievement) using structural equation modeling. In order to unpack the nature of these relations, these processes were compared across favorite and least favorite subjects. Overall, the findings lend support to the RCMC model. As hypothesized, self-regulation mediated the relations between motivation and academic outcomes more for college students than high school students. In addition, according to both the variable- and person-centered analyses, college students used behavior regulation more than high school students did. Most interesting and contrary to the hypotheses, students draw on emotion regulation in their favorite classes more than in their least favorite classes. It may be that emotion regulation is harnessed to protect positive affect in favorite classes, whereas students comply with feeling negative emotions in their least favorite classes. The implications of these findings are two-fold. First, by manipulating motivation in classrooms, teachers can help students draw on specific regulatory capacities. Second, self-regulatory skills could be taught in classes alongside the academic material.