THE INFLUENCE OF PERSONAL MOTIVATIONAL BELIEFS AND CLASSROOM CLIMATE DIMENSIONS ON ACADEMIC PROCRASTINATION IN COLLEGE MATHEMATICS COURSES

A Dissertation Presented to the

Faculty of the College of Education

University of Houston

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Philosophy

by

Danya Marie Corkin

May, 2012

Acknowledgement

Completion of this dissertation was made possible by the guidance I received from my advisor Dr. Shirley Yu, my committee members, and all of the love and support I received from my family and friends, especially my husband. I would like to express my sincere gratitude to my advisor for facilitating this process and for providing me with multiple research opportunities that allowed me to improve my skills as a researcher. I also want to thank Dr. Consuelo Arbona, my master's thesis advisor, for being a continual mentor to me throughout my doctoral studies. I am also indebted to Dr. Margit Wiesner for the statistical guidance she has provided me over the years. Last, but not least, I would like to thank Dr. Christopher Wolters for always challenging me and forcing me to think more critically about self-regulated learning and motivation theories.

I would especially like to thank my parents, David and Sonia Serrano, and my brother Alex for always believing in me. I would not have been able to do this without their unconditional love. I also want to acknowledge my abuela, Rosalia Castañeda. Her example of a strong work ethic and persistence in the face of adversity has influenced me greatly.

Finally, I would like to show my deepest gratitude towards my husband, Joe Corkin, for the sacrifices he made while I was going to school these past few years. I want to thank him for always expressing pride towards my accomplishments and for encouraging me to pursue my dreams.

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Corkin, Danya Marie. "The Influence of Personal Motivational Beliefs and Classroom Climate Dimensions on Academic Procrastination in College Mathematics Courses." Unpublished Doctor of Philosophy, University of Houston, May, 2012.

Abstract

Academic procrastination can be defined as the irrational delay of doing work on academic-related tasks that should be completed within a specific timeframe (Steel, 2010). Estimates suggest anywhere between 50 to 95 percent of college students procrastinate on their coursework (see Steel, 2007). Because of the prevalence of this behavior, a plethora of research has focused on determining the personality traits that may influence procrastination, but not as much work has been devoted to examining the contextual cues that may elicit this behavior. Moreover, research on which aspects of the classroom climate may promote procrastination is scant.

Therefore, the purpose of this study was to develop and test a conceptual model where the effects of various dimensions of the college classroom climate (instructor support, course organization, academic press, and course situational interest) on academic procrastination were hypothesized to be direct and indirect through students' personal motivational beliefs (self-efficacy and task value). The second aim of this study was to examine whether motivational regulatory strategies and time management moderated the relation between procrastination and students' perceptions of how interesting they found the presentation of the course material, an aspect of the course environment predicted to influence procrastination.

The final study sample consisted of 248 students enrolled across 16 undergraduate mathematics courses. Three path analytic models were tested, but all had inadequate fit with the observed data. This may have resulted from including two bi-directionally

related, highly correlated motivational beliefs as endogenous variables in the model. A follow-up hierarchical linear regression analysis revealed that among the classroom climate dimensions, course situational interest was the only negative predictor of procrastination. However, after accounting for motivational beliefs, course situational interest was no longer a predictor; whereas, self-efficacy and task value emerged as negative predictors of procrastination.

Results of the hierarchical linear regression analysis testing the moderating effects of motivational regulation strategies and time management indicated that three types of motivational regulation strategies significantly moderated the relation between course situational interest and procrastination. However, the nature of these effects varied by strategy. Implications of these findings for college instructors, students, and future research concluded this study.

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Chapter I

Introduction

Academic procrastination can be defined as the irrational delay of doing work on academic-related tasks that should be completed within a specific timeframe (Steel, 2010). Researchers who have examined procrastination within an academic setting have consistently found that a large percentage of both undergraduate and graduate students procrastinate on academic tasks such as working on course assignments, studying for an exam, and writing a paper (e.g., Solomon & Rothblum, 1984). Estimates presented in previous studies of the proportion of college students who procrastinate have reported that anywhere between 50 to 95 percent of college students procrastinate (Ellis & Knaus, 1977; Hill, Hill, Chabot, & Barrall, 1978; Onwuegbuzie, 2004; Schraw, Wadkins, & Olafson, 2007; Solomon & Rothblum, 1984; Steel 2007).

These numbers are a bit disconcerting given that the negative implications of academic procrastination are well documented. Researchers examining the relation between procrastination and academic performance consistently have found a negative association between procrastination and several measures of performance such as overall college GPA, course grades, final exam grades, and assignment grades (see Steel, 2007). Findings also indicate that procrastinators struggle to meet course deadlines, which may partially explain why these students tend to perform worse on course assignments and exams than students who do not procrastinate (e.g., Dewitte & Schouwenburg, 2002; Ferrari, 2001). Furthermore, procrastinators not only have a tendency of performing worse than non-procrastinators but also experience higher levels of anxiety, stress, and

fears of failure (Schraw et al., 2007; Solomon & Rothblum, 1984; Steel, 2007), all affective states that may have a negative impact on student learning.

Given the high number of college students who engage in procrastination, coupled with its negative implications, an abundance of research has been devoted to determining the antecedents most strongly associated with procrastination (See Steel, 2007 for review). Much of this work has focused on examining the personality traits associated with academic trait procrastination—a type of procrastination viewed as more stable. However, procrastination researchers have also suggested that academic procrastination can be situational in nature, or in other words, can be influenced by situational/contextual factors (Ferrari, 2004; Schouwenburg, 2004; Senecal, Lavoie, & Koestner, 1997). For example, one common environmental factor found to have an influence on procrastination is task characteristics, or more specifically, task aversiveness (Ferrari, Keane, Wolfe, & Beck, 1998; Ferrari & Scher, 2000). Despite researchers noting that procrastination may be influenced by the academic environment (Schouwenburg, 2004), studies investigating the role the college course environment has on students' procrastination is scarce.

Therefore, the current study has two main aims. First, by drawing from existing classroom climate literature, the extent that several aspects of the college classroom climate are directly associated with academic procrastination will be explored. In addition, the extent that personal motivational beliefs (i.e. self-efficacy and task value) mediate the relations between dimensions of the course climate and academic procrastination will be examined. The second part of this investigation will be grounded in a social cognitive self-regulated learning theoretical framework (Zimmerman, 2000) to

examine the extent that the relationships between procrastination and aspects of the course—found to be significantly associated with procrastination—are moderated by self-regulated learning strategies (i.e., motivational regulation strategies and time management).

The present study adds to self-regulated learning research because findings provide support for the effectiveness of motivational regulation strategies in reducing procrastination within college classrooms that vary in levels of situational interest. In addition, results provide college instructors with further understanding of the aspects of the college course environment that promote adaptive motivational processes and simultaneously discourage maladaptive behaviors such as procrastination.

Chapter II

Literature Review

Conceptual Framework

To provide support for the rationale of developing a model linking students' perceptions of the classroom climate to academic procrastination, a social cognitive theoretical perspective will be used to guide the current investigation. One of the major assumptions of social cognitive theory is that reciprocal relationships exist between environmental events, personal factors, and behavior (Bandura, 1986). Despite theorists recognizing that the relations between the academic environment, personal beliefs (i.e., self-efficacy), and behavior are reciprocal in nature, much of the research in motivation that has investigated these relations has examined them occurring in a unidirectional sequence.

For example, major self-regulated learning theorists informed by socio-cognitive theory have noted that the academic environment plays a role in how students actively construct their personal motivational beliefs (Pintrich, 2004; Pintrich & De Groot, 1990; Zimmerman, 2000). In fact, the significant associations existing between students' perceptions of their academic context and their motivation are well established (see Patrick, Kaplan, & Ryan, 2011; Urdan & Schoenfelder, 2006). More specifically, research indicates that students' perceptions of the academic context predict their motivational beliefs (Ames & Archer, 1988; Levpuscek & Zupancic, 2008; Murayama & Elliot, 2009; Wolters, 2004), and in turn, students' motivational beliefs influence their achievement-related behaviors (Eccles, Adler, & Meece, 1984; Feather, 1988; Meece, Wigfield, & Eccles, 1990; Nagy, Trautwein, Baumert, Koller, & Garrett, 2006; Simpkins,

Davis-Kean, & Eccles, 2006; Watt, 2006; Wolters, 2003a). A commonly assessed academic context that has been found to play a critical role in students' motivation, engagement, and achievement is the classroom environment (see Fraser, 2000; Patrick et al., 2011).

Connecting the Classroom Climate and Procrastination

The classroom climate can be defined as the psychological and social characteristics of a learning environment that are shaped by its organizational structure, instructional practices, physical attributes, and interpersonal relationships (Moos, 1979). Early research examining the classroom climate used an observation methodological approach to assess classroom environments (Dunkin & Biddle, 1974). However, researchers later determined that measuring students' perception of the classroom environment using self-report instruments was a better and more economical approach to measure the classroom climate (Fraser, Treagust, & Dennis, 1986). One of the major rationales supporting this notion, according to researchers, was that students' own perceptions of the learning environment has a greater influence on their behavior than objective reality (Fraser, Treagust, & Dennis, 1986; Fraser & Treagust, 1986; Winston, Vahala, Nichols, Gillis, Wintrow, & Rome, 1994).

Therefore, to provide a more refined understanding of the classroom environment, researchers created numerous instruments to identify a multitude of dimensions of the classroom climate perceived by students as distinct (e.g., Fraser & Treagust, 1986). While researchers have tested various instruments measuring the classroom climate, each with variations in the classroom characteristics measured, at a broader level, the identification of dimensions across most of these instruments has been grounded in Moos'

(1979) theoretical framework of social environments. Specifically, Moos (1979) proposed that dimensions of social environments may be classified into three general categories. The *relationship* category includes the dimensions that capture the nature and strength of the interpersonal relationships that exist between individuals within a classroom. The second category, classified as *personal development*, captures the dimensions assessing opportunities that facilitate students' personal and academic growth. Finally, the third group of dimensions, known as *system maintenance and change*, describe the extent to which the environment provides clear expectations, is orderly, and is flexible to change yet maintains control.

Therefore, in line with Moos' (1979) contention that at least one dimension from each category must be assessed to provide an adequately encompassing view of an environment, the current study will examine four dimensions that encompass all three of Moos' (1979) categories. In addition, these four dimensions have been identified to some degree across several classroom climate instruments previously developed (e.g., Classroom Environment Scale; CES; Trickett & Moos, 1973; Individualized Classroom Environment Questionnaire; ICEQ; Fraser, 1982; College Classroom Environment Scales; CCES; Winston et al., 1994). Furthermore, findings from previous research suggest that these aspects of the classroom may have an influence on students' procrastination behavior. Because participants for the current study will be at the college level, I will refer to the four classroom climate dimensions as instructor support, course organization, academic press, and course situational interest. In this section, I will first explain how all four dimensions have been conceptualized in the classroom climate literature, as well as discuss how the latter two dimensions—academic press and course

situational interest—have been conceptualized in literature related to achievement motivation. I will also explain why each of these dimensions may be associated with academic procrastination.

Probably the most conceptually consistent and frequent classroom climate dimension that has emerged in previous research – classified under Moos' relationship category–is teacher support (Fraser, 1982; Fraser, Treagust, & Dennis, 1986; Trickett & Moos, 1973; Winston, Vahala, Nichols, Gillis, Wintrow & Rome, 1994). Teacher support has been labeled differently across instruments (i.e., personalization; Fraser, 1982); however, the consensus is that this aspect of the classroom environment captures the extent that teachers express warmth and a personal interest in their students. In addition, some classroom climate instruments assessing teacher support also tap into the extent that teachers provide academic support (MacLeod & Fraser, 2010; Winston et al., 1994). The current study will conceptualize instructor support as capturing both emotional and academic facets of support. Previous studies have conceptualized emotional or personal support as the extent that teachers are perceived as warm and caring while academic support has more to do with how helpful a teacher is perceived when it comes to providing academic assistance (e.g., Patrick et al., 2011).

Teacher support has been linked to various positive academic outcomes, such as achievement (Fraser & Fisher, 1982; Johnson, 2006). Further detail will be provided regarding findings linking specific classroom climate dimensions with adaptive motivational processes in another section of this paper. No work identified to date has directly linked teacher support to academic procrastination, despite the fact that there are indications that a direct association may exist between these two constructs. While

procrastination has not been directly linked to the level of teacher support in the classroom, self-handicapping has been examined as it relates to the classroom climate (Dorman, Adams, & Ferguson, 2002). Procrastination is often considered a form of self-handicapping, defined as actions taken by students that serve to undermine their own ability to perform well. Findings from a study examining the extent that the classroom climate influenced self-handicapping behavior among middle school students taking a math class indicate that higher levels of teacher support, described as the level of caring provided by the teacher, was associated with reduced levels of self-handicapping (Dorman et al., 2002). Based on this finding, it seems possible that high levels of teacher support will reduce the likelihood of academic procrastination. However, as mentioned, no studies identified to date have examined whether instructor support in a college classroom is linked to students' academic procrastination.

Another dimension of the classroom climate that has emerged as a unique aspect of the classroom environment, but perhaps with less frequency across instruments and less consistency across definitions, is the organization or structure of a classroom (Fraser & Treagust, 1986; Trickett & Moos, 1973; Winston et al., 1994). Classroom organization falls under Moos' (1979) category of system maintenance and change. One common thread that does emerge in the conceptualization of classroom organization is that it captures the extent to which the course content, instructor expectations, and evaluation criteria are clearly articulated (Winston et al., 1994). Only one study identified to date has found an association between the organization of a college classroom and procrastination (Schraw et al., 2007). This study used a qualitative approach based on student interviews and found that well-organized instructors may inadvertently promote

procrastination. Specifically, instructors who provided detailed syllabi and detailed and regular evaluation feedback promoted procrastination. Students claimed that having an instructor who created a well-organized atmosphere provided them with the opportunity to plan to procrastinate (Schraw et al., 2007).

At the same time, indicators representing a lack of classroom organization such as unclear directions and flexible deadlines were also reported to promote procrastination (Schraw et al., 2007). Furthermore, instructors who are lenient about deadlines not only tend to promote procrastination, but also increase the likelihood that students will use a false excuse for not completing their coursework on time (Ferrari et al., 1998). Findings from these studies suggest that a relation may exist between the organization of a college classroom and academic procrastination; however, the nature of this relationship does not seem clear.

An aspect of the college classroom climate that has also been included as a unique dimension in classroom climate instruments is academic rigor/press (Winston et al., 1994). Academic press also has a foundation in achievement motivation research (Middleton & Midgley, 2002). Academic press—classified under Moos' personal development category—can be defined as the extent that a course is viewed as challenging, as well as the extent that the instructor expresses high expectations for students' work and presses students to demonstrate their understanding of material (Middleton & Midgley, 2002). Again, little research has been conducted examining how this aspect of the classroom climate may affect the extent that students procrastinate. In the qualitative study referred to previously, Schraw and his colleagues (2007) found that teachers who had low expectations for students' coursework promoted procrastination,

which suggests that classrooms viewed as being high in academic press may reduce procrastination. Supporting this notion, Ferrari and Scher (2000), examining the extent that college students procrastinated on various academic and non-academic tasks, found that early in an academic semester, students were less likely to procrastinate on tasks that they perceived as allowing them to use or develop their skills and abilities. Ferrari and Scher (2000) even go on to recommend to instructors to assign tasks that "increase academic rigor" in order to reduce procrastination among their students (p. 364). These findings suggest that the extent the college classroom environment is perceived as having high levels of academic press may reduce the likelihood that students procrastinate on their coursework.

The final aspect of the classroom climate that will be discussed in terms of the extent that it may relate to academic procrastination is course situational interest. Although not labeled situational interest in the classroom climate literature, the extent that a class is perceived as enjoyable has emerged as a unique aspect of the classroom climate in various instruments (Fraser, Anderson, & Walberg, 1982; Fraser & Treagust, 1986; Winston et al., 1994). The extent that a class is perceived as enjoyable has also been embedded as a characteristic within dimensions that also capture students' level of involvement and enthusiasm for the class (Dorman & Fraser, 2009).

Perhaps a more specific understanding of what enjoyment of the college class environment may entail can be found in the achievement motivation literature (Hidi, 1990; Hidi & Harackiewicz, 2000; Hidi & Renninger, 2006). Based on their four-phase model of interest development utilized to explain achievement-related behavior, Hidi and Renninger (2006) contend that students' interest in a topic or course, can be elicited by

environmental features, such as the manner in which information in a classroom is presented. Informed by Interest theory, Linnenbrink and her colleagues (2010) developed an instrument assessing college students' "triggered situational interest" for a course, which captures the extent that the presentation of course material is perceived by students as attention grabbing. No work to date has been identified that links triggered situational interest to procrastination. Triggered situational interest, however, has been found to predict interest in course material (Harackiewicz, Durik, Barron, Linnenbrink-Garcia, Tauer, & 2008). In addition, findings indicate that the contextual factor found to be most strongly and consistently associated with procrastination is aversiveness to engaging in tasks that are perceived as boring and uninteresting (Ferrari & Scher, 2000; Ferrari et al., 1998; Soloman & Rothblum, 1984; see Steel, 2007). Taken together, these findings suggest that triggered situational interest, or course situational interest, as referred to in this study, may be inversely associated with procrastination.

Connecting Motivational Beliefs and Procrastination

Perhaps due to procrastination being characterized as a type of self-regulatory failure (Steel, 2007), a logical direction that research has taken is to examine academic procrastination within self-regulated learning theory, a major theoretical framework of motivation (Pintrich, 2004). Because self-regulated learners are considered disciplined, goal-directed individuals who monitor their learning and are motivated to accomplish academic tasks (Zimmerman, 2008), researchers wanted to better understand whether characteristics of a self-regulated learner were absent in regular procrastinators (Wolters, 2003a). Studies assessing the association between procrastination and self-regulated learning have focused on investigating how personal motivational beliefs influence

procrastination (Howell & Watson, 2007; Wolters, 2003a). One common motivational belief examined within a self-regulated learning framework is self-efficacy (e.g. Pintrich, 2004; Wolters, 2003a).

Self-efficacy can be defined as students' beliefs regarding their capability of successfully executing academic related tasks (Bandura, 1977). Having high self-efficacy for a task is considered a positive motivational belief due to its strong associations with task persistence and effort (see Usher & Pajares, 2008 for review). Students with high self-efficacy are more likely to apply effort when faced with a difficult task and more frequently use self-regulatory strategies that lead to academic success (e.g., Schunk & Pajares, 2005). Researchers have consistently found that self-efficacy is a significant positive predictor of academic achievement (e.g., Pajares & Urdan, 2006; Zimmerman, Bandura, & Martinez-Pons, 1992). Hence, not surprisingly, findings typically suggest that higher levels of self-efficacy have been associated with lower levels of procrastination (Corkin, Yu, & Lindt, 2011; Ferrari, Parker, & Ware, 1992; Klassen, & Kuzucu, 2009; Steel, 2007; Wolters, 2003a).

Another motivational belief that has predominantly been examined as a major component of a well-established motivational theory linked to self-regulated learning theory is task value (Wigfield, Hoa, & Klauda, 2008). According to the expectancy-value theoretical model of achievement motivation (Eccles et al., 1983), the extent that a student values the academic tasks they engage in will have an effect on their achievement-related behaviors (Wigfield & Eccles, 2000). This theory also contends that a task can be valued based on whether the task is perceived as interesting, as personally important, and/or as useful (Eccles & Wigfield, 1995). The majority of research

conceptualizing task value in this manner has studied its influence on students' choices to persist in particular academic domains, namely, math and science (Wigfield & Eccles, 2000). These studies have consistently found that students' task values within a particular academic domain are the strongest predictors of intentions to continue taking courses in that domain (Crombie et al, 2005; Eccles et al., 1984; Feather, 1988, Updegraff & Eccles, 1996; Watt, 2006).

Surprisingly, studies utilizing this motivational theoretical framework to guide their investigation have not examined the nature of the relation between task value and procrastination behavior. However, procrastination researchers have both noted and provided empirical support for the idea that students' perceptions of a task are associated with their level of procrastination (Schraw et al., 2007; Steel, 2007). Previous findings indicate that students are more likely to delay engaging in academic tasks that are perceived as boring, unpleasant, or difficult (Pychyl, Lee, Thibodeau, & Blunt, 2000; Scher & Ferrari, 2000; Solomon & Rothblum, 1984). Most of these studies have arrived at these conclusions by having students respond to open-ended questions or having them maintain diaries/daily logs to examine the characteristics of tasks they are more likely to delay (Pychyl et al., 2000; Solomon & Rothblum, 1984). These findings imply that if tasks are perceived as useful, enjoyable, or interesting, the likelihood that students procrastinate on these tasks is reduced.

Researchers also seem to align with the idea that if tasks assigned in college courses are made more relevant, it may discourage procrastination among students (Schraw et al., 2007). Taking this assumption one step further, Steel (2007) has proposed a model where one of the major tenets states that individuals are less likely to delay

engaging in tasks that they value. Therefore, examining the extent that task value, as it is conceptualized in the motivation literature, is associated with academic procrastination seems warranted.

Connecting the Classroom Climate and Motivational Beliefs

Additional indications as to why procrastination may be influenced by the classroom climate have to do with the potential mediating role that motivational beliefs may have on the relation between classroom climate and procrastination. Findings from classroom climate and achievement motivation research have consistently indicated that certain facets of the classroom environment directly predict students' motivational beliefs (see Urdan & Schoenfelder, 2006). The motivational beliefs that probably have been examined most as being influenced by the classroom climate are self-efficacy (Dorman, 2001; Dorman & Adams, 2004; Middleton & Midgley, 2002) and various aspects of task value (Church, Elliot, & Gable, 2001; Fraser & Fisher, 1982; Harackiewicz et al., 2008; Hulleman, Durik, Schweigert, & Harackiewicz, 2008; Winston et al., 1994).

Aspects of the classroom climate influencing self-efficacy. In terms of research examining the associations between aspects of the classroom climate that may relate to self-efficacy, no work was identified that directly linked course organization and situational interest to self-efficacy. However, Lorsbach and Jenkins (1999) posited that students' self-efficacy beliefs are dependent upon—and strongly linked to—aspects of the classroom environment falling within all three of Moos' (1979) categories of the social environment. This suggests that both course organization and situational interest may be associated with self-efficacy.

Stronger empirical support exists concerning the influence that teacher support and academic press have on students' self-efficacy beliefs (Middleton & Midgley, 2002). Research findings indicate that student' perceptions of both teacher support and academic press in a classroom enhances both secondary and college level students' self-efficacy for the course material (Dorman, 2001; Dorman & Adams, 2004; Middleton & Midgley, 2002; Vogt, 2008). The majority of these studies assessed students' self-efficacy specifically for math (Dorman, 2001; Dorman & Fraser, 2004; Middleton & Midgley, 2002).

Aspects of the classroom climate influencing task value. Teacher support and academic press have also been found to positively and directly relate to interest in course material among secondary level students (Dever & Karabenick, 2011; Dorman & Fraser, 2009; Dorman, 2009; Fraser & Fisher, 1982; Macleod & Fraser, 2010; Levpuscek & Zupancic, 2009). These results suggest that students who perceive teachers as taking a personal interest in them, and who provide a sense of challenge in the classroom, may promote students' interest in the subject matter of their class.

Another aspect of the classroom climate that has consistently been found to influence students' interest in a task is course situational interest. Results relating to aspects of the classroom environment influencing student interest have indicated that environmental features of the course (i.e., course lectures) that elicit student interest increase the likelihood that college students will subsequently find the course tasks or material interesting (Church, Elliot, & Gable, 2001; Harackiewicz et al., 2008; Hulleman, et al., 2008).

Only one study was identified that found a positive link between classroom organization and junior high students' interest level for class-related activities (Fraser & Fisher, 1982). However, this study used a measure of classroom organization that not only included students' perceptions regarding the structure of the course, but also captured students' perceptions of how well behavior in the classroom was managed.

Beliefs that students have about the extent that they find the course or course tasks useful has also been a motivational outcome examined by both the classroom climate literature and motivation literature. Winston et al. (1994) found that students' perceptions of instructor support significantly influenced students' value for the course. In other words, students who perceived their instructor as someone who expressed personal concern for them and provided them with academic assistance were more likely to report the class as being valuable towards their education. Winston and colleagues (1994) also found classrooms that were perceived as more stimulating and academically rigorous enhanced students' value for the course. Similarly, Harackiewicz et al., (2008) assessing the extent that students' found the psychology course lectures interesting, found that interest elicited by the presentation of material increased the likelihood that students would value the course material when it was assessed later in the semester.

The direct relationships found in previous research between aspects of the classroom climate and personal motivational beliefs associated with procrastination suggest that both self-efficacy and task value may mediate the relation between the classroom climate and academic procrastination. In addition, examining whether personal motivational beliefs may mediate the relationship between classroom climate and procrastination seems plausible given that results from previous studies indicate that

the predictive effects of other aspects of the classroom environment (i.e., mastery goal structure) on procrastination have been found to be reduced after accounting for students' personal motivational beliefs (i.e., self-efficacy; Wolters, 2004).

Self-Regulated Learning Strategies and Procrastination

Thus far, I have discussed how the classroom environment may promote students' procrastination behavior without explicitly recognizing another major assumption of social cognitive theory. That is, students are not passively influenced by their situational conditions but rather have a sense of personal agency when it comes to their learning experiences (Bandura, 1986). This is also a main contention of self-regulated learning theory (Pintrich, 2004). Supporting this line of thought, another major assumption of self-regulated learning theory is that students can at times actively monitor, control, and regulate certain facets of their cognition, motivation, behavior, and environment (Pintrich, 2004). Based on these assumptions among others, self-regulated learning theorists have examined students' use of strategies to regulate their level of task engagement when encountering environments or situations that may be less than ideal in facilitating the learning process (Wolters, 1998).

As mentioned previously, because procrastination has been viewed as a form of self-regulatory failure, under a self-regulatory framework researchers have investigated the extent that the regulation of cognition, through the employment of learning strategies, is associated with academic procrastination. Learning strategies are commonly operationalized with measures that capture the usage of cognitive strategies (i.e., rehearsal, organization) and metacognitive strategies (i.e., planning, monitoring). Findings from studies examining the relation between learning strategy usage and

procrastination indicate that both cognitive and metacognitive strategy usage are negatively associated with procrastination (Howell & Watson, 2007; Wolters, 2003a, 2004).

Motivational regulation and procrastination. Another area that an individual can regulate is their motivation towards a task (Pintrich, 2004). Regulation of motivation can be defined as strategies students employ to enhance their level of motivation when encountering academic tasks or situations (i.e., boredom) that damper their motivation. The idea of students regulating their own motivation is reflected in a number of major self-regulated learning theoretical models (Pintrich, 2004; Zimmerman, 2000) and has been established as influencing students' effort, persistence, and achievement (Pintrich, 2004; Wolters, 1999; see Wolters, 2003b).

However, few studies have investigated the extent that use of regulation of motivational strategies is associated with procrastination. Only one study identified to date has examined the association between motivational regulation strategies and procrastination. Findings from this study indicated that five out of six motivational regulation strategies were significantly and negatively associated with academic procrastination (Wolters & Benzon, 2010). This finding suggests that students who more frequently employ motivational regulation strategies are less likely to procrastinate. However, researchers have yet to examine whether students' use of motivational regulation strategies moderate the relation between procrastination and situations or environments that may promote or enhance procrastination. Given indications that the extent students regulate their motivation depends upon the situation or task encountered (e.g., Wolters, 1998), coupled with findings suggesting that certain situations or tasks

reduce students' motivation and simultaneously enhance their level of procrastination (Steel, 2007), one may assume that regulating motivation levels may influence the association between motivational beliefs concerning a task or environment and procrastination.

Concerning the point that the extent students regulate their motivation may be dependent upon the situation or task encountered, Wolters (1998) conducted a study that had students report a variety of motivational regulation strategies used when encountering task characteristics that decreased their motivation. The task characteristics examined in this study were tasks perceived as boring, irrelevant, or difficult; which, perhaps not coincidentally, are task characteristics found to promote procrastination behavior (See Steel, 2007). Findings from this study indicated that the frequency in which particular motivational strategies were employed varied by the task characteristic that students encountered. Results also demonstrated that when students encountered uninteresting or irrelevant material, the motivational regulation strategies they most often employed were the regulation of performance goals, self-consequating, and the regulation of value/interest (Wolters, 1998).

More recently, an instrument has been developed to assess these same motivational regulation strategies. Dimensions of this instrument include regulation of value, which has been defined as a strategy students use to make their course material seem more interesting or useful. A second dimension is regulation of performance goals, which involves students' efforts to remind themselves of the importance of doing well in their course, and self-consequating—a strategy where students promise themselves a reward for meeting their goals regarding work completion (Wolters & Benzon, 2010).

Although failing to integrate the research that has developed from self-regulated learning theory regarding the regulation of motivation, procrastination researchers have noted that self-regulatory strategies such as goal-setting and interest enhancement (a construct conceptually similar to regulation of value) may work to effectively reduce procrastination (Gropel & Steel, 2008). However, no work to date has been identified examining the extent that these strategies moderate the association between procrastination and situations or environments that may affect this behavior. This in light of the fact that findings from past research examining environmental predictors of procrastination indicate that individuals high in conscientiousness were found to be less vulnerable to variations in perceived task pleasantness when it came to the likelihood that they would delay on a task, compared to individuals low in conscientiousness (Lay & Brokenshire, 1997). Given the conceptual overlap between characteristics of someone high in conscientiousness and characteristics of a self-regulated learner, an investigation of the extent that motivational regulation strategies moderate the effect that environmental conditions (i.e., course situational interest) have on procrastination seems warranted. Course situational interest was the aspect of the classroom climate chosen to examine in the current study given that research has shown one of the most frequent reasons individuals find a task aversive is because they view it as boring or uninteresting (See Steel, 2007).

Time management and procrastination. In addition to the relations between procrastination and the regulation of cognition and motivation that have been discussed, the regulation of behavior is another facet of self-regulated learning. One strategy that is classified as a means of regulating behavior according to self-regulated learning theorists

is time management (Pintrich, 2004). Time management can be defined as the act of prioritizing and scheduling activities, setting goals, and organizing the work process to ensure timely completion of tasks. Time management is conceptualized as having four unique dimensions: setting goals and priorities, mechanics of time management, perceived control of time, and preference for disorganization (Macan, Shahani, Dipboye & Phillips, 1990). Of the four dimensions of time management, the current study will focus on the mechanics of time management, as it is more indicative of the behavioral aspects of time management. The mechanics of time management encompass the behaviors that are usually associated with time management such as scheduling, planning and making lists.

Surprisingly, time management has not been a central self-regulatory strategy examined in the motivation literature. However, studies examining time management among adult populations indicate that time management training reduces procrastination at work (Van Eerde, 2003). Within academic settings, time management, specifically the mechanics of time management, have been found to positively relate to both academic performance and life satisfaction while negatively relate to trait procrastination (Lay, 1992; Macan et al., 1990). Goal-setting, another aspect of time management, also has been found to be inversely related to procrastination; however, this relation was weakened by a motivational regulation strategy, specifically interest enhancement (Gropel & Steel, 2008). These studies indicate that time management reduces the likelihood of procrastination; however, the extent that this strategy moderates the relationship between students perceptions of the classroom (i.e., course situational interest) and procrastination needs to be further investigated.

Purpose of Study

The main purpose of this study was to examine the extent to which the four aspects of the classroom climates discussed in this chapter (instructor support, course organization, academic press, and course situational interest) influence undergraduate students' levels of academic procrastination in their mathematics courses. To examine how both the classroom environment and motivational beliefs influence students' procrastination, a conceptual path analytic model (see Figure 1) was proposed to test (a) the direct effects that the four aspects of the classroom climate have on procrastination, and (b) the indirect effects the four aspects of the classroom climate have on procrastination through self-efficacy and task value. First, I hypothesize that students who perceive their math courses as having high levels of instructor support, course organization, academic press, and course situational interest will be less likely to procrastinate on their coursework. Second, consistent with previous research findings, I hypothesize that high levels of self-efficacy and task value for the course will negatively relate to procrastination, and that these motivational beliefs will partially mediate the influence of the classroom climate on procrastination.

The second purpose of the current study was to examine whether self-regulated learning strategies (i.e., motivational regulation strategies and time management) moderated the relationship between course situational interest, which captures students' perceptions of how interesting they find the presentation of course material, and academic procrastination. Because previous findings indicate that conscientiousness moderates the association between task pleasantness and procrastination (Lay & Brokenshire, 1997), I am positing that students who engage in higher levels of regulation

of motivation and better time management will be less susceptible to the effects that variations in the environment (i.e., course situational interest levels) will have on their procrastination behavior.

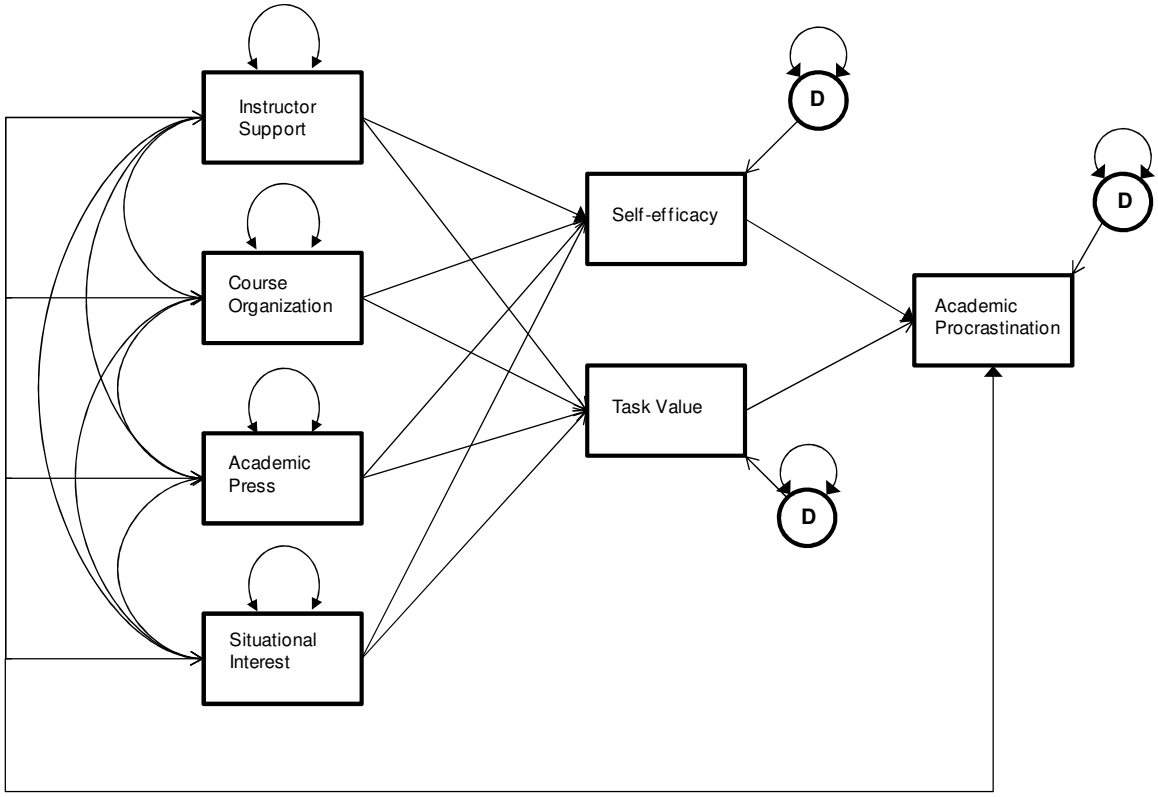

Figure 1. Original path model of classroom climate, motivational beliefs, and procrastination

Chapter III

Method

Participants

Originally, 292 participants completed the survey and provided two forms of consent to participate in the study. However, 37 participants were removed from the final dataset because: (a) they were not taking a math course in the current semester (n = 3), (b) they provided a math course name and meeting time that did not correspond to a course offered in the current semester (n = 11), or (c) they indicated they were taking a math-related course outside of the mathematics department (n = 23). Students taking courses offered outside of the mathematics department were removed from the analysis because the focus of the current study was to examine procrastination behavior among students taking mathematics courses offered by the mathematics department.

Of the 255 participants remaining, data from seven individuals were removed due to problematic response patterns (the data screening process will be further explained in a later section). Thus, the final pool of participants were 248 (78% female; mean age = 20.25 years) college students enrolled across 16 different undergraduate mathematics courses (see Appendix A). The sample was ethnically diverse: Hispanic (24%), Caucasian (27%), African American (17%), Asian/Asian American (28%), Native American (0.4%), and Other (3%). The majority of students were either freshman (57%) or sophomores (21%) and most reported having majors within the following colleges: Liberal Arts and Social Sciences (33%), Natural Sciences and Mathematics (18%), or Education (13%).

Procedure

Participants were recruited by announcements in their Pre-calculus course, or via a university online research participation portal called SONA. Extra credit was awarded in SONA in exchange for participation in the study, which required approximately 30 to 45 minutes to complete. One student recruited from the Pre-calculus classroom that did not provide course credit for participation was randomly selected at the end of the semester as the winner of a $50 Visa Gift Card.

Consenting students individually accessed a survey on SurveyMonkey, an online survey software site. The survey consisted of two sections: 1) demographics and 2) Likert-scaled items adapted from previous scales with adequate reliability and validity measuring the main constructs. Items from scales measuring the same construct were randomly distributed throughout the survey. At the beginning of the survey, participants selected a single mathematics course in which they were enrolled in the semester the data was collected. The course selected was the "target" course for which they answered questions about their perceptions of their mathematics classroom climate, their personal motivational beliefs about the course, and the extent to which they procrastinated on course-related tasks. Participants selected the target course from a menu of undergraduate mathematics courses offered in the current semester.

Measures

Academic procrastination (12 items). The Pure Procrastination Scale (Steel, 2010) was used to assess academic procrastination. Items included for the current study were slightly modified to reflect procrastination in an academic setting, specifically an undergraduate mathematics course. This measure consisted of 12 items developed by

Steel (2010) who conducted a factor analysis on three well-established measures of procrastination: Decisional Procrastination Questionnaire (DPQ; Mann, Burnett, Radford, & Ford, 1997), General Procrastination Scale (GPS; Lay, 1986), and the Adult Inventory of Procrastination (AIP; McCown & Johnson, 1989). The Pure Procrastination Scale assesses an irrational form of delay that Steel (2010) contends is a more consistent measure of the true conceptualization of procrastination. This measure was found to have adequate convergent validity and reliability. The alpha coefficient for the current study was .92, consistent with Steel's (2010) reported alpha coefficient. Items were rated on scales ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating higher levels of procrastination.

Instructor support (6 items). Instructor support was measured by adapting five items from the personalization scale of the Individualized Classroom Environment Questionnaire (ICEQ; Fraser, 1982) assessing the extent that students perceive the instructor as taking a personal interest in students in the class. Items were modified to reflect the college level of instruction in a mathematics course since this instrument has been typically used to assess perceptions of middle and high school students. One item created by the author was included that assessed the extent that the instructor provides academic support since the ICEQ items do not tap into this aspect of teacher support. The ICEQ has been found to display satisfactory reliability and predictive validity in accounting for students' learning outcomes (Fraser & Fisher, 1982). The alpha coefficient for the current study was .83. Items were rated on scales ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating higher levels of instructor support.

Course organization (9 items). Course organization was assessed by adapting three items from the structure dimension of the College Classroom Environment Scales (CCES; Winston et al., 1994), two items from the order and organization dimension of the Classroom Environment Scale (CES; Trickett & Moos, 1973), and three items assessing instructor organization at the college level used in a study by Freeman, Anderman, and Jensen (2007). The CCES has been found to have adequate convergent and discriminant validity as well as adequate criterion validity in accounting for student attitudes (Winston et al., 1994). The CES, which has been typically used to assess secondary school environments, has also has been found to have adequate discriminant and criterion validity in accounting for learning outcomes. It is important to mention that the CES items pertaining to order in the classroom were not included in the current study because these items assess the extent that teachers manage student behavior in the classroom, an aspect of the environment that is not necessarily relevant at the college level. One item assessing course organization created by the author was also included in the current study.

Overall, the current course organization scale assessed the extent that students perceived their classroom environment as having clearly articulated course content, evaluation criteria, and expectations regarding assignments and deadlines. In addition, this scale assessed the extent that the instructor provided prompt evaluative feedback. The alpha coefficient for the current scale was .90. Items were rated on scales ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating higher levels of course organization.

Academic press (8 items). Academic press was assessed by adapting four items from Middleton and Midgley's (2002) Academic Press for Understanding Scale and four items from the academic press dimension of the Course Climate Scale (Arroyo-Giner, Wolters, Fan, & Yu, 2010). Middleton and Midgley (2002) found their Academic Press for Understanding Scale to have satisfactory discriminant validity and criterion validity in accounting for student's motivational beliefs. In addition, findings from Arroyo-Giner's and colleagues (2010) study indicated that their academic press scale had adequate criterion validity in accounting for students' level of motivational engagement.

The current developed scale assessed the extent that students perceived their math course environment as challenging and perceived their instructors as having high expectations for the quality and effort put forth towards their coursework. After conducting an exploratory factor analysis on these items, which will be discussed in the next chapter, the alpha coefficient for this scale in the current study was .82. Items were rated on scales ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating higher levels of academic press.

Course situational interest (7 items). Situational interest for the course was measured by adapting five items from the triggered situational interest dimension developed by Linnenbrink-Garcia and colleagues (2010) and two items from the course situational interest dimension of the Course Climate Scale developed by Arroyo-Giner and colleagues (2010). Linnenbrink-Garcia et al., (2010) found this scale to have adequate discriminant validity. The current developed scale assessed the extent that students in the course perceived the presentation of course material as interesting, enjoyable, and attention grabbing. The items adopted from the Linnenbrink-Garcia et al.

(2010) scale were slightly modified to ask students what their general impression was of how most students perceived the course environment. After conducting an exploratory factor analysis on these items, which will be discussed in the next chapter, the alpha coefficient for this scale in the current study was .87. Items were rated on scales ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating higher levels of course situational interest.

Self-efficacy (5 items). Self-efficacy was assessed by five items from Midgley et al.'s (2000) Patterns of Adaptive Learning Scale (PALS). Ratings were made on a five-point scale with response anchors labeled 1 (strongly disagree) and 5 (strongly agree) assessing students' perceptions of their competence to do course work. Adequate validity and reliability have been reported for this scale. The alpha coefficient for the present study was .91. Items were slightly modified to ask students about their competence perceptions pertaining specifically to their math course.

Task value (6 items). Task Value was assessed by six items from the Motivated Strategies for Learning Questionnaire (MSLQ) developed by Pintrich, Smith, Garcia, and McKeachie (1993). Ratings were made on a five-point scale with response anchors labeled 1 (strongly disagree) and 5 (strongly agree) assessing students' perceptions of the extent that they find the course material interesting, important, and useful. Adequate validity and reliability has been reported for this scale. The alpha coefficient for the present study was .83. Items were slightly modified to specifically ask students about the extent that they find their math course material interesting, important, and useful.

Motivational regulation (14 items). Motivational regulation was measured by fourteen items assessing strategies students employ to manage their level of motivation

when engaging in academic tasks including regulation of value (5 items), self-consequating (5 items), and regulation of performance goals (4 items; Wolters & Benzon, 2010). These three dimensions of motivational regulation were selected because they are strategies found to be most frequently used when students encounter academic tasks or situations they find boring or irrelevant (Wolters, 1998)—situations when students are also more likely to procrastinate (Steel, 2007). Regulation of value is a strategy students use to make their coursework material seem more interesting or useful. Regulation of performance goals assesses the extent that students remind themselves of the importance of doing well in their course to enhance their motivation. Self-consequating is a strategy where students promise themselves a reward for meeting their goals regarding work completion. Survey directions preceding these items asked students to think about situations when they are working on math assignments or studying for their math course and encounter feelings of wanting to put off their work or lose motivation to persist in completing the work. Students were asked to report how frequently they employed the strategies described by each item using a 7-point Likert scale from 1 (not at all) to 7 (very often). Items were slightly modified to ask students about their motivational regulation strategy use specifically as it pertains to their math course-related tasks. The current alpha coefficients for the dimensions of regulation of value, self-consequating, and regulation of performance goals were .90, .91, and .87, respectively.

Time management (6 items). Time management was assessed by adapting six items from a study by Wang, Wolters, Fan, and Mueller (2007). These items assessed the extent that time management behaviors were used such as planning, scheduling, and making lists. The alpha coefficient for this scale was high at .91. Students were asked to

report how frequently they use these behaviors as it relates to their math course using a 7-point Likert scale from 1 (not at all) to 7 (very often).

Chapter IV

Results

Results are organized into three main sections. First, because the measures of the four aspects of classroom climate were constructed from items adopted from various scales, results of four exploratory factor analyses conducted to identify the number of factors for each of the classroom climate dimensions will be presented. Second, the procedures and outcomes of the proposed path analysis model will be discussed. In addition, findings from a hierarchical multiple linear regression model that further explored the extent that each of the classroom climate dimensions predicted procrastination will also be presented. Finally, a hierarchical multiple linear regression model examining the extent that motivational regulation strategies and time management moderate the predictive effect of course situational interest on procrastination will be discussed.

Exploratory Factor Analyses of Four Aspects of the Classroom Climate

Four exploratory factor analyses were conducted using a maximum likelihood extraction procedure, as recommended by Fabrigar, Wegener, MacCallum, and Strahan (1999; as cited in Costello & Osborne, 2005) for data that are relatively normally distributed. In terms of the rotation method, an oblique rotation was performed. The oblique Promax rotation method was arbitrarily chosen because according to Fabrigar et al., (1999; as cited in Costello & Osborne, 2005) all oblique rotation methods are likely to create similar results. Both the Scree Test and the Kaiser method were used to identify the number of factors for each classroom climate dimension.

For the six items hypothesized to represent Instructor Support, all loaded onto one factor based on the Kaiser and Scree test, and all had a factor loading above .32 (the lowest factor loading was .47), which Tabachnick and Fidell, (2001; as cited in Costello & Osborne, 2005) recommend as the minimum loading value for an item to load on a particular factor. In addition, five out of the six items had strong factor loadings (.50 or greater; Costello & Osborne, 2005). However, the significant chi-square goodness-of-fit statistic ($\chi^2 = 48.77$, df = 9, $p < .001$) indicated that the extracted number of factors was not enough to account for the analyzed matrix of variable interrelationships. In other words, the significant chi-square statistic signified a rejection of the null hypothesis that the extracted number of factors was enough to account for all the correlations in the matrix of variables. Nevertheless, because only one factor emerged as having an eigenvalue greater than one, and given that all of the items loaded fairly strongly on this factor, the one factor solution was deemed adequate. The items that composed the Instructor Support factor (eigenvalue = 3.28), accounted for 46.56% of the variance. High scores on these items described a math course instructor that students perceive as respectful, friendly, and willing to provide academic assistance.

For the items hypothesized to represent Course Organization, all had strong factor loadings (>.50) onto one factor based on the Kaiser and Scree test. The significant chi-square goodness-of-fit statistic ($\chi^2 = 68.95$, df = 27, $p < .001$) again signified a rejection of the null hypothesis as explained above. However, because of the same reasons provided previously, the one factor solution was deemed adequate. The items that composed the Course Organization factor (eigenvalue = 5.10), accounted for 51.66% of the variance. This construct consisted of nine items with higher scores describing a math

course environment articulating clear content instruction and unambiguous assignment expectations in terms of timeliness and evaluation criteria. Items also described a course environment where a planned course of study was clearly expressed and followed.

The third set of items factor analyzed were hypothesized to represent Academic Press. Based on the Kaiser method and the Scree Test, two factors emerged. However, upon examining the commonality values for each of the items, one item—"In my math course, the instructor allows students to get away with doing easy work" (reverse-coded)—clearly had a very low commonality value (less than .10) compared to the other items. Costello and Osborne (2005) contend that if an item has a commonality value of less than .40, it may suggest that this item is not related to the other items. Furthermore, researchers contend that the quality of the factor analysis will increase as commonality values increase (Hogarty, Hines, Kromrey, Ferron, & Mumford, 2005). Therefore, this item was dropped and an exploratory factor analysis was re-run for the seven remaining items. These seven items loaded onto one factor with all items having a factor loading above .32 (the lowest factor loading was .47). Again the chi-square goodness-of-fit statistic ($\chi^2 = 38.17$, df = 14, $p < .001$) indicated a rejection of the null hypothesis. However, the one factor solution represented the “cleanest” solution given that the two–factor solution would have resulted in the second factor having less than three items load onto it. According to Costello and Osborne (2005), a factor with less than three items is weak and unstable. Thus, the one factor solution was chosen over the two-factor solution. The items that composed the Academic Press factor (eigenvalue = 3.38), accounted for 40.44% of the variance. This factor consisted of seven items that describe

a math course environment in which students' view the course material as challenging and perceive the course instructor as having high expectations for students' work.

The final classroom climate dimension assessed was Course Situational Interest. After running an exploratory factor analysis for these seven items, results based on the Scree Test and Kaiser method indicated the presence of two factors. However, upon a closer examination of the commonality values for each of the items, one particular item—"During my math course, students must try hard not to engage in other activities (internet, chatting w/others)"—stood out as having a very low commonality value (less than .10).

Thus for the same reasons provided previously, this item was dropped and an exploratory factor analysis was re-run for the six remaining items. These six items loaded onto one factor with all items again having strong factor loadings (.50 or greater). The chi-square goodness-of-fit statistic ($\chi^2 = 107.52$, $df = 9$, $p < .001$) indicated a rejection of the null hypothesis. However, for the same reasons provided previously, the one factor solution was retained because it represented the cleanest solution. The items that composed the Course Situational Interest factor (eigenvalue = 3.66), accounted for 52.82% of the variance. This factor consisted of six items that describe a math course environment in which students perceive the presentation of course material as enjoyable and interesting. Item factor loadings for the four factors identified are reported in Table 1.

Table 1

*Final item factor loadings from **four** exploratory factor analyses with maximum likelihood extraction and oblique rotation*

Items	Factor Loading			
	Instructor Support	Course Organization	Academic Press	Situational Interest
My math instructor makes an effort to get to know students.	.47			
My math instructor is respectful towards students.	.84			
My math instructor takes a personal interest in students.	.64			
My math instructor is helpful when students have questions about assignments.	.81			
My math instructor makes students aware of resources available to them, (i.e., LSS, CASA, teaching assistant)	.70			
My math instructor is unfriendly towards students.(R)	.56			
Tests and papers are graded and returned promptly in my math course.		.58		
My math instructor keeps students informed of their progress.		.62		
My math instructor plans course activities in detail.		.75		
My math instructor follows the course syllabus very closely.		.80		
My math instructor is always well prepared for class.		.72		
The grading criteria in my math course have been clearly outlined.		.73		
There are firm deadlines of when assignments are due in my math course.		.61		
Math course assignments are clear for students to understand.		.77		
My math course is well organized.		.84		
In my math course, the instructor presses students to do thoughtful work.			.74	
In my math course, the instructor gives work that makes students think critically.			.84	
My math instructor expects students to show all of their work when solving math problems.			.49	
My math instructor critically evaluates assignments.			.60	
Students put forth a great deal of effort towards this math course.			.62	
Students have to work hard to complete the requirements of this math course.			.47	
My math instructor expects students to complete challenging assignments.			.61	
My math instructor's teaching style makes this class enjoyable.				.90
Students in this class don't like the math course lectures very much. (R)				.67
Students in this class like the math course instructor.				.79
The lectures in my math course aren't very interesting.(R)				.55
The lectures in my math course really seem to drag on forever.(R)				.52
The lectures in my math course are enjoyable.				.85

N= 239-246. All factor loadings > .45 are presented in the table. (R) indicates that the item is reversed scored.

Path Analysis: Classroom Climate, Motivational Beliefs, and Procrastination

Data screening. Prior to conducting the proposed path analysis, several data screening steps were undertaken. The first was to screen for missing values. Once the classroom climate variables were created based on the results of the exploratory factor analyses, no missing values were found for the variables representing the four classroom climate dimensions, self-efficacy, task value, and procrastination.

Second, the data were screened for deliberately careless response patterns. In other words, these were instances when participants provided the same response for a large number of consecutive questions. For example, two participants (who also had completed the survey in 5 minutes or less) provided a consecutive response of "2" in approximately half of the survey, and then provided a response of "3" for the second half of the survey. These two cases were removed from the analysis.

All of the main study variables for the path analysis were checked for univariate outliers. Univariate outliers were defined by whether an observed score for a particular variable was above or below three standard deviations from the variable mean. No cases were identified as being outliers across the majority of variables; therefore, it was difficult to justify removing any cases for appearing as outliers in one or two of the study variables. To check for multivariate outliers, Mahalanobis distances were calculated for the variables that were to be included in the path analysis model. This check was performed by entering the four classroom climate dimensions and the two personal motivation variables into a linear regression model with procrastination as the dependent variable. There were five cases where the Mahalanobis distance value exceeded the chi-square critical value ($\chi^2 = 22.46$, d.f. = 6, $p < .001$). Therefore, because multiple

regression (in this case, path analysis) can be "adversely affected by the presence of extreme values" (Meyers, Gamst, & Guarino, 2006, p. 199), these cases were removed. This brought the final sample to 248.

Statistical assumptions that apply to structural equation modeling were also checked. Violations of univariate normality were first examined by generating histograms of each of the main variables. All of the histograms appeared to represent a normal distribution. Skewness and kurtosis values were also examined and no values surpassed +1 or -1 suggesting that the normality assumption was met. Because tests for multivariate normality violations are not available through SPSS and AMOS, it was not possible to check for multivariate normality in the current study.

Next, the issue of multicollinearity was assessed. The intercorrelations between the independent variables of the path analysis were examined and none was found to exceed .80. The highest correlation identified was between Course Organization and Instructor Support ($r = .71$). The collinearity statistics of the linear regression model including the path analysis variables were also examined to check for multicollinearity. No Variance Inflation Factor (VIF) statistics exceeded 10, suggesting that multicollinearity was not an issue among these variables (Meyers et al., 2006).

Violations of linearity, homoscedasticity, and independence of residuals of the data were also checked. To test for linearity, an inspection of standardized residuals plot of the overall variate from the linear regression model and bivariate plots for each independent variable with the dependent variable in the path analysis were examined. The standardized residuals plot did not show a clearly discernible non-linear pattern, indicating that the linearity assumption was tenable. In addition, for the six bivariate

plots of each independent variable, no non-linear patterns emerged, thus also indicating that the assumption of linearity for each independent variable was met. The assumption of homoscedasticity was also met because the standardized residual plot did not appear to display any pattern of increasing or decreasing residuals. Finally, the standardized residual plot showed a random scatter of points indicative of independence (Hair, Black, Babin, & Anderson, 2010).

The final statistical assumption that should be checked before running a structural equation model is to assess whether the covariance matrix is ill-scaled. An ill-scaled covariance matrix occurs when the ratio from the largest to smallest variance is greater than 10. Ill-scaled covariance matrices may prevent the SEM iterative estimation process from reaching a point of convergence to a stable solution; thus, increasing the likelihood that the model may result in a poor fit (Kline, 2011). For the current study, the variable with the largest variance was course situational interest (.88) and the one with the smallest variance was academic press (.50). The ratio from the largest to smallest variance equated to 1.75, indicating that the covariance matrix was not ill-scaled.

Descriptive statistics and bivariate correlations. Descriptive statistics, bivariate correlations, and internal consistencies (Cronbach alpha coefficients) for the four classroom climate dimensions, self-efficacy, task value, and procrastination (variables involved in the path analysis model) are reported in Table 2. After having established in the exploratory factor analysis that the items for each classroom climate dimension loaded on a single factor each, the coefficient alpha for each of the classroom climate factors, instructor support, course organization, academic press, and course situational interest was .83, .90, .82, and .87, respectively. The correlations among the

Table 2

Cronbach Alphas, Means, Standard Deviations, and Pearson Correlations among the Main Variables in Path Analysis

Variable	***α***	***M***	***SD***	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1. Instructor Support	.83	3.83	0.81	---						
2. Course Organization	.90	4.01	0.78	.71***	---					
3. Academic Press	.82	3.73	0.71	.59***	.66***	---				
4. Course Situational Interest	.87	3.33	0.94	.65***	.62***	.45***	---			
5. Self-efficacy	.91	4.08	0.87	.38***	.46***	.20**	.34***	---		
6. Task Value	.83	3.63	0.85	.41***	.43***	.35***	.45***	.63***	---	
7. Procrastination	.92	2.50	0.89	-.23***	-.27***	-.19**	-.30***	-.43***	-.49***	---

Notes. $N = 248$; $^{**}p < .01$. $^{***}p < .001$.

four classroom climate factors were significant and ranged from moderate (r = .45) to large (r = .71). Pearson correlations indicated that each of the four classroom climate dimensions was significantly negatively related to procrastination. As expected, students who reported perceiving higher levels of instructor support (r = -.23, p < .001), course organization (r = -.27, p < .001), academic press (r = -.19, p < .01), and course situational interest (r = -.30, p < .001) reported lower levels of procrastination in their math course. These findings provided support for testing the direct paths from the classroom climate dimensions to procrastination included in the hypothesized path analytic model. Then again, because the four classroom climate factors have moderate to strong correlations with each other, the potentially high amount of variance shared between them may reduce the likelihood that all four factors will have significant direct effects on procrastination when entered simultaneously in the model (Meyers et al., 2006).

In terms of the relations between the four classroom climate dimensions and the two personal motivation variables, the correlations between the four classroom climate dimensions and self-efficacy were significant and ranged from small (r = .20) to moderate (r = .46). Students who reported perceiving higher levels of instructor support (r = .38, p < .001), course organization (r = .46, p < .001), academic press (r = .20, p < .01), and course situational interest (r = .34, p < .001) in their mathematics course also reported higher levels of confidence in their ability to be successful in their math course. Similarly, the correlations between the four classroom climate dimensions and task value were significant and moderate (r = .35) to (r = .45). Students who reported perceiving higher levels of instructor support (r = .41, p < .001), course organization (r = .43, p < .001), academic press (r = .35, p < .001), and course situational interest (r = .45, p < .001)

in their mathematics course reported the course material as more interesting, important, and useful. These findings provided support for the direct paths from the four classroom climate dimensions to both self-efficacy and task value included in the model.

Pearson correlations also indicate that both self-efficacy and task value were significantly related to procrastination. Students with greater self-efficacy ($r = -.43$, $p < .001$) and who had greater value perceptions for their math course ($r = -.49$, $p < .001$) reported lower levels of procrastination on their math course material. Again, these findings provided support for testing the direct paths from self-efficacy to procrastination and task value to procrastination in the model. Overall, the significant associations found between each of the four classroom climate dimensions with the two personal motivational beliefs coupled with the significant associations found between each of the two personal motivational beliefs with procrastination provided preliminary justification for testing the meditational paths proposed in the conceptual model.

Procedures. The software package, AMOS (version 18.0) was used to conduct the path analyses. As mentioned, Figure 1 displays a graphical representation of the initial specification of the conceptual model for the current study. Following the recommendations of Kline (2011), several model fit indices were used to test the proposed model. Absolute fit indices such as the chi-square statistic, the goodness of fit index (GFI; Jöreskog & Sörbom, 1982), and Root Mean Square Error of Approximation (RMSEA; Steiger, 1990), were used to evaluate how closely the specified covariance matrix matched the covariance matrix of the observed data. Statistically significant model chi-square values indicate that the exact-fit hypothesis is rejected, which given the current sample size would more than likely signify poor model fit (Kline, 2011). GFI

values above .95 indicate good fit. Root Mean Square Error of Approximation (RMSEA; Steiger, 1990) values less than .05 indicate a good fit. RMSEA 90% confidence interval criteria were also evaluated.

In addition to using absolute fit indices to test for fit of the proposed model, two relative fit indices were evaluated. The two relative fit indices that were evaluated for the current study were the Bentler Comparative Fit Index (CFI; Bentler, 1990) and the Normed Fit Index (NFI; Bentler & Bonett, 1980). CFI and NFI values above .95 indicate good fit.

As depicted in the proposed conceptual model (Figure 1), self-efficacy and task value were hypothesized to partially mediate the relations between each of the four classroom climate variables and academic procrastination. In other words, the effects of these four aspects of the classroom climate on academic procrastination were posited to be direct and indirect through students' personal motivational beliefs (i.e., self-efficacy, task value). In addition to the proposed path analytic model, an alternative model (Figure 2) was tested that excluded two direct paths. Specifically, the path coefficients from course organization to self-efficacy and from situational interest to self-efficacy were constrained to zero. The decision to test this alternative model was based on the lack of strong theoretical evidence for these two associations. If both of these models emerge as a good fit to the observed data, the originally proposed model will be compared to the alternative model using the model chi-square difference test to determine which model is a better fit to the observed data. Any further adjustments to attain the most parsimonious model were justified by taking both theory and empirical results into consideration as suggested by Kline (2011).

Not only were the proposed models evaluated for good model fit using the model fit indices mentioned above, in addition the data were examined to check for improper parameter estimates such as negative error variances, and standardized path coefficients that were greater than +1 or -1. Modification indices were also checked to determine if there were paths or covariances that could be added or removed to improve model fit. Furthermore, standardized residual covariance values were examined to identify local parts of the model that either under explained (values greater than 2) or over explained (values greater than -2) the relationship between two specified variables. These two model modification tools were used to make model adjustments, but only if the modification recommendations could be theoretically supported (Kline, 2011). Finally, the statistical model was estimated using the maximum-likelihood estimation method.

Concerning the intended sample size needed to test the current model, the total sample size for the current study was 248, which provided adequate statistical power to carry out the planned analyses. The sample size easily exceeded the minimum sample size of 100 as well as the common sample size of 200 used in published SEM articles (Kline, 2011). The alternative model met the minimum 10:1 ratio of subjects-to freely estimated parameters recommended by Jackson (2003) and the initially proposed model was just short of that ratio (9:1). Despite the fact that the proposed model was just short of the 10 to 1 ratio, the fact that the maximum likelihood estimation method was used to estimate the proposed model enhanced the likelihood that the current sample size was indeed acceptable for the original model (Kline, 2011).

To reiterate, the original path analytic model (see Figure 1) represented a partially mediated model where the four classroom climate dimensions were posited to have both

direct effects and indirect effects through self-efficacy and task value on procrastination. This model revealed significant path coefficients for the following five associations: course situational interest to task value, academic press to self-efficacy, course organization to self-efficacy, self-efficacy to procrastination, and task value to procrastination. However, the fit indices indicated that this model was a poor fit to the data, χ^2 (1, N = 248) = 93.87, p = .000, CFI = .881, NFI = .882, GFI = .917 RMSEA = .613 (Left C.I. = .512; Upper C.I. = .721), and the significant path coefficients should, therefore, not be interpreted. Upon checking for improper parameter estimates, none were found.

An inspection of the modification indices revealed that model fit would improve substantially (59.01) if a direct path from self-efficacy to task value were to be added (and vice versa). The absence of a direct path between self-efficacy and task value was also reflected in the value of the standardized residual for self-efficacy with task value. Upon examining the standardized residuals covariance matrix, it was found that the model significantly under explained the relationship between self-efficacy and task value (standardized residual = 6.520) while over explaining the relationship between self-efficacy and procrastination (standardized residual = -2.197). However, the alternative model was tested next before making any decisions about how to address the identified areas of local misfit in the original model.

The alternative path analytic model (see Figure 2) was the same as the original model except the model was trimmed by constraining two direct effect path coefficients to zero (essentially removing the path from course organization to self-efficacy and the path from situational interest to self-efficacy from the model). This model showed

significant path coefficients for the following four associations: course situational interest to task value, instructor support to self-efficacy, self-efficacy to procrastination, and task value to procrastination. Again, however, the model fit indices suggested that this model

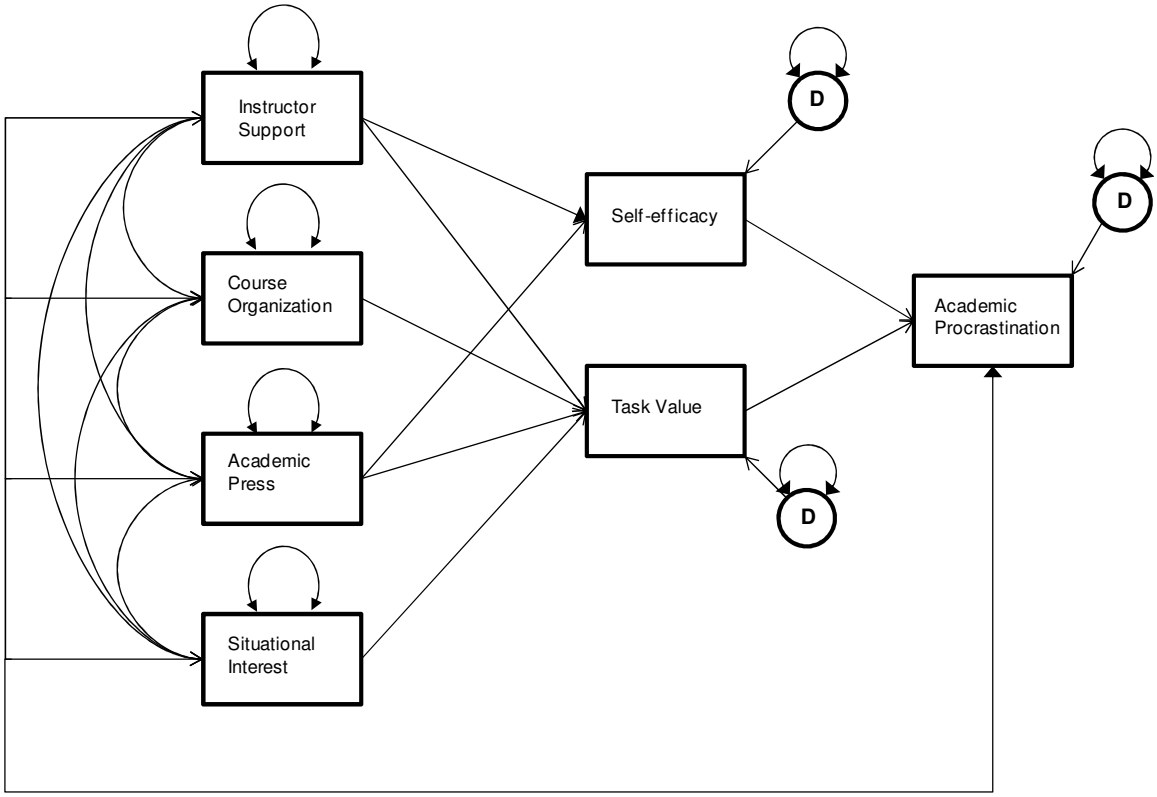

Figure 2. Alternative path model of classroom climate, motivational beliefs, and procrastination.

was a poor fit to the data, χ^2 (3, N = 248) = 125.51, p = .000, CFI = .842, NFI = .843, GFI = .898 RMSEA = .407 (Left C.I. = .348; Upper C.I. = .469). Consequently, the significant predictive effects should not be interpreted.

Once again, no improper parameter estimates were found. For the alternative model, an inspection of the modification indices revealed that model fit would improve substantially if direct paths from self-efficacy to task value (59.00) and from course organization to self-efficacy (11.73; a relationship in the original model that was removed

in the alternative model) were to be added. The absence of these direct paths from the model was also reflected in the values of the standardized residual for self-efficacy with task value and for course organization with task value. Upon examining the standardized residuals covariance matrix, it was found that the alternative model significantly under explained the relationship between self-efficacy and task value (standardized residual = 7.483) and the relationship between course organization and self-efficacy (standardized residual = 3.072) while over explaining the relationship between self-efficacy and procrastination (standardized residual = -2.638).

Despite both models emerging as inadequate fits to the observed data, the originally proposed model and the alternative model findings were inspected further to evaluate several options for exploratory model adjustments. For various reasons, it appears that the original model is a slightly better fit to the data when compared to the alternative model. First, the alternative model appears to be oversimplified given that this model under explains more relationships (i.e., course organization and self-efficacy) compared to the original model. Second, upon inspecting several of the fit indices (i.e., GFI, CFI, and NFI), it appears that the original model was a relatively better fit to the observed data compared to the alternative model given that these values for the original model were closer to exceeding the .95 values necessary to deem the model a "good" fit.

Because both the original model and the alternative model inadequately fit the observed data, one more attempt was made to modify the relatively better-fitting original model through the process of model trimming whereby non-significant effects are eliminated (path coefficients are fixed to zero). Model trimming was performed in an attempt to create a more parsimonious model and to obtain an adequately fitting model.

Following the logic of model trimming, only the significant effects of the original model were retained in the trimmed model (see Figure 3; Kline, 2011). This resulted in eliminating the instructor support variable from the model. Despite instructor support

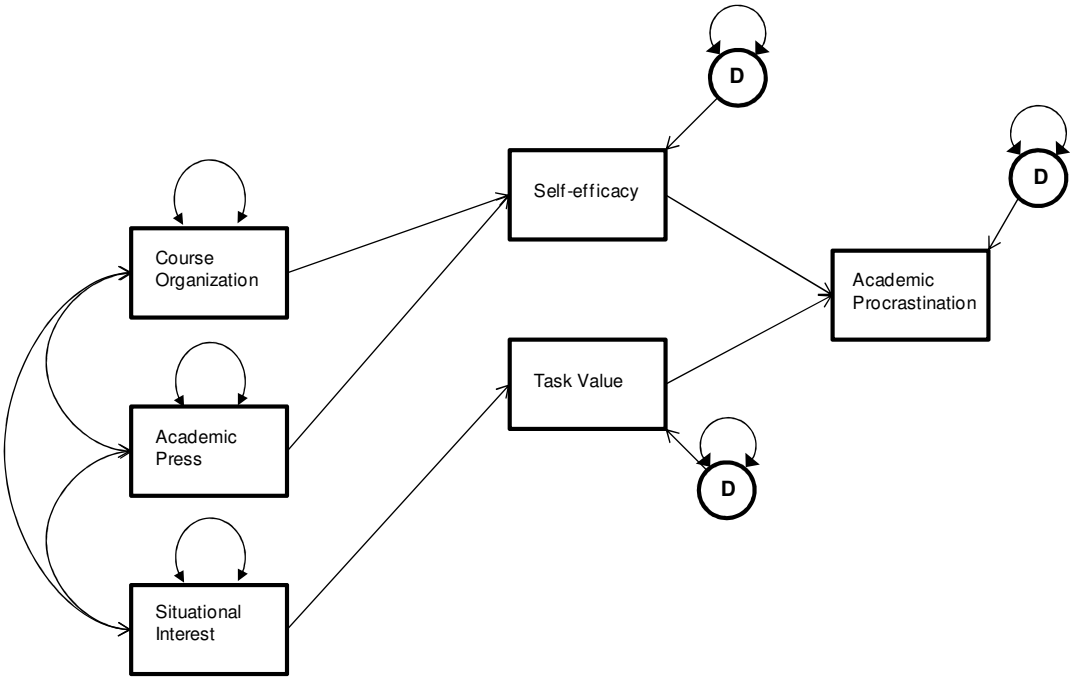

Figure 3. Trimmed path model of classroom climate, motivational beliefs, and procrastination.

significantly correlating with self-efficacy, it appears that its unique contribution in explaining the variance in the model is not significant when course organization is included in the model. Recall that course organization and instructor support are highly correlated (r = .71), and when the direct path between course organization and self-efficacy in the alternative model was removed, a significant direct effect was found between instructor support and self-efficacy.

The trimmed path analytic model represented a fully mediated model where (a) course organization and academic press were predicted to have indirect effects through

self-efficacy on procrastination, and (b) course situational interest was predicted to have indirect effects through task value on procrastination. As expected, all of the path coefficients were significant: course situational interest to task value, academic press to self-efficacy, course organization to self-efficacy, self-efficacy to procrastination, and task value to procrastination. However, the fit indices indicated that this model was again a poor fit to the data, $\chi 2$ (7, N = 248) = 111.60, p = .000, CFI = .813, NFI = .805, GFI = .895 RMSEA = .246 (Left C.I. = .207; Upper C.I. = .287). Upon checking for improper parameter estimates, none were found.

An inspection of the modification indices revealed that model fit would improve if direct paths from self-efficacy to task value (70.39), from course organization to task value (6.62), and from academic press to task value (6.67; two relationships in the original model that were removed in the trimmed model) were to be added. The absence of these direct paths from the model was also reflected by the values of the standardized residual for self-efficacy with task value, for course organization with task value, and for academic press with task value. Upon examining the standardized residuals covariance matrix, it was found that the trimmed model significantly under explained the associations between self-efficacy and task value (standardized residual = 7.864), course organization and task value (standardized residual = 2.207), and academic press and task value (standardized residual = 2.257), while over explaining the relationship between self-efficacy and procrastination (standardized residual = -2.931).

Despite the trimmed model emerging as a poor fit to the observed data, the originally proposed model and the trimmed model findings were inspected further to evaluate which of the two models were a better fit to the data. Again, it appeared that the

trimmed model had been oversimplified given that this model under explains more relationships (i.e., course organization to task value and academic press to task value). Moreover, upon inspecting several of the fit indices (i.e., GFI, CFI, and NFI), it also appeared that the original model was again a slightly better fit to the observed data compared to the trimmed model given that these values for the original model were closer to exceeding the .95 values necessary to deem the model a "good" fit. Because all three models were a poor fit to the observed data, further meditational analyses were not warranted.

Overall results across the three models suggested that a directional link from self-efficacy to task value was necessary to attain good model fit to the observed data. Additional discussion regarding other possibilities in testing additional path analysis models including classroom climate dimensions, motivational beliefs, and procrastination variables will be elaborated on in the next chapter.

Hierarchical Multiple Linear Regression Analysis: Follow-up Testing of the Predictive Effects of the Classroom Climate Dimensions on Procrastination

Because the three models tested were deemed poor fits to the observed data, the significant predictive effects could not be interpreted. Therefore, a hierarchical multiple linear regression was conducted to elucidate the extent to which four aspects of the classroom climate and the two motivational beliefs could be used to predict undergraduate students' level of procrastination in their mathematics courses. The first step of the regression model included the four classroom climate variables: instructor support, course organization, academic press, and course situational interest. In the second step of the regression model, the two motivational beliefs were added.

Results of the hierarchical regression predicting academic procrastination are reported in Table 3. After entering instructor support, course organization, academic press,

Table 3

Hierarchical Regression Predicting Procrastination

Predictor variables	β Step 1	β Step 2
Step 1		
Instructor Support	.00	.05
Course Organization	-.13	.02
Academic Press	-.01	-.03
Course Situational Interest	-.22*	-.11
Step 2		
Self-efficacy		-.21**
Task Value		-.33***
R^2	.09***	.26***
ΔR^2		.18***

Notes. β indicates standardized regression coefficient.
*$p < .05$. **$p < .01$. ***$p < .001$.

and course situational interest in step 1, the model was significant, $F(4,247) = 6.75$, $p < .001$, $R^2 = 9\%$. Course situational interest ($\beta = -.22$, $p < .05$) was the only significant negative predictor among the four classroom climate dimensions. This result indicates that despite all four classroom climate variables having a significant inverse bivariate correlation with procrastination, it appears that when simultaneously including all four aspects of the classroom climate into the model, only course situational interest emerges as a significant predictor of procrastination.

In step 2, upon entering the two personal motivational beliefs, the model remained significant, $F(6,247) = 15.28$, $p < .001$, $R^2 = 26\%$. Course situational interest was no longer a significant negative predictor; however, both motivational beliefs emerged as significant negative predictors. Specifically, self-efficacy ($\beta = -.21$, $p < .001$) and task value ($\beta = -.33$, $p < .001$) were both significant negative predictors of procrastination.

These findings suggest that: (a) students' perceptions of how interesting and enjoyable they find the presentation of the courses material is a better predictor of procrastination among the four classroom climate dimensions, and (b) self-efficacy and task value are stronger predictors of undergraduate students' level of academic procrastination in their mathematics courses than the course climate dimensions.

Regression Analysis: Motivation Regulation and Time Management as Moderators

Data screening. Because course situational interest was the only classroom climate dimension that emerged as a significant predictor of procrastination among the classroom climate dimensions (in addition to other reasons provided in previous chapters), a two-step hierarchical linear regression was conducted to examine the extent that motivational regulation strategies and time management moderated the effects of course situational interest on procrastination. Prior to conducting this analysis, several data screening steps were taken again given that the regression model included four variables that had not been included in the path analysis (regulation of value, regulation of performance goals, self-consequating, time-management). The first step involved screening the missing data. Cases with missing data were minimal (less than 1%) and appeared to occur at random. Therefore, it was deemed appropriate to handle missing data for further statistical analyses by using the Listwise deletion method offered through SPSS.

All of the main variables involved in the hierarchical regression analysis were also checked to for univariate and multivariate outliers, but none were found. Outliers were defined by the method specified in the data screening procedures previously explained. Statistical assumptions that apply to regression analysis were also checked.

Upon the inspection of histograms and skewness and kurtosis values, it appeared that the normality assumption was met. The issue of multicollinearity was also assessed. The intercorrelations between the independent variables of the regression analysis were examined and none was found to exceed .80. The highest significant correlation identified was between regulation of value and self-consequating (r = .57). The collinearity statistics of the linear regression model were also examined to check for multicollinearity. No Variance Inflation Factor (VIF) statistics exceeded 10 (Meyers et al., 2006). The assumption of linearity, homoscedasticity, and independence of residuals of main variables included in the regression analysis were also checked and none were violated.

Descriptive statistics and bivariate correlations. Descriptive statistics, bivariate correlations, and alpha coefficients (Cronbach Alphas) among the main variables in the regression analysis are reported in Table 4. The correlations among the three motivational regulation strategies were significant and ranged from small (r = .19) to moderate (r = .57). Pearson correlations indicated that the three motivational regulation strategies were significantly related to procrastination. As expected, students who reported more often employing regulation of value (r = -.18, p < .01), regulation of performance goals (r = -.25, p < .001) and self-consequating strategies (r = -.23, p < .001) to enhance their motivation to complete their math coursework, reported lower levels of procrastination. Time management was also found to be significantly related to procrastination in the expected direction. Students who more often engaged in time management behaviors (r = -.29, p < .001) such as planning, scheduling, and making lists as it pertained to their math coursework procrastinated at lower levels.

Table 4

Cronbach Alphas, Means, Standard Deviations, and Pearson Correlations among Age and the Main Variables in Regression Analysis

Variable	***α***	***M***	***SD***	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1. Age	---	20.25	4.25	---						
2. Course Situational Interest	.87	3.34	0.94	-.01	---					
3. Regulation of Value	.90	3.76	1.60	.07	.22**	---				
4. Regulation of Performance Goals	.87	5.79	1.16	.01	.23***	.19**	---			
5. Self-consequating	.91	4.39	1.53	.04	.20**	.57***	.40***	---		
6. Time Management	.91	4.67	1.64	-.06	.11	.30***	.25***	.43***	---	
7. Procrastination	.92	2.50	0.89	.09	-.30***	-.18**	-.25***	-.23***	-.29***	---

Notes. $N = 246$; $^{**}p < .01$. $^{***}p < .001$

Hierarchical multiple linear regression analysis. As mentioned, a two-step hierarchical multiple linear regression analysis was conducted to examine the extent the three motivational regulation strategies and time management moderated the relation between course situational interest and procrastination. Because the student population of the university where the data was collected includes non-traditional college students when it comes to age, coupled with previous findings indicating that age has a slight negative effect on procrastination (see Steel, 2007), participants' age was controlled for in the model. The first step of the regression included age in addition to course situational interest, the three motivational regulation strategies (regulation of value, regulation of performance goals, and self-consequating), and time management. The second step added four interaction terms (course situational interest x regulation of value; course situational interest x regulation of performance goals; course situational interest x self-consequating; course situational interest x time management). As recommended by Aiken and West (1991), the interaction terms entered in the second step were created after centering the corresponding lower-order terms (i.e., predictors).

Results of the hierarchical regression predicting academic procrastination are reported in Table 5. After entering age, course situational interest, three motivational regulation strategies and time management in step 1, the model was significant, $F(6,245) = 8.71$, $p < .001$, $R^2 = 18\%$. Course situational interest ($\beta = -.23$, $p < .001$) and time management ($\beta = -.21$, $p < .01$) were both significant negative predictors. In step 2, the model remained significant, $F(10,245) = 6.83$, $p < .001$, $R^2 = 23\%$. Course situational interest ($\beta = -.21$, $p < .01$) and time management ($\beta = -.23$, $p < .01$) remained significant

negative predictors while three of the four interaction terms added to the significance. Course situational interest x regulation of value (β = .16, p < .05) and course situational

Table 5

Hierarchical Regression Predicting Procrastination Testing Moderating Effects of Motivational Regulation and Time Management

Predictor variables	β Step 1	β Step 2
Step 1		
Age	.08	.07
Course Situational Interest	-.23***	-.21**
Regulation of Value	-.04	-.06
Regulation of Performance Goals	-.13	-.12
Self-consequating	-.02	.00
Time Management	-.21**	-.23**
Step 2		
Situational Interest X Regulation of Value		.16*
Situational Interest X Regulation of Performance		.15*
Situational Interest X Self-consequating		-.24**
Situational Interest X Time Management		-.07
R^2	.18***	.23***
ΔR^2		.05**

Notes. β indicates standardized regression coefficient.
*p < .05. **p < .01. ***p < .001.

interest x regulation of performance goals (β = .15, p < .05) were significant positive predictors while course situational interest x self-consequating (β = -.24, p < .01) was a significant negative predictor. These results indicate that regulation of value, regulation of performance goals, and self-consequating all moderate the relationship between course situational interest and procrastination. Conversely, the course situational interest by time management interaction term was not found to be significant. This indicates that the negative predictive effect course situational interest has on procrastination is not significantly influenced by students' level of time management.

Testing and plotting simple slopes. Because three of the interaction terms were significant in the hierarchical regression analysis (indicating that the regression of

procrastination on course situational interest varied across the range of each motivational regulation strategies), three tests of simple slopes were conducted to understand the nature of the interaction effects. In this case, the simple slope is indicative of the slope of the regression of procrastination on course situational interest on a single value of each of the motivational regulation strategies. Because moderating variables of the current study were all continuous, following the recommendation of Cohen and Cohen (1983; as cited in Aiken & West, 1991), values representing one standard deviation above the mean and one standard deviation below the mean were used to plot the interaction.

Figure 4 presents two simple regression lines of the regression of procrastination on course situational interest as a function of two values of regulation of value. The regulation of value analysis revealed that course situational interest was a significant negative predictor of procrastination when students employed regulation of value strategies less frequently (b = -.34, SE = .07, $p < .001$), after controlling for corresponding lower-order terms, and including the three other interaction terms in the model. Conversely, course situational interest was unrelated to procrastination when students employed regulation of strategies at higher frequencies (b = -.07, SE = .09, p = .48). Upon examining the simple regression lines, there appears to be a significantly greater decline in procrastination as the presentation of the material in a course is perceived as more interesting for students who employed regulation of value strategy less often compared to students who employed this strategy more often. It is also important to note that, within classrooms that were perceived to present course material in a less interesting/enjoyable manner (i.e., classrooms that fell on the low end of the course situational interest continuum), students who employed the regulation of value strategy

more frequently procrastinated at lower levels compared to their peers who employed the regulation of value strategy less frequently.

Similarly, Figure 5 presents two simple regression lines of the regression of procrastination on course situational interest as a function of two values of regulation of performance goals. The regulation of performance goals analysis revealed that course situational interest was a significant negative predictor of procrastination when students employed the regulation of performance goals strategy less frequently (b = -.35, SE = .09, $p < .001$), after controlling for corresponding lower-order terms, and including the three other interaction terms. Conversely, course situational interest was unrelated to procrastination when students employed the regulation of performance goals strategy at higher frequencies (b = -.05, SE = .08, p = .53). Upon examining the simple regression lines, there appears to be a significantly greater decline in procrastination as the presentation of the material in a course is perceived as more interesting for students who employed the regulation of performance goals strategy less often compared to students who employed this strategy more often. Again, it is important to note that, within classrooms that were perceived to present course material in a less interesting manner, (i.e., classrooms that fell on the low end of the course situational interest continuum) students who employed the regulation of performance goals strategy more frequently procrastinated at lower levels compared to their peers who employed this strategy less frequently.

The final interaction term found to be significant was between course situational interest and self-consequating. Figure 6 displays the two simple regression lines of the regression of procrastination on course situational interest as a function of two values of

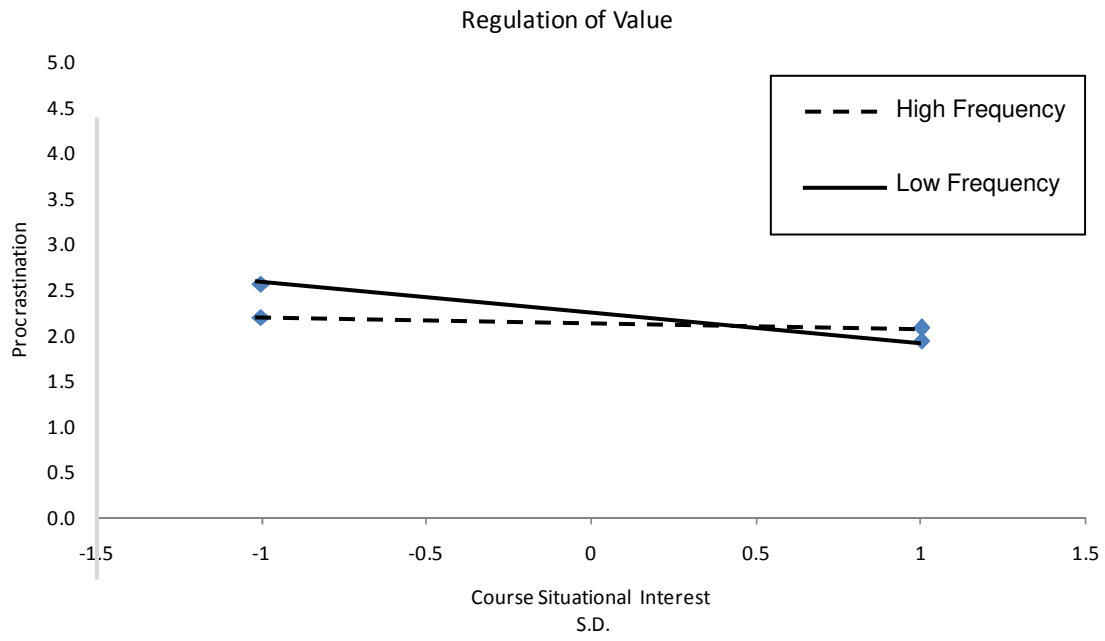

Figure 4. Simple regression analysis from centered analysis. Regulation of value as moderator.

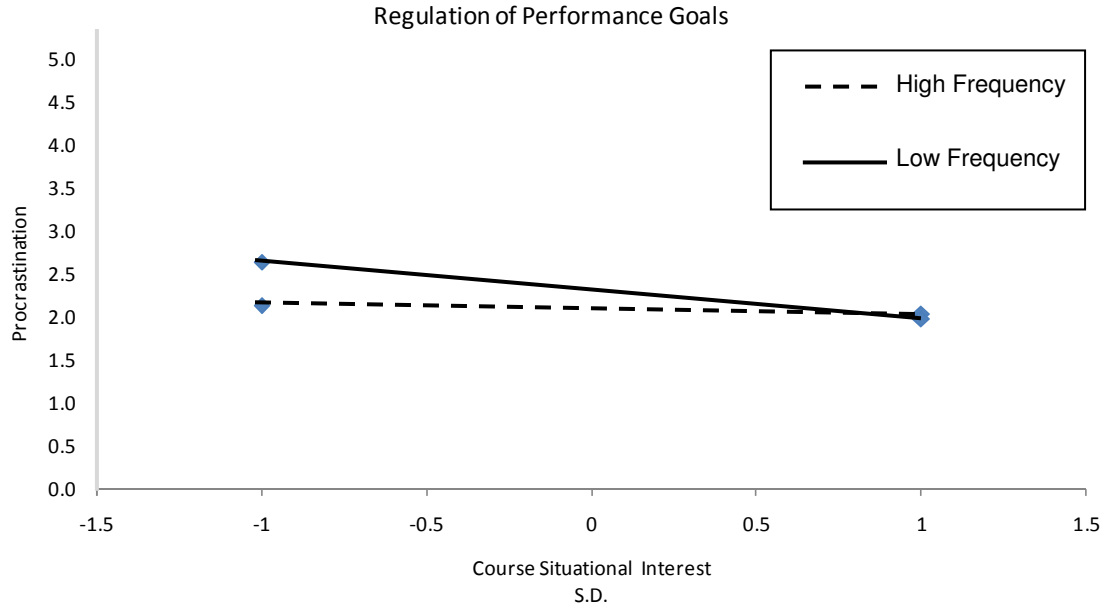

Figure 5. Simple regression analysis from centered analysis. Regulation of performance goals as moderator.

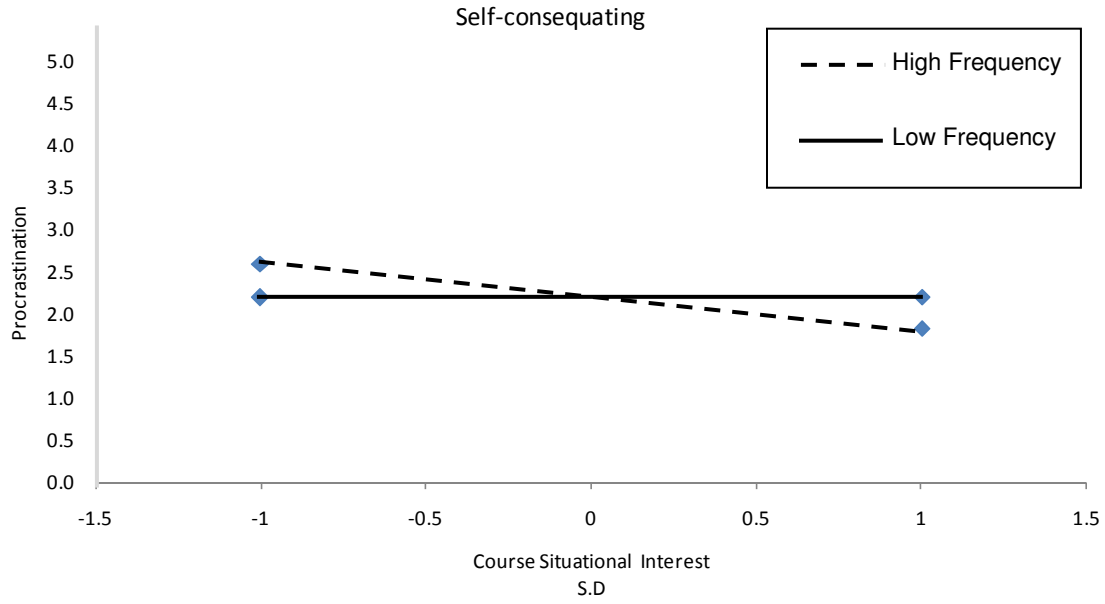

Figure 6. Simple regression analysis from centered analysis: Self-consequating as moderator.

self-consequating. The self-consequating analysis revealed that course situational interest was a significant negative predictor of procrastination when students employed self-consequating at higher frequencies (b = -.41, SE = .09, p < .001), after controlling for corresponding lower-order terms, and including the three other interaction terms. Conversely, course situational interest was unrelated to procrastination when students employed the self-consequating at lower frequencies (b = .01, SE = .09, p = .95). Upon examining the simple regression lines, as the presentation of course material is viewed as increasingly interesting across classrooms, there appears to be a significantly greater decline in procrastination for students who employed self-consequating more often compared to students who employed this strategy less often. This finding indicated that the more frequently students employed the self-consequating strategy, the more dramatic the decline in procrastination as course situational interest increased. Overall, it appeared

that higher use of self-consequating had the strongest predictive effect on the relationship between course situational interest and procrastination.

One caveat to these findings is that the course situational interest scale ranged from 1 to 5 and the motivational regulation strategy scales ranged from 1 to 7. However, unstandardized regression coefficients were used to calculate the simple regression lines; therefore, changing these invariant predictor scales by additive constants would not have made a difference in these solutions (Aiken & West, 1991).

Chapter V

Discussion

The present study contributes to various areas of research, namely, procrastination, the classroom climate, and self-regulated learning in several ways. First, the current study adopted concepts from both classroom climate theory and achievement motivation to create scales measuring various aspects of the college classroom environment. Second, the current findings added to both procrastination and classroom climate research by providing insight into the nature of the relationships between the college classroom environment and procrastination. The influence that the college classroom environment has on students' procrastination had not been quantitatively assessed in past research (Schraw et al., 2007) and some researchers had proposed this as an area in need of further investigation (Wolters & Corkin, 2012). Third, the current study married concepts from the procrastination literature, the classroom climate literature, and the larger motivation theoretical frameworks to understand further how environmental and motivational facets interact to predict students' procrastination behavior.

Classroom Climate Scales

Results from the four factor analyses indicated that the composite of several scales adapted from the motivation literature and the classroom climate literature represented one factor for each of the four respective aspects of the classroom climate. Not only did items load onto one factor for each aspect of the classroom climate, all four factors had high reliabilities suggesting that the items retained in each factor represented the same construct.

The four factors that emerged from this study contribute to the classroom climate literature because most instruments that assess the unique dimensions of the classroom climate have examined middle and high school classrooms (e.g., Fraser & Treagust, 1986). The current study may provide researchers with scales that may be used to measure these four aspects of the classroom climate to assess college course environments. Furthermore, recent work conducted by Arroyo-Giner and colleagues (2010) to construct an instrument measuring numerous unique dimensions of the college course climate, which includes the four aspects examined in the current study, holds promise in providing a viable method in assessing a more all-encompassing view of the college classroom environment.

With that said, caution should be taken when using the current classroom climate scales in future studies given that the current study did not conduct an overall exploratory factor analysis to empirically distinguish these four factors. In addition, the variance accounted for by the academic press after rotation was 40%, which may be indicative of a weak factor.

Relations between the Classroom Climate, Motivational Beliefs, and Procrastination

While the path analytic models tested were not good fits to the observed data, with reasons why discussed later, findings based on bivariate correlations provide support that the aspects of the classroom climate examined do seem to relate to students' academic procrastination in their math course. First, current findings suggest those mathematics classrooms where students perceived their instructors to be respectful, friendly, and helpful reduced students' level of procrastination on course-related tasks. The fact that instructor support and procrastination are inversely related seems to make

sense given the consistent findings that students who perceive their teachers as helpful and friendly are more likely espouse adaptive motivational beliefs and engagement (see Patrick et al., 2011). This finding is also consistent with research indicating that middle school students who perceived their mathematics teachers as demonstrating support and friendliness were less likely to engage in self-handicapping behaviors such as putting off work until the last minute (Dorman et al., 2002).

Second, current results also provided clarity to the nature of the relationship between course organization and procrastination. In Schraw et al.'s (2007) study, students reported that instructors who provided clear syllabi, followed it closely, and who provided prompt evaluation feedback inadvertently promoted procrastination. The reasoning provided by students of why these classroom climate characteristics promoted procrastination was that well-organized instructors allowed them to plan to procrastinate. At the same time, however, findings from this same study and others suggested that procrastination is reduced when instructors maintain unambiguous deadlines for course assignments (Ferrari et al., 1998; Schraw et al., 2007). The current findings provide further support that courses that are highly organized in all of these respects are associated with lower levels of procrastination. It is possible that results from this study slightly differed from Schraw and colleagues (2007) finding suggesting that high levels of course organization promoted procrastination because they interviewed students taking psychology courses who already had claimed to be regular procrastinators whereas the current study surveyed students, regardless of their regular procrastination levels, taking mathematics courses.

Next, the current results were consistent with previous findings indicating that course environments where students perceive their instructors as having high expectations for their work, who provide challenging tasks, and who press them to understand the course material, reduce levels of procrastination (Ferrari & Scher, 2000; Schraw et al., 2007). This finding provides further support for the adaptive nature of a college classroom environment that espouses high levels of academic press. It is important to note that the academic press items used in the this study focused more on press for understanding the course material (Middleton & Midgley, 2002), and not academic press when it comes to performing or achieving at a certain level. The influence this latter form of academic press has on procrastination was not examined.

Finally, the aspect of the classroom climate that had the strongest negative association with procrastination and was the only classroom climate dimension among the four that significantly predicted procrastination was course situational interest. The fact that course situational interest was the only significant negative predictor among the four classroom climate dimensions does not seem surprising given that students' interest level for the presentation of the course material is closely linked to students' general interest for tasks within a course (Harackiewicz et al., 2008; Hidi & Renninger, 2006). Moreover, as mentioned, the characteristic of a task most frequently reported as a reason for procrastinating relates to the extent that a task is perceived as interesting (Solomon & Rothblum, 1984). In addition, the most important self-related cause of procrastination has been found to be personal interest in course material (Schraw et al., 2007). Taken together, these findings suggest that the aspects of the environment that elicit interest would probably have a greater influence on the extent students procrastinate.

Not only did each of the four classroom climate dimensions significantly relate to procrastination, but also all four aspects of the college classroom environment were found to significantly and positively relate to each other. This finding is also consistent with results from previous college classroom climate research that developed similar scales to the ones in the current study (Arroyo-Giner et al., 2010; Winston et al., 1994). Of note is the strong relationship found between course organization and instructor support. It appears that instructors who are perceived as highly organized are also more likely to be perceived as helpful and friendly. In fact, findings from a recent study utilizing factor analysis to develop an instrument to measure various unique aspects of the college classroom climate suggested that course organization and instructor support could not be empirically differentiated into two separate factors (Arroyo-Giner et al., 2010). Another study examining the relationship between two similar constructs (instructor warmth and openness and instructor organization) also found a strong positive association between these two aspects of the classroom climate (Freeman et al., 2007).

Therefore, given that organization and instructor support are theoretically distinct, reasons provided by researchers as to why they are so highly related has to do with the fact that both of these aspects of the classroom climate deal with how the instructor facilitates the course (Arroyo-Giner et al., 2010). This strong association also may be explained by the fact that instructors who are highly organized tend to have the course syllabi, evaluation criteria, and assignment deadlines established prior to the beginning of the semester. Thus, these highly organized instructors may have more time to get to know and help students and to articulate the academic resources available to them

compared to instructors who are more preoccupied with how they are going to structure their course each class session.

Another contribution of the current study is that it included a motivational belief that had not been linked directly to procrastination. Findings indicated that task value, which is a main construct of expectancy-value theory (Eccles et al., 1983; Wigfield & Eccles, 2000), was a strong predictor of students' academic procrastination. In other words, the more the students find the course material interesting, useful, or important, the less likely they are to procrastinate in that course. Research examining antecedents of procrastination have conceptualized task value as a task characteristic (see Steel, 2007) rather than conceptualizing it as a motivational belief. This is the first study identified to date that examined the relationship between procrastination and task value as it is conceptualized within a larger motivational framework (EVT; Eccles et al., 1983).

The current study also adds to the mounting evidence that self-efficacy is inversely associated with procrastination (Corkin et al., 2011; Ferrari et al., 1992; Klassen & Kuzucu, 2009; Steel, 2007; Wolters, 2003a). In other words, findings indicate that students who were confident about successfully executing tasks related to their math course were also less likely to procrastinate. Taken together these findings are consistent with Steel's (2007) proposed temporal motivation theory (TMT) model stating that individuals are less likely to procrastinate on tasks that they value and for which they feel self-efficacious. These relationships may also be explained through an expectancy-value perspective (Wigfield & Eccles, 2000), although as alluded to previously, no prior motivation or procrastination studies to date were identified examining these connections under this theoretical lens.

Results from the current study also indicate that personal motivational beliefs are stronger predictors of students' procrastination levels beyond aspects of the classroom environment. No previous work was identified examining whether motivational beliefs are stronger predictors of procrastination when accounting for the classroom climate dimensions examined in the current study. Nevertheless, the current finding parallels research indicating the influence that an aspect of the classroom environment (performance-approach structure) had on procrastination was reduced when accounting for students' personal motivational beliefs (i.e., mastery goal orientation; Wolters, 2004). The current findings seem to indicate that one's own personal motivation may be more influential on procrastination than aspects of the classroom environment examined. However, course situational interest was found to be moderately related to task value; therefore, the potentially high amount of variance shared between these two variables may have reduced the likelihood that course situational interest would have remained a significant negative predictor of procrastination when task value was entered in the model (Meyers et al., 2006). Course situational interest may have remained a significant negative predictor of procrastination if the only personal motivational belief entered in the model had been self-efficacy.

Finally, consistent with findings and inferences made by previous research (Dever & Karabenick, 2011; Dorman, 2001; Fraser & Fisher, 1982; Harackiewicz et al., 2008; Lorsbach & Jenkins; 1999; Middleton & Midgley, 2002; Winston et al., 1994), results indicate that students who perceive their classrooms as having high levels of each of the four aspects of the classroom climate examined exhibit adaptive motivational beliefs. In addition, it appears that each one of the four classroom climate dimensions

relates more strongly with one out of the two motivational beliefs examined. For example, as expected, course situational interest is more highly correlated with task value than with self-efficacy. Therefore, we may infer that the relationship between course situational interest and procrastination is mediated through task value rather than through self-efficacy. Unfortunately, because the path analysis resulted in a poor fit to the observed data, a definitive statement cannot be made regarding whether the relationship between each of the classroom climate dimensions to procrastination is significantly mediated through one motivational belief versus the other. However, some additional inferences may be made from the models tested, which will be discussed in the next section.

Path Analyses: Inferences and Paths Forward

Despite the fact that path analyses testing the direct effects of the four aspects of classroom climate on procrastination, as well as the indirect effects the classroom climate had on procrastination through motivational beliefs, resulted in a poor fit to the observed data, it seems that the originally proposed model was a slightly better fit. Reasons justifying the better fit of the original model are as follows: (a) the majority of the model fit indices were closer to the values needed to deem the model a good fit, and (b) this model included all but one direct path (self-efficacy to task value) that emerged in the latter two models as modification indices. However, we may infer from the final trimmed model that a fully mediated model as opposed to a partially mediated model (original model), may have fit the data better given that the significant paths that were found were from the classroom climate dimensions to one or two of the motivational beliefs, and from each of the motivational beliefs to procrastination. Based on the

trimmed model, none of the direct paths from the classroom climate dimensions to procrastination was significant once personal motivational beliefs were included in the model. This suggests that the effect of the classroom climate on procrastination may be better explained through students' personal motivational beliefs. Although not a one to one comparison, previous studies that have examined similar aspects of the course environment (lecture engagement; academic press) also found that motivational beliefs (i.e., achievement goals; self-efficacy) fully mediate the relationships between the course environment and academic outcomes (Church et al., 2001; Levpuscek & Zupancic, 2008). Unfortunately, this assumption cannot be confirmed given that the trimmed model was a poor fit to the observed data.

It also may be inferred that the effect course situational interest has on procrastination is explained better through task value rather than through self-efficacy when including course organization and academic press in the model. This seems to make sense given that there is little to no empirical evidence linking course situational interest to self-efficacy, and the connection between situational interest and task value seems to be well-supported by interest theory. Interest theory suggests that interest in a particular academic subject initially develops by features in the environment that arouse attention or interest (situational interest), which may eventually lead to finding course material personally meaningful and valued (Hidi, 1990; Hidi & Harackiewicz, 2000; Hidi & Renninger, 2006).

Again, based on the significant paths that emerged from the models, there are several reasons that the effects course organization and academic press have on procrastination may be better explained through self-efficacy rather than through task-

value when including course situational interest in the model. First, despite the fact that there was little empirical support for linking course organization to self-efficacy, after running the alternative model, it was evident that to attain a better model fit, it was necessary to include this direct relationship in the model. Second, in terms of the link between academic press and self-efficacy, previous findings have suggested that academic press affects students' self-efficacy beliefs (e.g., Middleton & Midgley, 2002).

However, it remains difficult to make such a conclusion given that the modification indices of the trimmed model revealed that model fit would improve if direct paths from these two aspects of the classroom climate to task value were to be added. In addition, these assumptions cannot be confirmed because none of the three models resulted in a good fit to the observed data. Overall, it does appear that when including course organization, course situational interest, and academic press in the model, the relationships each of these classroom climate dimensions have on procrastination vary by whether one or both of the personal motivational beliefs could potentially act as mediators.

Another inference concerning the models relates the omission of instructor support in the trimmed model. No significant paths were found between instructor support and the two personal motivation beliefs when course organization was included in the model. Again, this is more than likely due to the strong correlation that course organization and instructor support have with one another.

The final inference that may be made about the models tested is that a direct link between self-efficacy and task value is necessary to attain good model fit to the observed data. However, it may be difficult to justify adding a directional link between these two

personal motivational variables when according to an expectancy-value perspective these two types of belief act in parallel to predict achievement-related behaviors and academic outcomes (Eccles, Wigfield, & Schiefele, 1998). Because task value and self-efficacy are highly correlated yet found to be empirically distinguishable from one another (Eccles & Wigfield, 1995), researchers that have tested models driven by expectancy-value theory have taken various approaches in examining the unique effects that each of these personal motivational beliefs have on academic outcomes. Specifically, researchers that have tested expectancy-value theoretical models have either included these two motivational beliefs as exogenous variables that covary (Bong, 2001), or they have estimated separate models for each type of belief (Updegraff & Eccles, 1996; Simpkins et al., 2006). One additional approach taken by researchers to justify including a direct path from self-efficacy beliefs to beliefs about a task is to measure them at two different times (Meece, Wigfield, & Eccles, 1990).

To ameliorate the issue caused by including two bi-directionally related endogenous variables in the path analytic models proposed in the current study, various approaches may be considered when conducting subsequent investigations of path analytic models testing the indirect effects of the classroom climate on procrastination through motivational beliefs. First, following the logic of studies that have examined the mediating role that self-beliefs and task beliefs have on the relationship between contextual influences and achievement-related behaviors (e.g., Simpkins et al., 2006), future studies could estimate separate models for each type of belief. This approach may also reduce the likelihood of losing significant paths due to multicollinearity between these two types of beliefs.

A second approach may be to collect data at two different time points throughout the semester. For example, students may report perceptions of the classroom climate a few weeks into the semester, their self-efficacy beliefs about the course at the middle of the semester, and their task value beliefs and procrastination at the end of the semester. This approach would allow for making causal inferences between these two motivational beliefs.

A third approach could be to enter these two motivational beliefs as exogenous variables in the model and have them covary. One may argue that motivational beliefs could influence students' perceptions about the classroom. Previous classroom climate studies have examined the influence personal attributes, such as personal ability has on students' perceptions of the classroom. However, the direction examined in the current models— the classroom environment influencing personal motivational processes—is the most common way of understanding the nature of these relationships in past research (e.g., see Fisher & Fraser, 1983; Patrick et al., 2011; Wolters, 2004).

A final approach involves an existing theory that stems from the Counseling Psychology literature. Social Cognitive Career Theory (Lent, Brown, & Hackett, 1994) contends that students are likely to develop interests in academic subjects upon which they feel highly self-efficacious and expect positive outcomes. According to this theory, self-efficacy beliefs precede beliefs about a task, specifically interest for a task. This theory may provide some justification for adding a directional link from self-efficacy to task value. It is still difficult, however, to make this argument because this theory focuses more on specifically explaining career choices, and the instruments that are used to measure self-efficacy and interest are different from those used for the current study.

The instruments used to measure self-efficacy and task value in the current study are more consistent with how these concepts are operationalized within an expectancy-value theoretical framework (Eccles et al., 1984).

Course Situational Interest, Motivational Regulation Strategies, Time Management and Procrastination

Consistent with previous research (Wolters & Benzon, 2010), current findings from bivariate correlations indicated that more frequent use of motivational regulation strategies was associated with lower levels of procrastination. Specifically, students who more often employed strategies to (a) emphasize the personal importance of performing well and getting good grades, (b) increase the usefulness or importance of the course material, and (c) provide themselves with a reward for meeting goals regarding their work completion reported lower levels of procrastination. Furthermore, students who more frequently employed time management-related behaviors reported lower levels of procrastination in their math course, which was also similar to previous findings (e.g., Lay, 1992).

However, according to results from the hierarchical linear regression analysis, when including these motivational regulation strategies along with course situational interest and time management in the regression model, these three strategies were no longer predictive of procrastination behavior. Only course situational interest and time management were significant negative predictors of procrastination. Adding to the finding suggesting that procrastination may be more closely related to students' motivational beliefs (i.e., task value) rather than their use of motivational regulation strategies (Wolters & Benzon, 2010), the current finding suggests that procrastination

may be more closely linked to students' beliefs about the course environment (i.e., course situational interest) than with their use of motivational regulation strategies. It is relevant to note that even though course situational interest does not represent a personal motivational belief, as explained earlier, this aspect of the environment is closely linked with task value (see Hidi & Renninger, 2006).

Another relevant finding is that time management-related behavior was the only significant negative predictor of procrastination among all of the self-regulated learning strategies assessed. This finding may be explained by the fact that planning and scheduling one's time is a strategy that is conceptually similar to procrastination. In addition, this strategy is one that students are possibly most familiar with and is probably the most well known strategy taught by teachers or through self-help books to overcome procrastination (e.g., Ferrari, 2010). Conversely, studies have found that regulation of motivation strategies are employed to overcome a number of situations hindering motivation (Wolters, 1998) and may not necessarily be targeted at reducing procrastination. Therefore, students may not direct these motivational strategies for the purposes of overcoming procrastination. Furthermore, because two of these motivational regulation strategies (regulation of value and regulation of performance goals) are internal processes individuals engage in, it may be more difficult for students to recognize the effectiveness of these strategies in reducing procrastination when compared to time management strategies. For example, engaging in time management may provide an individual with concrete evidence (i.e., filled out calendar/schedule) of its effectiveness in reducing procrastination and therefore its employment may be more likely directed to decreasing this behavior.

In addition to course situational interest and time management emerging as significant predictors of procrastination, the interaction terms between situational interest and each of the motivational regulation strategies were found to be significant, although all not in the same direction. First, low levels of regulation of value and regulation of performance goals significantly strengthened the negative association between course situational interest and procrastination. One way to interpret this finding is that students who employed regulation of value or regulation of performance goals more frequently were less sensitive to variations in course situational interest as it related to the extent they procrastinated compared to their counterparts who employed these strategies less frequently. In other words, students who do not employ these strategies as frequently are more affected by variations in the level of course situational interest as it relates to their procrastination level when compared to their peers who employ these strategies more frequently.

The nature of these interactions are similar to the findings reported by Lay and Brokenshire (1997), which suggested that individuals high in conscientiousness were less sensitive to variations in task pleasantness on their procrastination behavior when compared to their less conscientious peers. Even though the current study did not examine students' level of conscientiousness, as mentioned in chapter 2, there is some conceptual overlap between characteristics of someone high in conscientiousness and characteristics of a self-regulated learner (see Steel, 2007). Coupling this with the fact that there is empirical support indicating that regulation of motivation is an important aspect of self-regulated learning (Wolters & Benzon, 2010), suggests that drawing parallels between the Lay and Brokenshire (1997) study and the current study is viable.

One reason why students who employ regulation of value or regulation of performance goals more frequently experience less of a decline in procrastination as the presentation of the course is perceived more interesting may be that these students are already engaging in low levels of procrastination. However, further investigations are needed to understand why students who employed these strategies less often experienced a steeper decline in procrastination compared to their peers who employed these strategies more frequently. It is also important to note that these findings may be unique to the set of variables and interaction terms that were included in the model.

In contrast to the nature of the moderating effects that regulation of value and regulation of performance goals had on the association between course situational interest and procrastination, high rather than low levels of self-consequating significantly strengthened the negative association between course situational interest and procrastination. In other words, the greater amount of self-consequating employed by students as their perceptions of the course situational interest increased the more dramatic the decline in procrastination. This finding suggests that the effect course situational interest has on reducing procrastination is dependent upon the more frequent use of self-consequating. Because self-consequating is perhaps a more behavioral strategy that has to do with providing rewards for persisting in a task, it seems feasible to relate this finding to work that has examined the relationship between the timing of rewards and punishments as it relates to an academic task with procrastination. Specifically, researchers have found that the relationship between individuals' beliefs about a task (i.e., task aversiveness) and procrastination is dependent upon the timing of rewards and punishment for completing that task (e.g., Lay, 1987, as cited in Steel, 2007). The

current finding provides additional support that environmental influences on procrastination may depend on the nearness of the expected rewards. In the case of self-consequating, students are setting more proximal rewards to enable them to complete tasks, which based on the current findings seem to be an effective strategy in reducing procrastination as the presentation of the course material is perceived as increasingly interesting.

In concluding this section, in line with an area in need of future research as proposed by Wolters and Benzon (2010), this study has begun to explore the effectiveness of different strategies within certain contexts, which in this case happened to be classrooms with varying levels of situational interest. Current findings indicate that high levels of self-consequating compared to two other forms of regulation of motivation strategies had the greatest effect on strengthening the inverse relationship between course situational interest and procrastination. A reason why this method seemed most effective in reducing procrastination across varying levels of course situational interest may have to do with an idea that was alluded to previously. Self-consequating is a strategy that provides more concrete rewards when compared to regulation of value and regulation of performance goals, which are internal mental processes (self-talk) used to enhance motivation.

Implications and Future Areas of Research

Despite the fact that this study was not able to determine whether environmental influences on procrastination are better explained through personal motivational beliefs, findings do suggest that certain aspects of the college course environment influence the extent that students procrastinate on course-related material. Because the current study

only examined the nature of these relationships among undergraduate mathematics courses, future research should examine these relationships in classes of various disciplines to investigate if the nature of these relationships varies by subject matter. Another area of future research may be to examine multiple task value components (as conceptualized by expectancy-value theory) separately (i.e., attainment value, utility value) to understand how these unique dimensions mediate the effects of the college classroom environment on procrastination. Finally, the most viable area for further research is to estimate separate models for each type of motivational belief to examine individually the mediating role that self-efficacy and task value have on the relationship between the classroom climate and procrastination rather than include these two theoretically bi-directionally related and highly correlated endogenous variables within a single recursive model.

Implications of this study may be useful to college instructors in informing them about what aspects of the course environment may be affecting their students' procrastination levels. Furthermore, this information may help instructors understand which features of the course environment promote adaptive motivational beliefs and motivational engagement among their students. In addition, findings provide students with a better understanding of which motivational regulation strategies are effective in enhancing the effects that the classroom environment may have in reducing academic procrastination.

Limitations

The implications and findings of the current study must be interpreted with certain limitations in mind. One limitation to the current study is that instructor perceptions of

their own course were not collected or assessed. Studies have found that instructors perceive their classrooms as more positively than the students within their class (Fraser & Treagust, 1986). With that said, however, students' perceptions of their environment have been viewed as a greater predictor of their beliefs and behavior. A second limitation is that the data are correlational; therefore, we cannot infer any causal relationships between these variables. A third limitation has to do with the sample size of the original path analysis model proposed. It would have been ideal to have at least 270 participants given that there were 27 freely estimated parameters in the model, but unfortunately, data from numerous participants had to be removed from the analysis because they did not meet the study criteria. A final limitation deals with the fact that all participants were enrolled within mostly first and second year level undergraduate courses offered through the math department. Therefore, the current results may not generalize to higher level mathematics courses or courses offered through other departments or within other disciplines.

Regardless of these limitations, the current study extends our understanding of the environmental aspects that play a role in students' procrastination. Furthermore, the current study integrated concepts from the procrastination literature, the classroom climate literature, and larger motivation theoretical frameworks (i.e., expectancy-value and self-regulated learning theory) to further understand how environmental features and motivational processes interact to predict students' procrastination behavior. This study also adds to the self-regulated learning literature in identifying the differing effectiveness of certain regulation of motivation strategies in reducing procrastination across varying college classroom environments.

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Appendix A

Mathematics Courses

Mathematics Courses
MATH1300 Fundamentals of Math
MATH1310 College Algebra
MATH1311 Elementary Mathematical Modeling
MATH1312 Introduction to Mathematical Reasoning
MATH1313 Finite Mathematics with Applications
MATH1314 Calculus for Business and the Life Sciences
MATH1330 Precalculus
MATH1431 Calculus I
MATH1432 Calculus II
MATH2303 Concepts in Algebra
MATH2311 Introduction to Probability & Statistics
MATH2331 Linear Algebra
MATH2433 Calculus III
MATH3330 Abstract Algebra
MATH3339 Statistics for the Sciences
MATH4389 Survey of Undergraduate Mathematics