

2020

Faculty behaviors predicting student satisfaction: A self-determination approach using basic psychological needs and academic motivation

Mary Schenkenfelder
Iowa State University

Follow this and additional works at: <https://lib.dr.iastate.edu/etd>

Recommended Citation

Schenkenfelder, Mary, "Faculty behaviors predicting student satisfaction: A self-determination approach using basic psychological needs and academic motivation" (2020). *Graduate Theses and Dissertations*. 18219.

<https://lib.dr.iastate.edu/etd/18219>

This Dissertation is brought to you for free and open access by the Iowa State University Capstones, Theses and Dissertations at Iowa State University Digital Repository. It has been accepted for inclusion in Graduate Theses and Dissertations by an authorized administrator of Iowa State University Digital Repository. For more information, please contact digirep@iastate.edu.

**Faculty behaviors predicting student satisfaction:
A self-determination approach using basic psychological needs and academic
motivation**

by

Mary Schenkenfelder

A dissertation submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Psychology (Counseling Psychology)

Program of Study Committee:
Lisa M. Larson, Major Professor
Patrick Armstrong
Daniel Russell
Meifen Wei
David Vogel

The student author, whose presentation of the scholarship herein was approved by the program of study committee, is solely responsible for the content of this dissertation. The Graduate College will ensure this dissertation is globally accessible and will not permit alterations after a degree is conferred.

Iowa State University

Ames, Iowa

2020

Copyright © Mary Schenkenfelder, 2020. All rights reserved.

TABLE OF CONTENTS

	Page
LIST OF TABLES	iv
LIST OF FIGURES	v
ACKNOWLEDGMENTS	vi
ABSTRACT	vii
CHAPTER 1 INTRODUCTION	1
Self-Determination Theory	2
Supportive Faculty Behaviors and Academic Major Satisfaction	4
Supportive Faculty Behaviors and Need Satisfaction	7
Supportive Faculty Behaviors and Academic Motivation.....	8
Need Satisfaction and Academic Motivation	9
Need Satisfaction and Academic Major Satisfaction	11
Academic Motivation and Academic Major Satisfaction.....	12
CHAPTER 2 LITERATURE REVIEW	16
Self-Determination Theory	16
Academic Major Satisfaction and Academic Outcomes	17
Supportive Faculty Behaviors and Academic Major Satisfaction	18
Supportive Faculty Behaviors and Need Satisfaction	23
Supportive Faculty Behaviors and Academic Motivation.....	26
Need Satisfaction and Academic Motivation	30
Need Satisfaction and Academic Major Satisfaction	32
Need Satisfaction and Other Academic Outcomes	34
Academic Motivation and Academic Major Satisfaction.....	36
Academic Motivation and Other Academic Outcomes.....	36
The Present Study	38
CHAPTER 3 METHODS	40
Design.....	40
Participants	40
Measures	42
Procedure	50
Hypotheses.....	51

CHAPTER 4 RESULTS.....	54
Preliminary Analyses	54
Main Analyses.....	57
Additional Analyses	65
CHAPTER 5 DISCUSSION.....	70
Hypotheses.....	70
Additional Analyses	81
Implications	86
Limitations.....	89
Future Directions.....	91
REFERENCES	93
APPENDIX A. VERBAL IMMEDIACY BEHAVIORS SCALE.....	119
APPENDIX B. NONVERBAL IMMEDIACY SCALE.....	120
APPENDIX C. NEED FOR AUTONOMY SUBSCALE OF THE W-BNS.....	121
APPENDIX D. NEED FOR COMPETENCE SUBSCALE OF THE W-BNS	122
APPENDIX E. NEED FOR RELATEDNESS SUBSCALE OF THE W-BNS	123
APPENDIX F. COMPREHENSIVE-RELATIVE AUTONOMY INDEX.....	124
APPENDIX G. ACADEMIC MAJOR SATISFACTION SCALE.....	125
APPENDIX H. DEMOGRAPHICS QUESTIONNAIRE	126
APPENDIX I. INFORMED CONSENT.....	127
APPENDIX J. IRB APPROVAL	130

LIST OF TABLES

Table 1: Demographic Characteristics of the Sample.....	102
Table 2: Summary of Means, Standard Deviations, and Correlations.....	103
Table 3: Factor Loadings for the Measurement Model.....	105
Table 4: Factor Loadings for the Measurement Model without Mod Indices.....	106
Table 5: Bootstrap Analysis of Indirect Effects	107
Table 6: Bootstrap Analysis of Indirect Effects (without Competence).....	109
Table 7: Correlations among Latent Variables.....	111

LIST OF FIGURES

Figure 1: The proposed fully mediated model.....	112
Figure 2: The alternative partially mediated model.....	113
Figure 3: The fully mediated model.....	114
Figure 4: The partially mediated model	115
Figure 5: Fully mediated model controlling for grade point average	116
Figure 6: Fully mediated model with competence removed	117
Figure 7: Model with adjusted positions of faculty behaviors and needs	118

ACKNOWLEDGMENTS

I am incredibly grateful to my advisor, Dr. Lisa Larson, who has not only been a consistently excellent research mentor but has also served as a stable attachment figure through my grad school career. Dr. Larson has my gratitude for her complete dedication to helping me reach my professional goals and for her complete unwillingness to compromise her values to please others.

I would like to thank my committee members: Dr. Meifen Wei, Dr. Patrick Armstrong, Dr. Daniel Russell, and Dr. David Vogel. In particular, I would like to thank Dr. Wei and Dr. Russell for their consultation regarding structural equation modeling.

Thank you also to my friends and family, who have been with me to celebrate when good things are happening and to commiserate when not-so-good things are happening. And, of course, thank you to my husband, who has been patient and understanding through my entire time in grad school in a way that I never could have been if our roles had been reversed.

ABSTRACT

The relation between supportive faculty behaviors and academic major satisfaction was examined through a lens of self-determination theory. It was hypothesized that supportive faculty behaviors would predict academic major satisfaction indirectly through basic psychological needs in the classroom (perceived volitional autonomy, perceived competence, relatedness) and academic motivation. Structural equation modeling was used to test hypotheses. In a sample of 331 college students, supportive faculty behaviors did not directly predict academic major satisfaction but did indirectly predict academic major satisfaction through perceived competence in class, relatedness in class, and academic motivation. Implications, limitations, and future directions are discussed.

Keywords: academic major satisfaction, perceived autonomy, perceived competence, perceived relatedness, academic motivation, self-determination theory, nonverbal immediacy, verbal immediacy, faculty behavior

CHAPTER 1. INTRODUCTION

Well-being outcomes, such as life satisfaction and social adjustment, provide information about what kind of experience students are having at college and play a role in determining whether or not students will be successful in college (Richardson, Abraham, & Bond, 2012), transfer away from a school (Robbins et al., 2004), or stay in college at all (Pascarella & Terenzini, 2005). In the following study, the well-being outcome of academic major satisfaction will be considered, and a model will be presented for fully understanding how the environment shapes that outcome.

Many parts of college life have an impact on outcomes; in this case, the focus is on the academic experience and more specifically on the classroom (Pascarella & Terenzini, 2005). Within the academic realm, the classroom is a primary place where students experience the environment directly shaped by those who are likely seen as representatives of the university—that is, faculty.

In the classroom, faculty have significant control over the environment and significant influence on student experience. Faculty create the classroom environment—structuring how time is spent, establishing what kinds of relationships they have with students, and creating norms for how students interact with each other in class (Martin & Dowson, 2009). If it is possible to reach an understanding of which faculty behaviors contribute to positive outcomes, then faculty can be encouraged to engage in behaviors that facilitate these positive outcomes.

This study aims to create a whole picture of how faculty behaviors in the classroom affect student outcomes: identification of the behaviors faculty engage in that predict positive or negative outcomes, as well as a robust understanding of the mechanisms through which faculty behaviors facilitate those outcomes (Figure 1). The theoretical lens that will be used as the frame

to understand these mechanisms is self-determination theory (SDT; Deci & Ryan, 1980, 1991; Baumeister & Leary, 1995).

Self-Determination Theory

Self-determination theory is, at its core, a theory of motivation. Motivation is the thing in people and their environments that moves them to act and continue acting (Ryan & Deci, 2000). It is the feeling that makes people want to do something because they love doing it, and it is the feeling that convinces them to do something, even when they do not want to (Ryan & Deci, 2000).

Self-determination theory starts from the assumption that people are essentially oriented toward motivation, learning, and self-improvement but that the environment can have a significant impact on whether this orientation is expressed. When the environment is such that a person's needs are met, they feel more motivated and thus are happier in the tasks they set out to accomplish and better at accomplishing those tasks (Deci & Ryan, 2000).

It is important, here, to differentiate trait motivation from state motivation in order to clarify what is meant when discussing motivation in an academic context (Vallerand, 1997; Vallerand & Ratelle, 2002). Trait motivation—the individual differences in how motivated people tend to be across tasks—is relatively stable within a person. Some people are simply more motivated, no matter what they are doing. State motivation, in contrast, refers to how motivated a person is with regard to the specific tasks required in a particular environment. State motivation varies with the degree to which a person enjoys the tasks in a particular environment or the kinds of rewards offered in that environment. State motivation also varies based on the extent to which a person feels they are acting of their own volition, perceives they are effective in what they do, and feels connected to the people around them (Ryan & Deci, 2000).

In this case, the area of interest is state motivation within the domain of the academic environment—how motivation varies in the academic environment. Specifically, the question being asked is how academic motivation varies depending on the academic environment that faculty create. Motivation as a general concept refers to the variety of factors that move us to act. Academic motivation refers to the variety of factors in an academic setting that move students to act on academic tasks (Deci, Vallerand, Pelletier, & Ryan, 1991).

Self-determination theory adds another distinction to the types of motivation: intrinsic and extrinsic (Ryan & Deci, 2000). This differentiation can easily be seen within academic motivation. Intrinsic motivation is based in a desire to seek out novelty and challenges and comes from the natural inclination of people to explore new things and to want to master new tasks. Extrinsic motivation is based externally. It is the drive to perform a task in order to attain an outcome that is separate from the task itself. This type of motivation varies greatly: the desire to do well on a test in order to get a good grade, and the desire to do well on a test in order to obtain a sense of pride in oneself are both considered examples of extrinsic motivation.

These different facets of academic motivation are on a spectrum from extremely extrinsically motivated (completing classwork because one does not want to fail) to extremely intrinsically motivated (completing classwork because one enjoys the assignment; Ryan & Deci, 2000). Within the SDT framework, the more supportive the environment is, the more academic motivation of any kind a student will have, but also, the further a student will move along the spectrum of motivation toward intrinsic. So a student who feels more supported in the environment should feel more motivated, and that motivation should feel more intrinsic.

In SDT the environment is what shapes motivation by supporting or not supporting three basic psychological needs: perceived volitional autonomy, perceived competence, and

relatedness. These needs are considered to be universal and essential for well-being (Deci & Ryan, 1980, 1991; Baumeister & Leary, 1995). Perceived volitional autonomy is the need to feel you are making choices for yourself, perceived competence is the fundamental need to feel efficacious in your tasks, and relatedness is the fundamental need to feel connected to those around you (Deci & Ryan, 1980, 1991; Baumeister & Leary, 1995). If any one of these needs is not met in a specific environment, then motivation and well-being in that environment will suffer. Thus, in order for academic motivation and academic major satisfaction to be high, these needs must be supported in the classroom environment that faculty create.

Supportive Faculty Behaviors and Academic Major Satisfaction

This study attempts to understand the mechanisms by which faculty behaviors predict academic major satisfaction. For this model to make sense, we need to start from the knowledge that faculty behaviors will predict major satisfaction.

Faculty interactions with students are a major topic of study within the education literature (e.g., Martin & Dowson, 2009). It is clear that frequent, positive interactions with faculty in a variety of settings contribute to positive academic outcomes. Cohen (1981), in a meta-analysis, found a strong relation between student ratings of instructor and academic achievement ($r = .43$, $k = 67$). In their literature review, Crisp & Cruz (2009) found that across 12 studies, measures of interactions between faculty-student relationships outside the classroom positively related to academic outcomes including GPA and student persistence (although there was variation in which outcomes were most strongly associated with these relationships).

However, the research done in this area often does not have a strong theoretical foundation, so student-faculty interaction has not been conceptualized in a consistent way. There has not been an intentional, theoretical effort to understand which types of interactions between

faculty and students should be the most useful and then to examine that hypothesis. This study seeks to remedy this issue by applying the frame of self-determination theory.

From an SDT perspective, the goal is to examine faculty behaviors in the classroom that have the goal and/or the effect of meeting the psychological needs (perceived volitional autonomy, perceived competence, and relatedness) in that environment. There is one line of research which examines faculty behaviors, verbal and nonverbal, in a classroom, that are directed toward supporting a positive classroom climate (Christophel, 1990). These supportive faculty behaviors in the classroom are the kind of environmental supports SDT suggests should ultimately lead to positive outcomes like major satisfaction.

Supportive faculty behaviors have been associated with positive outcomes in the classroom. A meta-analysis of supportive faculty behaviors and classroom outcomes found a high degree of correlation between nonverbal supportive faculty behaviors and perceived learning ($r = .51, k = 44$) and moderate to high correlation between verbal supportive faculty behaviors and perceived learning ($r = .49, k = 25$; Witt, Wheelless, & Allen, 2004). The same meta-analysis found moderate to high degrees of correlation between nonverbal supportive faculty behaviors and positive feelings about a class ($r = .49, k = 55$) and between verbal supportive faculty behaviors and positive feelings about a class ($r = .49, k = 26$). However, this meta-analysis also found a small correlation between nonverbal supportive faculty behaviors and actual learning in a class ($r = .17, k = 11$) and between verbal supportive faculty behaviors and actual learning in a class ($r = .06, k = 4$).

It seems there is clear and strong evidence that supportive faculty behaviors are linked to a positive subjective experience in the classroom. Given that there are fewer studies addressing the link between supportive faculty behaviors and objective learning, it seems less clear that they

are linked. This trend suggests that supportive faculty behaviors may be more related to student experiential outcomes than to cognitive outcomes, which suggests supportive faculty behaviors should be linked to the experiential outcome of academic major satisfaction.

There is, however, no evidence directly linking major satisfaction with supportive faculty behaviors. Faculty have been considered in relation to major satisfaction through their contribution to the climate of a department. In one study, the amount of outside funding of full-time instructional faculty predicted major satisfaction (Umbach & Porter, 2002). Additionally, there is evidence that the experiences students have with faculty in their major department indirectly predict academic major satisfaction through perceived competence and perceived volitional autonomy (Schenkenfelder, 2017).

Supportive faculty behaviors relate to outcomes similar in nature to major satisfaction, and major satisfaction is predicted by characteristics of and experiences with faculty in their department. This evidence supports the argument that supportive faculty behaviors will predict academic major satisfaction.

Indirect effects of supportive faculty behaviors on academic major satisfaction also need to be considered. The self-determination theory model is one that relies on indirect effects: the environment predicts outcomes, but this is because the environment predicts needs, needs predict motivation, and motivation predicts outcomes. There is evidence supporting the hypothesis that the relation between supportive faculty behaviors and academic outcomes is mediated by variables including instructor credibility (Wheless, Witt, Maresh, Bryand, & Schrodt, 2011) and academic motivation (Fallah, 2014, Pribyl, Sakamoto, & Keaten, 2004).

Supportive Faculty Behaviors and Need Satisfaction

It is the environment that shapes experiences of perceived volitional autonomy, perceived competence, and relatedness, and in the classroom it is faculty who shape the environment (Deci & Ryan, 1980, 1991; Baumeister & Leary, 1995). There is a strong theoretical argument to be made that faculty shape the classroom environment. Many theoretical approaches to teaching, including pastoral pedagogy, relational pedagogy, and connective pedagogy, emphasize the role of instructors as socializers, that is, the role of instructors in shaping the social environment within the classroom (Martin & Dowson, 2009). These theoretical approaches also emphasize that creating a positive social environment will lead to positive outcomes. The SDT frame tells us that the environment supports the three needs. So if faculty are shaping the environment, those behaviors that are shaping the environment should predict need satisfaction within that environment.

However, the literature addressing the instructor behaviors is focused on only a few types of outcomes: student retention, student affective experience of classes or instructors, and cognitive learning outcomes such as information retained and GPA. Although the theoretical lens of SDT suggests that supportive faculty behaviors should predict need satisfaction, the empirical support for this argument is scant. There is one study that directly addresses this question. Schenkenfelder (2017) found that experiences students had with faculty in their major department significantly predicted volitional autonomy, perceived competence, and relatedness.

Schenkenfelder (2017) provides the only direct link between faculty and need satisfaction, but there is some evidence that provides less direct links. Class size has been correlated with perceived volitional autonomy, perceived competence, and perceived relatedness (Filak & Sheldon, 2003). Since class size can shape the ways in which instructors are able to

interact with students (larger classes mean less individual interaction), it is possible that the relationship between class size and the three needs is due in part to the way class size shapes faculty-student interaction. Additionally, the instructor's amount of experience in teaching a course was correlated with perceived volitional autonomy and perceived relatedness (Filak & Sheldon, 2003). It seems likely that faculty behave differently as they get more comfortable and confident teaching a course, so this relation may also be connected to the ways that faculty behave differently as they gain experience teaching a course. Finally, a study using a measure of perceived access to academic resources and social support found a relation with academic self-efficacy, or the perception that one will be effective in the academic domain (a concept closely related to perceived academic competence; Garriot, Hudyma, Keense, & Santiago, 2015). This suggests that aspects of the academic environment in general can act as supports for perceived competence.

Given the SDT framework posits that faculty shape the environment that supports need satisfaction in class, coupled with the limited empirical evidence supportive of the theory, there is a need for more studies to examine this relation. Because of the lack of direct evidence linking the two, this study will also help fill an important gap in the literature.

Supportive Faculty Behaviors and Academic Motivation

There is considerable evidence suggesting that academic motivation can be predicted in part by how faculty engage with students in their classrooms. A variety of faculty behaviors have been correlated with academic motivation. Many studies have found a positive relation between the frequency of faculty contact and academic motivation (e.g., Strayhorn, 2010; Trolan, Jach, Hanson, & Pascarella, 2016).

Specific faculty behaviors related to academic motivation include encouraging behaviors (Cokley, 2000) and engagement in career-related conversations (Cokley, Komarraju, Patel, & Castillon, 2004; Komarraju, Musulkin, & Bhattacharya, 2010). Additionally, a meta-analysis found a moderate correlation between academic motivation and an instructional style involving charisma and individualized consideration ($r = .40$, $k = 17$; Balwant, 2016).

Supportive faculty behaviors in the classroom have also been linked to academic motivation. Both verbal and nonverbal behaviors have been positively correlated with academic motivation in several samples (e.g., Fallah, 2014; Goodboy, Weber, & Bolkan, 2009).

There is also evidence to suggest that an indirect relation exists between supportive faculty behaviors and academic motivation, and that it is partially mediated by a variety of variables. These mediators include positive perception of the instructor (Kelly, Rice, Wyatt, Ducking, & Denton, 2015) and classroom climate (Lin, Durbin, & Rancer, 2017).

Need Satisfaction and Academic Motivation

Need satisfaction predicting motivation is an essential component of SDT (Deci & Ryan, 2000). There is considerable evidence linking need satisfaction with motivation. There is evidence that need satisfaction as a whole predicts academic motivation (Chen & Jang, 2010). There is also evidence that each need individually predicts motivation.

Perceived volitional autonomy is perhaps the most studied of the three psychological needs in this context. Choice in classrooms has been consistently related to intrinsic motivation. In a meta-analysis with a large sample of studies with experimental designs, participants who were allowed to choose whether or not to complete a task demonstrated more intrinsic motivation for that task than participants who were required to complete a specific task ($d = .30$, $k = 46$; Patall, Cooper, & Robinson, 2008). This meta-analysis did not separate academic

motivation from other types of motivation, but it did include studies of motivation in a school setting. Specific to a school setting, perceived volitional autonomy support from instructors has been found to correlate moderately to highly with intrinsic academic motivation (Guay, Ratelle, Larose, Vallerand, & Vitaro, 2013; Kerssen-Griep, Hess, & Trees, 2003; Kusurkar, Ten Cate, Van Asperen, & Croiset, 2011).

Perceived competence also has been positively correlated with academic motivation (Kusurkar et al., 2011). Likewise, self-efficacy, a concept that is conceptually very similar to perceived competence, also has been positively correlated with academic motivation (Stolk & Harari, 2014; Yoshida et al., 2008). Additionally, there is qualitative evidence in which students report feeling less academic motivation when they do not feel relatedness (Trenshaw, Revelo, Earl, & Herman, 2016).

The concept of relatedness in the classroom has been studied very little from a self-determination theory perspective, but attention has been paid to how various facets of social connectedness in the classroom contribute to academic motivation. Participants who reported their qualitative experiences of academic motivation in the classroom identified relatedness as a critical foundation on which motivation was built (Trenshaw et al., 2016). In a meta-analysis, a teaching style with an emphasis on promoting positive relationships with students was correlated with academic motivation ($r = .40, k = 17$; Balwant, 2016). Student perceptions of faculty support for relatedness predict academic motivation (Kerssen-Griep et al., 2003). In a larger classroom context, the classroom social community has been correlated with intrinsic motivation (Wighting, Liu, & Rovai, 2008). Overall, there is substantial evidence that each of the three needs predicts academic motivation, supporting a predictive link between need satisfaction in class and academic motivation.

Need Satisfaction and Academic Major Satisfaction

All three needs seem to be related to positive academic outcomes. In one study, students' experiences of perceived volitional autonomy, perceived competence, and relatedness combined predicted students' ratings of both teachers and courses (Filak & Sheldon, 2003). Additionally, meta-analyses showed that performance in the academic domain is positively related to perceived volitional autonomy ($r = .22, k = 46$), perceived competence ($r = .30, k = 70$), and relatedness ($r = .19, k = 19$; Cerasoli, Nicklin, & Nassrelrgawi, 2016). These needs have also been related to academic outcomes individually.

A moderate correlation has been found directly connecting perceived volitional autonomy and academic major satisfaction (Leach & Patall, 2013; Pesch, Larson, & Surapaneni, 2015; Schenkenfelder, 2017). Additionally, a variable related to perceived volitional autonomy, work volition, also has been found to positively predict academic major satisfaction (Jadidian & Duffy, 2012). A meta-analysis of experimental studies on the topic provided evidence that participants who are allowed to choose whether to complete a task (an increase in perceived volitional autonomy) have better task performance in a variety of domains, including the academic domain; this is in comparison to participants who are required to complete a specific task ($d = .32, k = 13$; Patall et al., 2008).

A moderate correlation has been found directly connecting perceived competence and academic major satisfaction (Leach & Patall, 2013; Pesch et al., 2015; Schenkenfelder, 2017). Academic self-efficacy—the perception that one is able to effectively complete academic tasks, a concept closely related to perceived academic competence—also has been related to major satisfaction (e.g., Larson, Toulouse, Ngumba, Fitzpatrick, & Heppner, 1994). A meta-analysis

addressing the relationship between academic self-efficacy and GPA showed that they are significantly correlated ($r = .18, k = 9$; Crede & Phillips, 2011).

A moderate correlation has been found connecting relatedness and academic major satisfaction (Schenkenfelder, 2017). Additionally, there is evidence that feelings of connectedness in the classroom relate to positive academic outcomes. In one study, relatedness was found to predict GPA (Guiffrida, Lynch, Wall, & Abel, 2013). In a meta-analysis, social support was significantly related to retention of college students ($r = .20, k = 26$; Robbins et al., 2004).

Although the research directly connecting need satisfaction to academic major satisfaction is not extensive, what research does exist supports a link between the two. Additionally, the three needs are connected to outcomes that have also been linked to major satisfaction, including academic performance (Leach & Patall, 2013; McIlveen, Beccaria, & Burton, 2013; Nauta, 2007) and retention (Nauta, 2007). This provides additional support that these needs should predict academic major satisfaction as they predict other outcomes.

In addition to the evidence suggesting a direct relation between need satisfaction and academic major satisfaction, there is also evidence that suggests an indirect relation between need satisfaction and academic major satisfaction. Variables that acted as partial mediators include social connectedness (Allen, Robbins, Casillas, & Oh, 2008), GPA (Krumrei-Mancuso, Newton, Kim, & Wilcox, 2013), and intrinsic motivation (Thomas, 2009).

Academic Motivation and Academic Major Satisfaction

There is considerable research linking motivation to positive outcomes in the academic domain and considerable research linking major satisfaction to those same outcomes, which

suggests that major satisfaction should be predicted by motivation in a similar way to the other outcomes.

Academic motivation has been linked to life satisfaction (e.g., Bailey & Phillips, 2016); academic major satisfaction has also been linked to life satisfaction (Sovet, Park, & Jung, 2014). GPA has been linked to both academic motivation (e.g., Bailey & Phillips, 2016; Guiffrida et al., 2013; Kusurkar, Ten Cate, Vos, Westers, & Croiset, 2013; Roksa & Whitley, 2017) and academic major satisfaction (Leach & Patall, 2013; McIlveen et al., 2013; Nauta, 2007). Finally, student retention has been linked to academic major satisfaction (Nauta, 2007), and student intention to persist in college has been linked to motivation (e.g., Guiffrida et al., 2013; Kusurkar et al., 2011).

Self-determination theory presents a frame for understanding the relation between supportive faculty behaviors and academic major satisfaction where this relation is fully mediated by need satisfaction and academic motivation. There are, however, significant limitations in the empirical research addressing this relation and whether it is mediated by those variables. These limitations include the general lack of research about predictors of academic major satisfaction, the lack of a consistent theoretical approach to understanding how faculty behaviors impact students, and the lack of research on whether the relation between supportive faculty behaviors and student outcomes is mediated by other variables. Because of the limitations of research in this area, the approach taken here was broader than self-determination theory would suggest is necessary, testing for both direct and indirect effects between supportive faculty behaviors and academic major satisfaction. This leads to the following predictions:

Hypothesis 1: Both a fully and partially mediated model will yield a good fit to the data; however, the fully mediated model (Figure 1) will be a more parsimonious model than a partially mediated model (Figure 2).

Hypothesis 2: Verbal supportive faculty behaviors will directly predict perceived volitional autonomy in class (path a), perceived competence in class (path b) and relatedness in class (path c). Nonverbal supportive faculty behaviors will directly predict perceived volitional autonomy in class (path d), perceived competence in class (path e), and relatedness in class (path f).

Hypothesis 3: Perceived volitional autonomy in class will directly predict academic motivation (path g). Perceived competence in class will directly predict academic motivation (path h). Relatedness in class will directly predict academic motivation (path i).

Hypothesis 4: Academic motivation will directly predict academic major satisfaction (path j).

Hypothesis 5: Need satisfaction across all three needs will fully mediate relations between supportive faculty behaviors and academic motivation.

Perceived volitional autonomy in class will partially mediate the relations between: (a) verbal supportive faculty behaviors and academic motivation (path a, path g); and (b) nonverbal supportive faculty behaviors and academic motivation (path d, path g).

Perceived competence in class will partially mediate the relation between: (a) verbal supportive faculty behaviors and academic motivation (path b, path h); (b) nonverbal supportive faculty behaviors and academic major satisfaction (path e, path h).

Relatedness in class will partially mediate the relation between: (a) verbal supportive faculty behaviors and academic motivation (path c, path i); and (b) nonverbal supportive faculty behaviors and academic motivation (path f, path i).

Hypothesis 6: Academic motivation will fully mediate relations between need satisfaction, and academic major satisfaction.

Academic motivation will fully mediate the relations between (a) perceived volitional autonomy in class and academic major satisfaction (path g, path j), (b) perceived competence in class and academic major satisfaction (path h, path j), and (c) relatedness in class and academic major satisfaction (path i, path j).

Hypothesis 7: Need satisfaction and academic motivation combined will fully mediate relations between supportive faculty behaviors and academic major satisfaction.

Perceived volitional autonomy in class and academic motivation combined will partially mediate the relations between verbal supportive faculty behaviors and academic major satisfaction (path a, path g, path j); and (b) nonverbal supportive faculty behaviors and academic major satisfaction (path d, path g, path j).

Perceived competence in class and academic motivation combined will partially mediate the relations between: (a) verbal supportive faculty behaviors and academic major satisfaction (path b, path h, path j); and (b) nonverbal supportive faculty behaviors and academic major satisfaction (path e, path h, path j).

Perceived relatedness in class and academic motivation combined will partially mediate the relation between: (a) verbal supportive faculty behaviors and academic major satisfaction (path c, path i, path j); and (b) nonverbal supportive faculty behaviors and academic major satisfaction (path f, path i, path j).

CHAPTER 2. LITERATURE REVIEW

The following literature review is intended to present a comprehensive overview of the research that is relevant to the present study. This review begins with an overview of the theoretical lens being used in the study. It then details the relations (both direct and indirect) that have been found of each of the predictor variables to each of the outcome variables.

Self-Determination Theory

Self-determination theory (SDT) is a multifaceted theory of motivation. It contains several subtheories which explain different types of motivation, the ways motivation is predicted, and the means by which motivation and need satisfaction lead to positive outcomes. The subtheory that is relevant to this study is Cognitive Evaluation Theory (CET).

Cognitive Evaluation Theory addresses the two types of motivation laid out in SDT: intrinsic motivation and extrinsic motivation (Ryan & Deci, 2000). Intrinsic motivation is motivation that is inherent and is based in a desire to seek out novelty and challenges. Intrinsic motivation comes from the natural inclination of people to explore new things and want to master new tasks. Extrinsic motivation is motivation that is based externally—motivation to perform a task in order to attain an outcome that is separate from the task itself. This type of motivation varies greatly; the desire to complete a task in order to make a salary and the desire to complete a task in order to obtain a sense of pride in oneself are both considered extrinsic motivation.

Cognitive Evaluation Theory addresses the social and environmental factors that facilitate or undermine intrinsic motivation (Ryan & Deci, 2000). CET focuses on two fundamental needs without which intrinsic motivation cannot exist. These fundamental needs are volitional autonomy and perceived competence. Volitional autonomy is the need to feel as if you are

making choices for yourself, and perceived competence is the fundamental need to feel efficacious in the tasks you take on. CET argues that if the environment supports these needs being met, then intrinsic motivation will increase, and if the environment does not support these needs being met, then intrinsic motivation will decrease. CET also addresses the need for relatedness. Within the context of intrinsic motivation, relatedness is not a fundamental need, because many intrinsically motivated tasks are solitary tasks. However, CET states that if there is a relationship involved in the task, it should be a secure, positive one in order for intrinsic motivation to exist.

Academic Major Satisfaction and Academic Outcomes

Generally, little research focuses on major satisfaction as an outcome. Because of this, throughout this literature review, the predictor variables in this study will be shown to be connected with other academically relevant outcome variables. This approach is being used because academic major satisfaction has consistently been shown to be related to these outcomes, so it is expected that if the variables in this study predict academic outcomes generally, they should also predict academic major satisfaction in the same way.

Academic major satisfaction has been shown to be related to important outcomes, including grade point average (GPA) and persistence in a major. Major satisfaction was significantly correlated with GPA, with r s between .11 and .35 ($p < .05$; Leach & Patall, 2013; McIlveen et al., 2013; Nauta, 2007). Major satisfaction may also predict student persistence. In one study, major satisfaction was significantly higher for those who remained in their majors than for those who didn't ($t[102] = 3.44, p = .001, d = .74$), and each item in the measure of major satisfaction that is most often used had an effect size of .50 to .70 in differentiating between those who stayed in their major and those who didn't ($p < .05$; Nauta, 2007).

Additionally, major satisfaction is related to other positive outcomes for students. In a Korean sample, academic major satisfaction was correlated with life satisfaction ($r = .39, p < .05$) and positive affect ($r = .21, p < .05$; Sovet et al., 2014). Major satisfaction has also been negatively correlated with negative affect in two different samples, resulting in r s of $-.25$ and $-.23$ ($p < .05$; Dahling & Thompson, 2012; Sovet et al., 2014). In a mediation model, negative affect had a direct effect on major satisfaction ($b = -.17$), and negative affect also fully mediated the relation between maximization (focusing on making the best possible decision) and academic major satisfaction, as can be seen through the change in b with the addition of negative affect as a mediator from significant to nonsignificant ($b = -.21$ to $b = -.16$; Dahling & Thompson, 2012). Major satisfaction predicted intrinsic science motivation in a moderated mediation model ($b = .44, p < .05$; Deemer, 2015). Overall, effect sizes between major satisfaction and positive outcomes for students are moderate, suggesting a positive relation between major satisfaction and positive student outcomes.

Supportive Faculty Behaviors and Academic Major Satisfaction

Within the literature in the area of communications investigating how faculty communicate with students, there is an interest in behaviors faculty use to communicate support and connectedness with students in the immediate moment. In the communications literature, these are referred to as immediacy behaviors and are generally split into two categories: nonverbal immediacy and verbal immediacy. Within counseling psychology, the word *immediacy* has a different meaning, relating to focus on the immediate moment in therapeutic processes. To avoid confusion, faculty behaviors that communications researchers call immediacy behaviors are here referred to as supportive faculty behaviors.

In this proposal, the term *supportive faculty behaviors* refers to behaviors that instructors use in the classroom to build a supportive and connected classroom environment. These behaviors can be verbal or nonverbal. Verbal supportive faculty behaviors are most often measured using the Verbal Immediacy Behaviors Scale (VIBS), which measures student perceptions of how often faculty speak in a way that expresses warmth, availability, and support (Gorham, 1998; Wilson & Locker, 2008). These verbal behaviors include using personal examples, encouraging students to talk, and having discussions about topics students are interested in, even if a topic is not part of the lesson plan.

Nonverbal supportive faculty behaviors are most often measured using the Nonverbal Immediacy Scale (NIS), which measures student perceptions of how often faculty behave in a way that expresses warmth, availability, and support nonverbally (Richmond, McCroskey, & Johnson, 2003). These nonverbal behaviors include making eye contact, speaking with animation in gestures or facial expression, and using a varied (as opposed to monotonous) vocal tone when speaking. In most research on the subject, nonverbal and verbal supportive faculty behaviors are studied as two separate constructs; however, some studies combine verbal and nonverbal supportive faculty behaviors. In the studies considering the two as separate constructs, there is more research addressing nonverbal supportive faculty behaviors than addressing verbal supportive faculty behaviors. There is no research directly connecting verbal or nonverbal supportive faculty behaviors to academic major satisfaction, but there is extensive research connecting both types of supportive faculty behaviors to other academic outcomes.

Perceived learning. Supportive faculty behaviors have been connected to students' self-reports of their perceptions of how much they learned in the class (perceived learning). A meta-analysis of supportive faculty behaviors and classroom outcomes found a high degree of

correlation between nonverbal supportive faculty behaviors and perceived learning in a sample that was predominantly college students but also included junior high and high school students, and that included both US and non-US studies ($r = .51, k = 44$; Witt et al., 2004). Since that meta-analysis, others have found nonverbal supportive faculty behaviors moderately correlated with perceived learning ($r_s = .33-.44, p < .05$; Burroughs, 2007; Goodboy et al., 2009; Houser & Frymier, 2009; Myers & Goodboy, 2014; Pribyl et al., 2004; Vallade & Malachowski, 2015). A small correlation was also found between nonverbal supportive faculty behaviors and student perceptions of their final grade ($r = .17, p < .05$; Allen, Long, O'Mara, & Judd, 2008). These results suggest a moderate to high correlation between nonverbal supportive faculty behaviors and perceived learning.

Verbal supportive faculty behaviors, though studied less than nonverbal supportive faculty behaviors, have been moderately to highly correlated with perceived learning. A meta-analysis found a moderate correlation between verbal supportive faculty behaviors and perceived learning ($r = .49, k = 25$; Witt et al., 2004). Since then, others have found a moderate correlation between verbal supportive faculty behaviors and perceived learning ($r_s = .43$ and $.31, p < .05$; Goodboy et al., 2009; Myers & Goodboy, 2014). These results suggest a moderate relation between verbal supportive faculty behaviors and perceived learning. Overall findings consistently suggest that both nonverbal and verbal supportive faculty behaviors are related to student perceptions of their own learning.

Actual learning. The correlation between supportive faculty behaviors and actual learning (as measured by student scores on quizzes or in classes) appears to be much lower. A meta-analysis found a small correlation between nonverbal supportive faculty behaviors and learning in a class ($r = .17, k = 11$) and a marginal relation between verbal supportive faculty

behaviors and learning in a class ($r = .06$, $k = 4$; Witt et al., 2004). Few studies have examined the relation between supportive faculty behaviors and actual learning.

One study on the topic has been published after that meta-analysis. In it, participants were shown one of four versions of a video lecture. The four versions differed on the amount of verbal supportive faculty behaviors used (high or low amount) and the amount of nonverbal supportive faculty behaviors used (high or low amount). In a One Way Multivariate Analysis of Variance (MANOVA), the four quadrants of nonverbal and nonverbal supportive faculty behaviors (high verbal/high nonverbal; low verbal/low nonverbal; high verbal/low nonverbal; low verbal/high nonverbal) were the independent variables, and the dependent variables included recall on a quiz, perceived learning, satisfaction with the class, and motivation. The overall F test was significant ($F[18, 515] = 8.41$, $p < .05$). In follow-up ANOVAs, only recall on the quiz was significantly different among the four quadrants. Specifically, the results showed that participants in the high verbal/high nonverbal condition had significantly higher scores on a quiz covering the lecture content (mean score 4.24) than did those in low nonverbal/low verbal (mean score 3.41), low nonverbal/high verbal (mean score 3.51), or high nonverbal/low verbal condition (mean score 3.71, $p < .01$; Goodboy et al., 2009). However, in that same study, nonverbal and verbal supportive faculty behaviors did not significantly correlate with score on the quiz ($r = .00$ and $.12$, respectively; Goodboy et al., 2009). These findings suggest that, when used together, verbal and nonverbal supportive faculty behaviors lead to an increase in learning, but that use of either verbal or nonverbal supportive faculty behaviors on their own does not lead to an increase in learning.

Student satisfaction. Supportive faculty behaviors have also been studied in relation to student satisfaction with classes. The Witt, Wheelless, & Allen (2004) meta-analysis found

moderate to high degrees of correlation between nonverbal supportive faculty behaviors and satisfaction with a class ($r = .49, k = 55$) and between verbal supportive faculty behaviors and satisfaction with a class ($r = .49, k = 26$). Since that meta-analysis, nonverbal supportive faculty behaviors have been correlated with class satisfaction, with a range of strength from small to large effect sizes ($r_s = .22-.61, p < .05$; Allen et al., 2008; Goodboy et al., 2009; Houser & Frymier, 2009; Myers & Goodboy, 2014; Vallade & Malachowski, 2015). Verbal supportive faculty behaviors have been correlated with class satisfaction moderately ($r_s = .39$ and $.42, p < .05$; Goodboy et al., 2009; Myers & Goodboy, 2014). In an experiment where participants were given vignettes about classroom situations, their ratings of expected class satisfaction were higher when instructors used nonverbal supportive faculty behaviors at a high rate in contrast to when instructors used nonverbal supportive faculty behaviors at a low rate ($F[4, 232] = 18.65, p < .001$; Mazer & Stowe, 2016). These results consistently show a significant relation between supportive faculty behaviors and student satisfaction, but the strength of that relation found is not consistent.

Verbal supportive faculty behaviors have correlated moderately to strongly with student satisfaction with the instructor ($r_s = .38-.56, p < .05$; Allen et al., 2008; Burroughs, 2007; McCroskey, Richmond, & Bennett, 2006; Park, Lee, & Kim, 2009). Moreover, verbal supportive faculty behaviors also correlated moderately with instructor satisfaction ($r = .32, p < .01$; Park et al., 2009). Finally, in a path analysis model, nonverbal supportive faculty behaviors predicted students' intent to persist in college ($\beta = .19, p < .01$; Wheelless et al., 2011). Within this model, the other significant predictor of students' intent to persist in college was student perceptions of instructor credibility ($\beta = .53, p < .01$). Taken as a whole, these results suggest that verbal supportive faculty behaviors and student satisfaction are moderately related.

Indirect effects. There was also evidence that faculty behaviors had an indirect relation with academic outcomes related to major satisfaction. Nonverbal supportive faculty behaviors have been found to predict intention to persist in college through instructor credibility in a structural equation model ($\beta = .10, p < .05$; Wheelless et al., 2011). Nonverbal supportive faculty behaviors have also been found to indirectly predict enjoyment in class through perception of how much emotional effort it is to be in that class ($\beta = .09, p < .01$; Titsworth, McKenna, Mazer, & Quinlan, 2013). In a third structural equation model in an Iranian sample with a good fit (GFI = .96, AGFI = .92, CFI = .96, RMSEA = .06), nonverbal and verbal supportive faculty behaviors combined predicted willingness to communicate in a second language through academic motivation ($\beta = .09, p < .05$; Fallah, 2014). In another study, when academic motivation was controlled for, the correlation between nonverbal supportive faculty behaviors and perceived learning became nonsignificant, indicating that academic motivation mediates the relation between the two (Pribyl et al., 2004). Overall, these results suggest that the relations between supportive faculty behaviors and academic outcomes are partly mediated by other variables.

Supportive Faculty Behaviors and Need Satisfaction

There was very little overlap between the research about supportive faculty behaviors and the research about self-determination theory's need satisfaction. Because there is so little evidence directly connecting supportive faculty behaviors and need satisfaction, presented here is research that connects supportive faculty behaviors to outcomes that are conceptually similar to need satisfaction, as well as research that connects other kinds of faculty behaviors to need satisfaction and similar outcomes.

The evidence connecting student perceptions of faculty to perceived volitional autonomy is consistent. Perceived volitional autonomy in the context of an online college course has been

moderately correlated with perceived instructor autonomy support ($r = .42, p < .05$) and perceived instructor competence support ($r = .37, p < .05$; Chen & Jang, 2010). Additionally, perceived instructor enthusiasm has been highly correlated with perceived autonomy in the classroom ($r = .54, p < .05$; Cui, Yao, & Zhang, 2017). Finally, in a path analysis with a good fit ($\chi^2 [2, N = 332] = 2.531, p = .28, CFI = .99, RMSEA < .05, SRMR = .01$), the experiences students have with faculty in their department directly predicted perceived autonomy satisfaction ($\beta = .12, p < .05$; Schenkenfelder, 2017). Overall, the relation between student perceptions of faculty and perceived volitional autonomy appears to be moderate.

The evidence connecting student perceptions of faculty to perceived competence is not consistent. In some studies, these factors seem to be strongly related, while others show weaker relations or no relation at all. Nonverbal supportive faculty behaviors have been correlated with perceived competence to a low degree ($r = .29, p < .05$; Houser & Frymier, 2009), although nonverbal supportive faculty behaviors were not a significant predictor of perceived competence in a regression with that sample. In a path analysis model, nonverbal supportive faculty behaviors predicted perceived competence indirectly through student perceptions that teachers understand what the students say ($\beta = .07, 95\% \text{ CI } [.01, .17]$; Finn & Schrodtt, 2012). In a Turkish sample, nonverbal and verbal supportive faculty behaviors combined correlated moderately with perceived competence ($r = .42, p < .05$; Cakir, 2015), although supportive faculty behaviors were not a significant predictor of perceived competence in a regression with that sample ($\beta = .14$). Perceived competence in the classroom has been moderately correlated with perceived instructor autonomy support ($r = .34$) and perceived instructor competence support ($r = .34$; Chen & Jang, 2010). Finally, in a path analysis with a good fit ($\chi^2 [2, N = 332] = 2.531, p = .28, CFI = .99, RMSEA < .05, SRMR = .01$), the experiences students had with

faculty in their department directly predicted perceived competence satisfaction ($\beta = .28, p < .01$; Schenkenfelder, 2017). Overall, there appears to be a moderate relation between perceived competence and student perceptions of faculty.

Student perceptions of faculty have also been correlated with self-efficacy, a person's belief that they are able to perform tasks effectively (Bandura, 1962, 1977, 1997). Self-efficacy is conceptually very similar to perceived competence. Nonverbal supportive faculty behaviors have been correlated to a small degree with academic self-efficacy ($r_s = .24-.28, p < .05$; Creasey, Jarvis, & Gadke, 2009; LaBelle, Martin, & Weber, 2013). Verbal supportive faculty behaviors also have been moderately correlated with academic self-efficacy ($r = .30, p < .05$; Creasey et al., 2009). In the same study, student perceptions of their relationship with faculty mediated the relation between supportive faculty behaviors and self-efficacy ($r = .30, p < .05$; Creasey et al., 2009). Similarly, in a path analysis examining the effect of different instructor behaviors on academic self-efficacy, nonverbal supportive faculty behavior did not significantly predict academic self-efficacy (LaBelle et al., 2013). In that path analysis, the only significant predictor of academic self-efficacy was perceived instructor clarity ($\beta = .41, p < .05$; LaBelle et al., 2013). Taken as a whole, these results suggest that there is a moderate relation between self-efficacy and student perceptions of faculty.

Supportive faculty behaviors have been consistently positively related to perceptions of relatedness. In an experiment where participants were given vignettes about classroom situations, their ratings of expected relatedness in the classroom were higher when instructors used nonverbal supportive faculty behaviors at a high, rather than low, rate ($F[1, 238] = 21.04, p < .001$; Mazer & Stowe, 2016). Perceived relatedness in the classroom has been highly correlated with perceived instructor autonomy support ($r = .63, p < .05$) and perceived instructor

competence support ($r = .66, p < .05$; Chen & Jang, 2010). In a regression predicting perceptions of belongingness with faculty among students of color, the perception that faculty hold racial/gender stereotypes was a significant negative predictor ($\beta = -.74, p < .05$), and faculty competence support was a significant positive predictor ($\beta = .65, p < .05$; Newman, Wood, & Harris, 2015). Student perception of faculty as supportive correlated strongly with perceptions of peer connectedness in the classroom ($r = .52, p < .05$) and with positive evaluations of the relationship with the instructor ($r = .66, p < .05$; Myers et al., 2016). Finally, in a path analysis with a good fit ($\chi^2 [2, N = 332] = 2.531, p = .28, CFI = .99, RMSEA < .05, SRMR = .01$), the experiences students had with faculty in their department directly predicted perceived relatedness satisfaction ($\beta = .29, p < .01$; Schenkenfelder, 2017). Overall, there appears to be a moderate to high relation between relatedness and student perceptions of faculty.

Supportive Faculty Behaviors and Academic Motivation

Academic motivation. Motivation as a general concept refers to the variety of factors that move us to act. Academic motivation refers to the variety of factors in an academic setting that move students to act on academic tasks (Deci et al., 1991).

Within self-determination theory, there are two types of motivation: intrinsic and extrinsic (Ryan & Deci, 2000). This differentiation can easily be seen within academic motivation. Intrinsic motivation is based in a desire to seek out novelty and challenges and comes from people's natural inclination to explore new things and desire to master new tasks. Extrinsic motivation is based externally. It is the drive to perform a task in order to attain an outcome that is separate from the task itself. This type of motivation varies greatly: the desire to do well on a test in order to get a good grade and the desire to do well on a test in order to obtain a sense of pride in oneself are both considered examples of extrinsic motivation.

These different facets of academic motivation are on a spectrum from extremely extrinsically motivated (completing classwork because one does not want to fail) to extremely intrinsically motivated (completing classwork because one enjoys the assignment; Ryan & Deci, 2000). Within the SDT framework, the more supportive the environment is, the more academic motivation of any kind a student will have, but also, the further a student will move along the spectrum of motivation toward intrinsic. So a student who feels more supported in the environment should feel more motivated, and that motivation should feel more intrinsic.

Those who research academic motivation among college students generally use the Academic Motivation Scale (Vallerand, Pelletier, Blais, Briere, Senecal, & Vallieres, 1992). This scale measures intrinsic academic motivation, extrinsic academic motivation, and academic amotivation (lack of motivation for academic tasks) as three separate constructs. Additionally, this scale splits intrinsic motivation into three categories (intrinsic motivation for knowledge, accomplishment, and stimulation) and extrinsic motivation into three categories (external regulation, introjected regulation, and identified regulation). Most studies using this scale use all seven subscales (three intrinsic motivation types, three extrinsic motivation types, and amotivation) and report them as separate scores; however, some use only selected subscales, and some combine the subscales to find an overall motivation score, an overall intrinsic motivation score, or an overall extrinsic motivation score. Because this study will be using a scale that treats motivation as one single spectrum, as opposed to treating it as seven separate categories, results reported here do not differentiate between types of intrinsic or extrinsic motivation. For studies reporting results concerning multiple types of intrinsic or extrinsic motivation, the range of scores in those results will be reported here.

Supportive faculty behaviors and academic motivation. The relation between supportive faculty behaviors and academic motivation has been addressed by 10 studies. Results of these studies consistently show a positive relation between the two. Nonverbal and verbal supportive faculty behaviors combined predicted academic motivation in two structural equation models (Fallah, 2014; Wei & Wang, 2010). In the first, nonverbal and verbal supportive faculty behaviors directly predicted academic motivation ($\beta = .33, p < .05$) in a model with a good fit (GFI = .96, AGFI = .92, CFI = .96, RMSEA = .06; Fallah, 2014). In the second, nonverbal and verbal supportive faculty behaviors also directly predicted academic motivation ($\beta = .45, p < .05$) in a model with good fit (CFI = .974; SRMR = .044; RMSEA = .062; Wei & Wang, 2010). Nonverbal and verbal supportive faculty behaviors combined have also been correlated with intrinsic academic motivation ($r = .18, p < .05$; Kelly et al., 2015). Nonverbal supportive faculty behaviors have also been moderately to strongly correlated with academic motivation ($r_s = .34-.52, p < .05$; Chesebro & McCroskey, 2001; Christophel, 1990; Goodboy et al., 2009; McCroskey et al., 2006; Pribyl et al., 2004). Verbal supportive faculty behaviors have been moderately correlated with academic motivation ($r_s = .36-.47$; Christophel, 1990; Goodboy et al., 2009).

In an experiment where participants were given vignettes about classroom situations, their ratings of expected motivation in a class were higher when instructors used nonverbal supportive faculty behaviors at a high rate in contrast to when instructors used nonverbal supportive faculty behaviors at a low rate ($F[1, 238] = 107.90, p < .001$; Mazer & Stowe, 2016). Finally, students in classes with instructors who were rated as using nonverbal supportive faculty behaviors very often had significantly higher academic motivation than those in classes with instructors who used nonverbal supportive faculty behaviors moderately often or not very often

($F[2,103] = 7.32, p < .001$; Christensen & Menzel, 1998). In the same study, students in classes with instructors who were rated as using verbal supportive faculty behaviors very often had significantly higher academic motivation than those in classes with instructors who used verbal supportive faculty behaviors moderately often or not very often ($F[2,106] = 28.14, p < .001$; Christensen & Menzel, 1998). Overall, the evidence presented here suggests a moderate relation between supportive faculty behaviors and academic motivation.

These studies provide evidence for a direct relationship between supportive faculty behaviors and academic motivation; however, several other studies provide evidence that the relation between faculty behaviors and academic motivation is indirect. In a structural equation model, nonverbal and verbal supportive faculty behaviors predicted intrinsic motivation indirectly through positive perception of the instructor ($\beta = .08, p < .05$; Kelly et al., 2015). In another study, perceived instructor verbal aggressiveness was found to significantly negatively predict academic motivation indirectly through perception of classroom climate as defensive ($\beta = -.05, p < .05$) and through perception of classroom climate as supportive ($\beta = -.12, p < .05$; Lin et al., 2017). Similarly, perceived instructor argumentativeness was found to positively predict academic motivation indirectly through perception of classroom climate as defensive ($\beta = .04, p < .05$) and through perception of classroom climate as supportive ($\beta = .08, p < .05$; Lin et al., 2017).

In sum, studies addressing supportive faculty behaviors and academic motivation have consistently found the direct relation between the two is moderate and positive. Additional results suggest that some of the relation between supportive faculty behaviors and academic motivation is indirect.

Need Satisfaction and Academic Motivation

Academic motivation has been shown to be related to need satisfaction as a whole and to each of the needs. Two studies address need satisfaction as a whole in relation to academic motivation. In a structural equation model, all three of the needs, combined into one need satisfaction variable, directly predicted academic motivation ($\beta = .15, p < .05$) in a model that was a good fit (SRMR = .05, CFI = .94; NNFI = .89, RMSEA = .12; Chen & Jang, 2010). Additionally, in a qualitative analysis of student experiences in the classroom focused on improving academic motivation, participants discussed relatedness most often of the three needs, indicated that relatedness was necessary in order to build competence, and indicated both relatedness and competence were necessary to feel academic motivation (Trenshaw et al., 2016).

Perceived volitional autonomy. Results of studies addressing the relation between perceived volitional autonomy and academic motivation are mixed but more often than not show a positive relation between the two. In a meta-analysis of studies in which participants were randomly assigned to a condition where they were allowed to choose whether or not to complete a task or a condition where they were required to complete a specific task, participants who were allowed to choose whether or not to complete a task demonstrated more intrinsic motivation for that task than did participants who were required to complete a specific task ($d = .30, p < .01, k = 46$; Patall et al., 2008). This meta-analysis did not separate academic motivation from other types of motivation, but did include studies of motivation in a school setting. This provides evidence that when volitional autonomy was increased, motivation (including academic motivation) also increased.

Other studies address the relation between perceived autonomy and specifically academic motivation. Academic motivation as a whole was not significantly correlated with perceived

autonomy in one study ($r = .08$; Chen & Jang, 2010). In other studies, perceived autonomy in the classroom has been correlated with intrinsic academic motivation to a small to moderate degree ($rs = .16-.34, p < .05$; Kerssen-Griep et al., 2003; Maherzi, 2011). Perceived autonomy in the classroom has been correlated with extrinsic academic motivation to a small degree ($rs = .12-.26, p < .05$ Maherzi, 2011). These results are mixed, with some showing a small relation between perceived volitional autonomy and academic motivation and one showing a moderate relation between the two.

Perceived competence. Correlations between perceived competence and academic motivation tend to be small, and few studies directly address the relation between the two. Academic motivation as a whole was significantly correlated with perceived competence in one study ($r = .10, p < .05$; Chen & Jang, 2010). In other studies, perceived competence in the classroom has been correlated with intrinsic academic motivation to a small to moderate degree ($rs = .18-.44, ps < .05$; Kerssen-Griep et al., 2003; Maherzi, 2011). Perceived autonomy in the classroom has been correlated with extrinsic academic motivation to a small to moderate degree ($rs = .15-.45, p < .05$; Maherzi, 2011).

Other research has correlated academic motivation with academic self-efficacy. In a meta-analysis, self-efficacy correlated moderately with academic motivation ($r = .32, k = 3$; Robbins et al., 2004). Since that meta-analysis, academic motivation was correlated with academic self-efficacy, yielding a small effect ($r = .25, p < .05$; Turner, Chandler, & Heffer, 2009). Academic self-efficacy was strongly correlated with intrinsic motivation ($r = .63, p < .05$) and correlated with extrinsic motivation to a small degree ($r = .21, p < .05$; Stolk & Harari, 2014). Taken as a whole, these results suggest a small to moderate relation between academic motivation and perceived competence.

Relatedness. Few studies have addressed the relation between relatedness and academic motivation, but several studies have addressed academic motivation and variables similar to relatedness. Perceived relatedness in the classroom has been correlated with intrinsic academic motivation to a moderate degree ($r_s = .39-.41, p < .05$; Kerssen-Griep et al., 2003). However, one study yielded null findings of academic motivation and relatedness (Chen & Jang, 2010).

In a meta-analysis, a teaching style with an emphasis on promoting positive relationships with students was moderately correlated with academic motivation ($r = .40, 90\% \text{ CI } [.34, .60] k = 17$; Balwant, 2016). In a hierarchical regression, perceived social support (from peers, family, and faculty) predicted intrinsic academic motivation ($B = .59$) and extrinsic academic motivation ($B = .71$; Young, Johnson, Hawthorne, & Pugh, 2011). Classroom social community has also been correlated to a small degree with intrinsic academic motivation ($r = .11$; Wighting et al., 2008). Overall, there appears to be a moderate relation between relatedness and academic motivation.

Need Satisfaction and Academic Major Satisfaction

Perceived volitional autonomy. Three studies have examined the relation between volitional autonomy and academic major satisfaction, finding moderate relations ($r_s = .21-.38, p < .05$; Leach & Patall, 2013; Paradnike & Bandzeviciene, 2015; Pesch et al., 2015). Perceived autonomy also directly and indirectly predicted major satisfaction. In a mediation model, perceived volitional autonomy predicted academic major satisfaction directly ($\beta = .27, p < .05$) and fully mediated the relation between mother's autonomy support and academic major satisfaction (Pesch et al., 2015).

Two other studies address relations among variables that are conceptually similar to perceived volitional autonomy and academic major satisfaction. In a regression predicting

students' satisfaction with courses, which is related to major satisfaction, perceived autonomy was a significant predictor ($\beta = .17, p < .05$; Filak & Sheldon, 2003). Major satisfaction has also been related to constructs that are conceptually similar to volitional autonomy. Academic major satisfaction has been correlated with work volition, which is conceptually similar to volitional autonomy ($r = .35, p < .05$; Jadidian & Duffy, 2012). These researchers also showed that work volition directly predicted major satisfaction ($\beta = .23, p < .01$; Jadidian & Duffy, 2012). Finally, in a path analysis with a good fit ($\chi^2 [2, N = 332] = 2.531, p = .28, CFI = .99, RMSEA < .05, SRMR = .01$), perceived autonomy satisfaction directly predicted academic major satisfaction ($\beta = .27, p < .01$; Schenkenfelder, 2017). Overall, these results suggest a moderate relation between perceived volitional autonomy and academic major satisfaction.

Perceived competence. Five studies reported findings relevant to the relation of perceived competence and academic major satisfaction. Moderate correlations have been found between perceived competence and academic major satisfaction with r s of .32 and .45 ($p < .05$; Leach & Patall, 2013; Pesch et al., 2015). In a mediation model, perceived competence directly predicted academic major satisfaction ($\beta = .22, p < .05$; Pesch et al., 2015). Perceived competence also mediated the relation between father's autonomy support and academic major satisfaction, with father's autonomy support predicting perceived academic competence ($\beta = .29, p < .05$; Pesch et al., 2015). In a regression predicting students' satisfaction with courses, perceived competence was a significant predictor ($\beta = .59, p < .05$; Filak & Sheldon, 2003). Finally, in a path analysis with a good fit ($\chi^2 [2, N = 332] = 2.531, p = .28, CFI = .99, RMSEA < .05, SRMR = .01$), perceived competence satisfaction directly predicted academic major satisfaction ($\beta = .14, p < .05$; Schenkenfelder, 2017). These results suggest that there is a moderate relation between perceived competence and academic major satisfaction.

Relatedness. In a path analysis with a good fit ($\chi^2 [2, N = 332] = 2.531, p = .28, CFI = .99, RMSEA < .05, SRMR = .01$), perceived relatedness dissatisfaction directly predicted academic major satisfaction ($\beta = -.27, p < .01$; Schenkenfelder, 2017). No other articles directly link relatedness to academic major satisfaction, but some articles link perceived relatedness to other student outcome variables. In one, using a regression analysis, there was no significant relation between perceived relatedness and students' satisfaction with courses; however, perceived relatedness did predict students' satisfaction with instructors ($\beta = .17, p < .05$; Filak & Sheldon, 2003). Additionally, in a meta-analysis, social support was significantly related to retention of college students ($r = .20, 90\% CI [.14, .26] k = 26$; Robbins et al., 2004). Students' perceptions of affiliation in a classroom, or their sense that the classroom is supportive, cooperative, and student focused (attributes that are similar to relatedness), were positively correlated with major satisfaction ($r = .13, p < .05$), and in a moderated mediation model, perceptions of affiliation predicted major satisfaction ($\beta = .58, p < .05$; Deemer, 2015). Overall, this suggests a low to moderate relation between relatedness and academic major satisfaction.

Need Satisfaction and Other Academic Outcomes

Few articles address the relation between need satisfaction and major satisfaction. Therefore, articles that address relations between need satisfaction and other academic outcomes are presented.

Need satisfaction has been linked to performance. A meta-analysis showed that performance in the academic domain is correlated with overall perceived need satisfaction ($r = .27, k = 38$; Cerasoli et al., 2016). The same meta-analysis showed perceived volitional autonomy was correlated with performance across domains, including the academic domain ($r = .22, k = 46$; Cerasoli et al., 2016). Another meta-analysis of experimental studies provided

evidence that participants who are allowed to choose whether to complete a task (an increase in perceived volitional autonomy) have better task performance in a variety of domains, including the academic domain, in comparison to participants who are required to complete a specific task ($d = .32$, 95% CI [.17, .47], $k = 13$; Patall et al., 2008). This suggests that there is a moderate relation between need satisfaction and academic performance.

Perceived competence has been correlated with performance across domains (including the academic domain) in a meta-analysis as well ($r = .30$, $k = 70$; Cerasoli et al., 2016). Several meta-analyses have addressed the relation of academic self-efficacy with academic performance. One found a correlation between academic self-efficacy and grade in class ($r = .30$, $k = 39$; Crede & Phillips, 2011). Three have addressed the correlation between academic self-efficacy and GPA. One found a small correlation ($r = .18$, $k = 9$; Crede & Phillips, 2011); the other two found moderate correlations ($r = .31$, 95% CI [.28, .34], $k = 67$; Richardson et al., 2012; $r = .38$, 90% CI [.34, .41], $k = 18$; Robbins et al., 2004). These results suggest that perceived competence is moderately related to academic performance.

Finally, relatedness has been correlated with performance across domains (including the academic domain) in a meta-analysis ($r = .10$, $k = 33$; Cerasoli et al., 2016). Two meta-analyses also examined the correlation between social support and GPA, both finding small correlations ($r = .08$, 95% CI [.03, .12], $k = 14$; Richardson et al., 2012; $r = .10$, 90% CI [.08, .12], $k = 33$; Robbins et al., 2004). These results suggest a low relation between relatedness and academic performance.

In addition to the direct relation between need satisfaction and academic outcomes, there also appears to be an indirect relation between the two. In a path model, there was an indirect effect of social connectedness on retention ($\beta = -.04$, $p < .01$; Allen et al., 2008). In another path

model, the effect of academic self-efficacy on end-of-the-year GPA was mediated by first-semester GPA ($\beta = .40, p < .05$; Krumrei-Mancuso et al., 2013). This suggests that the impact of perceived competence on GPA is mediated by actual competence. In a sample of African American women, the relation between self-efficacy and academic adjustment was mediated by intrinsic motivation in a mediation model ($F[3, 99] = 5.96, p < .05$; Thomas, 2009). These results suggest that the relations between needs and academic outcomes are partially mediated by other variables.

Academic Motivation and Academic Major Satisfaction

Three studies connect academic motivation and academic major satisfaction, with mixed results. In one, intrinsic motivation for learning science was moderately correlated with academic major satisfaction ($r = .37, p < .001$; Deemer, 2015). In another, the correlation between academic motivation and satisfaction with the content of academic studies was correlated to a small degree ($r = .16, p < .01$), but academic motivation and satisfaction with the environmental conditions of academic studies were not significantly correlated (Wach et al., 2016). In the third, the correlation between academic major satisfaction and intrinsic academic motivation was small and negative ($r = -.20, p < .01$), while academic major satisfaction and extrinsic academic motivation were not significantly correlated (Long, Gaynor, Erwin, & Williams, 1994). Overall, these results suggest a low to moderate relation between academic motivation and academic major satisfaction.

Academic Motivation and Other Academic Outcomes

Few articles address the relation between academic motivation and major satisfaction, so articles that address relations between academic motivation and other academic outcomes are presented here.

Academic motivation has been studied in relation to academic performance. Several meta-analyses have addressed the relation between academic motivation and GPA. One meta-analysis found a small effect size for the relation between intrinsic academic motivation and school performance across school ages ($d = .27$, 95% CI [.23, .32], $k = 10$; Taylor et al., 2014). Other meta-analyses have also found small correlations between academic motivation and GPA ($r = .26$, 90% CI [.22, .29], $k = 17$; Robbins et al., 2004), and between intrinsic academic motivation and GPA ($r = .17$, 95% CI [.12, .23], $k = 22$; Richardson et al., 2012). Extrinsic motivation was not found to be related to GPA ($r = .01$, 95% CI [-.06, .08], $k = 10$; Richardson et al., 2012). Finally, a meta-analysis found a small correlation between motivation and performance in a school context ($r = .21$, $k = 125$; Cerasoli, Nicklin, & Ford, 2014).

Since those meta-analyses, two studies have predicted academic performance using regression models. In one model, academic motivation predicted first-year GPA ($\beta = .12$, $p < .05$; Roksa & Whitley, 2017). In the other model, intrinsic motivation predicted grade in a class ($\beta = .17$, $p < .05$; Bailey & Phillips, 2016). Overall, there appears to be a low relation between academic motivation and academic performance.

There are also two studies that address the relations between academic motivation and retention and persistence. A meta-analysis found a small but significant correlation between academic motivation and retention ($r = .11$, 90% CI [.04, .17], $k = 7$; Robbins et al., 2004). Since that meta-analysis, a regression model found that intrinsic motivation for attending college predicted academic persistence intentions ($B = 1.75$, $p < .001$), and extrinsic motivations for attending college predicted academic persistence intentions ($B = .73$, $p < .001$; Strayhorn, 2012). These results suggest that there is a low relation between academic motivation and retention and persistence.

There is also evidence that academic motivation acts as a mediator between academic predictors and outcomes. In one study, academic motivation mediates the relationship between dual enrollment (high school students taking college courses) and first-year GPA at highly selective institutions, accounting for the direct effect of dual enrollment on GPA entirely (An, 2015).

The Present Study

From the preceding review of the literature on connecting supportive faculty behaviors, need satisfaction, academic motivation, and academic major satisfaction, it is clear that gaps need to be filled. The evidence connecting these variables tends to be inconsistent. It is likely that a large part of the reason for this inconsistency is the lack of consistency in theoretical approaches to understanding these variables. The theoretical approaches used to study these variables generally are not able to accommodate all of the variables laid out here and often do not account for both direct and indirect effects of these variables on each other. The present study fills this gap by presenting a theoretical model that provides a solid basis for understanding how each of these variables should relate to the others.

Additionally, some relations have not been adequately tested. There is no evidence connecting supportive faculty behaviors and academic major satisfaction. Additionally, there is little evidence connecting academic major satisfaction with need satisfaction or with academic motivation. There is evidence connecting supportive faculty behaviors, need satisfaction, and academic motivation with other academic outcomes, which suggests that they should also be connected to academic major satisfaction. The present study provides evidence to help clarify these relations and fill the gap in knowledge about these topics. This was done not just by testing for direct relations between these variables, but also by testing for indirect relations, so that the

knowledge gained is not just about whether the predictor variables are significantly related to the outcome variable but also about the process through which one variable predicts another.

CHAPTER 3: METHODS

Design

The design was a cross-sectional correlational design. The predictor variables were verbal supportive faculty behaviors, nonverbal supportive faculty behaviors, perceived volitional autonomy in class, perceived competence in class, relatedness in class, and academic motivation. The main criterion variable was academic major satisfaction. Psychological needs (perceived volitional autonomy in class, perceived competence in class, and perceived relatedness in class) and academic motivation were mediator variables. Figure 1 shows the predicted relations between variables.

Participants

The target population for this study was undergraduate college students. The sample was college students in introductory psychology courses who received extra credit for taking the survey. Participants were 18 years or older when they participated in the study. The sample was collected in the fall semester of 2018 from undergraduates in introductory psychology courses at Iowa State University. The study was offered along with other research studies on SONA, and participants had the opportunity to earn one credit for every 30 minutes they spend on a study (based on the Department of Psychology's research participation program).

To find a medium effect at a power of .80 and $p < .05$ for structural equation modeling, sample size varies from 20 per observed variable (Mueller, 1997) to at least 200 (Chou & Bentler, 1995). Given that there are six observed variables in the present study, the minimum sample size needed was 120. The expected participation rate for the present study was 50%, so we sampled 355 participants.

After removing missing data and outliers, 332 participants remained (see Chapter 4: Results, preliminary analysis for more detail). Participants were college students from a large Midwestern university. Table 1 presents a summary of demographic information about participants. Participants' ages range from 18 to 28. On gender, 24.5% of participants identified as male, 74.5% identified as female, 0.3% identified as non-binary, and 0.3% chose not to answer. On racial and ethnic categories, 83.4% of participants identified as White, 5.7% identified as Asian American/Pacific Islander, 4.5% identified as Hispanic/Latino, 1.2% identified as African American, and 5.1% specified another identity or chose not to answer. With regard to their year in school, 41.1% of participants indicated they were freshmen, 27.5% indicated they were sophomores, 14.2% indicated they were juniors, 10.3% indicated they were seniors, and 0.9% selected "other" or chose not to answer. With regard to academic major, 82.8% of participants indicated they had declared a major, and 15.4% of participants indicated they had not declared a major. Participants who indicated they had not declared a major were asked to identify the major they were most strongly considering.

At the university where this study was conducted, 57% of the undergraduate population is male, and 42% is female. The racial and ethnic composition of the undergraduate population is 6% Hispanic/Latino, 3% Black, 3% Asian, 2% two or more races, 0.2% American Indian, and 0.07% Native Hawaiian or Pacific Islander.

Chi-square tests were conducted to compare the demographics (specifically gender and race) of the sample with the expected demographics of the sample given the population. There were fewer men, and more women, than would be expected based on the university population, $\chi^2(3, N = 331) = 146.74, p < .001$. The race of the sample was not significantly different from what would be expected based on the university population, $\chi^2(5, N = 331) = 8.55, p = .13$. The

participant sample was determined to be acceptably similar to the overall undergraduate population, with the exception that this sample overrepresented young women.

Measures

Verbal supportive faculty behaviors. To measure verbal supportive faculty behaviors, this study used the two subscales of the Verbal Immediacy Behaviors Scale (VIBS), which measures student perceptions of how often faculty speak in a way that express warmth, availability, and support (Gorham, 1998; Wilson & Locker, 2008). The two subscales that will be combined to measure verbal supportive faculty behaviors are individual friendliness and flexibility during lecture (Wilson & Locker, 2008). The correlation between the two subscales is high, suggesting they can be used together to measure verbal supportive faculty behaviors ($r = .57$; Wilson & Locker, 2008). Reliabilities for the subscales are presented below. Wilson & Locker (2008) did not present a reliability for the full scale. The reliability of the full scale in this study was measured to be $\alpha = .86$. The full scale can be seen in Appendix A.

The individual friendliness subscale contains eight items and uses a five-point Likert scale that ranges from 0 (never) to 4 (very often). An example item is “Has initiated conversations with me before, after, or during class.” The mean of the items will be calculated such that a higher score indicates a higher rate of supportive verbal contact with individual students. Wilson & Locker (2008) found an internal consistency for this subscale of $\alpha = .88$. In this study, an internal consistency of $\alpha = .87$ was found. This subscale was correlated with flexibility during lecture ($r = .57$; Wilson & Locker, 2008) and with a measure of nonverbal supportive faculty behaviors ($r = .50$; Wilson & Locker, 2008). This subscale correlates positively with a rating of whether students find the instructor motivating ($r = .58$), projected grade in course ($r = .30$), attitude toward course ($r = .48$), and perceived effectiveness of instructor ($r = .53$; Wilson &

Locker, 2008). In a regression predicting attitude toward course, individual friendliness predicted attitude toward course ($\beta = .39, p < .001$; Wilson & Locker, 2008).

The flexibility during lecture subscale contains five items and uses a five-point Likert scale that ranges from 0 (never) to 4 (very often), where a higher score indicates a higher rate of faculty engaging in class topics interesting to students. An example item is “Gets into discussions based on something a student brings up even when it doesn’t seem to be part of the lecture plan.” The mean of the items will be calculated such that a higher score indicates a higher rate of supportive verbal contact with individual students. Wilson & Locker (2008) found an internal consistency for this subscale of $\alpha = .80$. In this study, an internal consistency of $\alpha = .71$ was found. This subscale was correlated with a measure of nonverbal supportive faculty behaviors ($r = .53$; Wilson & Locker, 2008). This subscale correlates positively with a rating of whether students find the instructor motivating ($r = .44$), projected grade in course ($r = .22$), attitude toward course ($r = .43$), and perceived effectiveness of instructor ($r = .45$; Wilson & Locker, 2008). In a regression predicting attitude toward course, individual friendliness predicted attitude toward course ($\beta = .10, p < .001$; Wilson & Locker, 2008).

Nonverbal supportive faculty behaviors. Nonverbal supportive faculty behaviors are measured using the Nonverbal Immediacy Scale (NIS), which measures student perceptions of how often faculty behave in a way that express warmth, availability, and support nonverbally (Richmond et al., 2003). The NIS contains 26 items and uses a five-point Likert scale that ranges from 1 (never) to 5 (very often). An example item from this scale is “They gesture when they talk to people.” The mean of the items was calculated such that a higher score indicates a higher rate of supportive nonverbal behaviors. In the study which developed the scale, the internal consistency for this scale was $\alpha = .92$ (Richmond et al., 2003). This subscale was correlated with

a measure of instructor warmth/approachability ($r = .82$; Richmond et al., 2003). This correlation is high, which indicates good convergent validity, since nonverbal supportive faculty behaviors should be closely related to the constructs of instructor warmth and instructor approachability. The internal consistency of this scale in this study was $\alpha = .87$. The full scale can be seen in Appendix B.

Perceived volitional autonomy in class. To measure perceived volitional autonomy, this study used a modified version of the need for autonomy scale of the Work-Related Basic Need Satisfaction Scale (W-BNS; Van den Broeck, Vansteenkiste, De Witte, Soens, & Lens, 2010). This scale was developed to measure need satisfaction in work-related contexts. For this study, the context was the classroom, and items were edited accordingly. There is evidence to suggest that work context and academic contexts are related (e.g., McIlveen et al., 2013). This relation means that the wording of this scale can be adjusted to fit the academic context easily. Although some have argued that satisfaction of needs (the perception of needs being met) and frustration of needs (the perception that needs are not met) are fundamentally different constructs, this scale measures them together because the satisfaction and frustration items included on the scale are so highly negatively correlated (ranging from $-.87$ to $-.98$; Van den Broeck et al., 2010).

The perceived volitional autonomy in class scale consisted of seven items and used a five-point Likert scale that ranged from 1 (totally disagree) to 5 (totally agree). An example item from this modified scale is “I feel free to do my classwork the way I think it could best be done.” The original item was “I feel free to do my job the way I think it could best be done.” The mean of the items was calculated such that a higher score indicates a higher level of perceived volitional autonomy in class. In the study, the scale was found to have an overall internal consistency of $\alpha = .81$ (Van den Broeck et al., 2010). The internal consistency of this scale in this

study was $\alpha = .71$. The perceived volitional autonomy scale correlated with the perceived competence scale of the same measure ($r = .46$) and with the relatedness scale of the same measure ($r = .58$; Van den Broeck et al., 2010). Perceived volitional autonomy also correlated with job satisfaction ($r_s = .54-.66, p < .01$), life satisfaction ($r_s = .30-.22, p < .01$), and autonomous motivation ($r = .59, p < .01$; Van den Broeck et al., 2010). The full scale can be seen in Appendix C.

Perceived competence in class. The measure of perceived competence in class was the modified need for competence scale of the W-BNS (Van den Broeck et al., 2010). The perceived competence in class subscale consisted of six items and used a five-point Likert scale that ranged from 1 (totally disagree) to 5 (totally agree). An example item from this modified scale is “I have the feeling that I can even accomplish the most difficult tasks in that class.” The original item was “I have the feeling that I can even accomplish the most difficult tasks at work.” The mean of the items was calculated such that a higher score indicated a higher level of perceived competence in class. In the study, the scale was found to have an overall internal consistency of $\alpha = .85$ (Van den Broeck et al., 2010). The internal consistency of this scale in this study was $\alpha = .89$. The perceived competence scale correlated with the perceived volitional autonomy subscale of the same measure ($r = .46$) and the relatedness scale of the same measure ($r = .28$; Van den Broeck et al., 2010). Perceived competence also correlated with job satisfaction ($r_s = .15-.18, p < .05$), life satisfaction ($r_s = .16-.24, p < .01$), and autonomous motivation ($r = .23, p < .01$; Van den Broeck et al., 2010). The full subscale can be seen in Appendix D.

Relatedness in class. To measure relatedness in class, this study used the modified relatedness scale of the W-BNS (Van den Broeck et al., 2010). The relatedness scale consisted of nine items and used a five-point Likert scale that ranged from 1 (totally disagree) to 5 (totally

agree), where a higher score indicated a higher level of perceived relatedness. An example item from this modified scale was “In that class, I feel part of a group.” The original item was “At work, I feel part of a group.” The mean of the items was calculated such that a higher score indicates a higher level of relatedness in class. In the study, the scale was found to have an overall internal consistency of $\alpha = .82$ (Van den Broeck et al., 2010). The internal consistency of this scale in this study was $\alpha = .87$. The relatedness scale correlated with the perceived volitional autonomy scale of the same measure ($r = .58$) and the perceived competence scale of the same measure ($r = .28$; Van den Broeck et al., 2010). Relatedness also correlated with job satisfaction ($r_s = .40-.41, p < .01$), life satisfaction ($r_s = .32-.41, p < .01$), and autonomous motivation ($r = .40, p < .01$). The full subscale can be seen in Appendix E.

Academic motivation. Academic motivation was measured using the Comprehensive-Relative Autonomy Index (C-RAI; Sheldon, Osin, Gordeeva, Suchkov, & Sychev, 2017). This scale is intended to measure motivation across contexts. It is also intended to measure the full continuum of self-determined motivation from intrinsic motivation through the range of types of extrinsic motivation (extrinsic motivation for a concrete reward such as a grade to extrinsic motivation for an internal feeling such as pride) and including lack of motivation.

This scale addresses a significant controversy in the literature: whether it is more meaningful to analyze data using separate measures of each type of intrinsic and extrinsic motivation or to measure motivation as a continuum from intrinsic motivation to extrinsic motivation. Sheldon et al. (2017) offered this scale as a solution to the debate, presenting evidence through cluster modeling, multidimensional scaling, circumplex modeling, and confirmatory factor analysis that the scale has a six-subscale structure that captures the facets of intrinsic motivation, extrinsic motivation, and lack of motivation. There is also a second-order simplex structure that indicates

the scale functions as a continuum, with the individual subscales lining up in the order predicted by SDT's model of motivation. Additionally, evidence was found that the scale provided better convergent and divergent validity when used as a continuum, as opposed to when used as discrete subscales (Sheldon et al., 2017). Finally, some have proposed scales similar in nature to the C-RAI but argued that different types of intrinsic or extrinsic motivation should be weighted differently when calculating final scores. Sheldon et al. (2017) provided evidence that there was no difference to convergent and divergent validity when raw scores were used instead of weighted scores.

The C-RAI contains 24 items making up six subscales. These subscales are based on a theoretical understanding of motivation as a continuum from less autonomous motivation to more autonomous motivation. The subscales are amotivation, external motivation, negative introjection, positive introjection, identification, and intrinsic motivation. Participants were asked why they are in the major they are in, and they answered by responding to a series of possible motivations, using a five-point Likert scale that ranges from 1 (strongly disagree) to 5 (strongly agree).

Each subscale contained four items. The amotivation subscale measures a lack of intention with regard to behavior. That is, a person acts but is confused or uncertain about why they are acting. An example item from this subscale is "I once had good reasons for X, but now I don't." For this study, "X" was replaced with "being in this major." The internal consistency for the amotivation subscale was $\alpha = .77$ in Sheldon et al. (2017) and $\alpha = .91$ in this study. In Sheldon et al. (2017), amotivation correlated significantly with intrinsic motivation ($r = -.20$), identified motivation ($r = -.40$), positive introjection ($r = -.22$), and external motivation ($r = .28$), but not

with negative introjection ($r = .00$). In this study, amotivation correlated significantly with all other C-RAI subscales (see Table 2).

The external motivation subscale measures the extent to which action is motivated by pressure from outside forces. An example item from this subscale is “because if I don’t do X, others will get mad.” For this study, “X” was replaced with “this major.” The internal consistency for the amotivation subscale was $\alpha = .59$ in Sheldon et al. (2017) and $\alpha = .90$ in this study. In Sheldon et al. (2017), external motivation correlated significantly with positive introjection ($r = .31$), negative introjection ($r = .55$), and amotivation ($r = .28$) but not with intrinsic motivation ($r = .05$) or identified motivation ($r = .04$). In this study, external motivation correlated significantly with amotivation, negative introjection, identified motivation, and intrinsic motivation but not with positive introjection (see Table 2).

The negative introjection subscale measures the extent to which a person is motivated to act in order to avoid losing self-worth. An example item from this subscale is “because I don’t want to feel bad about myself.” The internal consistency for the negative introjection subscale was $\alpha = .75$ in Sheldon et al. (2017) and $\alpha = .86$ in this study. In Sheldon et al. (2017), negative introjection significantly correlated with intrinsic motivation ($r = .20$), identified motivation ($r = .32$), positive introjection ($r = .54$), and external motivation ($r = .55$) but not with amotivation ($r = .00$). In this study, negative introjection correlated significantly with all other C-RAI subscales (see Table 2).

The positive introjection subscale measures the extent to which a person is motivated to act in order to gain self-worth. An example item from this subscale is “because I want to feel proud of myself.” The internal consistency for the positive introjection subscale was $\alpha = .90$ in Sheldon et al. (2017) and $\alpha = .86$ in this study. In Sheldon et al. (2017), positive introjection correlated

significantly with intrinsic motivation ($r = .39$), identified motivation ($r = .54$), negative introjection ($r = .54$), external motivation ($r = .31$), and amotivation ($r = -.22$). In this study, positive introjection correlated significantly with amotivation, negative introjection, identified motivation, and intrinsic motivation but not with external motivation (see Table 2).

The identified motivation subscales measure the extent to which a person is motivated to act because they value the action and believe the action is important. An example item from this subscale is “because X is meaningful to me.” In this study, “X” was replaced with “this major.” The internal consistency for the identified motivation subscale was $\alpha = .74$ in Sheldon et al. (2017) and $\alpha = .93$ in this study. In Sheldon et al. (2017), identified motivation correlated significantly with intrinsic motivation ($r = .60$), positive introjection ($r = .54$), negative introjection ($r = .32$), and amotivation ($r = -.40$) but not with external motivation ($r = .04$). In this study, identified motivation correlated significantly with all other C-RAI subscales (see Table 2).

The intrinsic motivation subscale measures motivation characterized by enjoyment and interest. An example item from this subscale is “because I enjoy X.” In this study, “X” was replaced with “this major.” The internal consistency for the identified motivation subscale was $\alpha = .88$ in Sheldon et al. (2017) and $\alpha = .86$ in this study. In Sheldon et al. (2017), intrinsic motivation correlated significantly with identified motivation ($r = .60$), positive introjection ($r = .39$), negative introjection ($r = .20$), and amotivation ($r = -.20$) but not external motivation ($r = .05$). In this study, intrinsic motivation correlated significantly with all other C-RAI subscales (see Table 2).

The full C-RAI scale was calculated by adding the scores of the three subscales measuring more autonomous motivation (positive introjection, identification, and intrinsic motivation) and

then subtracting scores of the three subscales measuring facets of extrinsic motivation (amotivation, external motivation, and negative introjection). In the study where the scale was developed, the internal consistency for the scale as a whole was $\alpha = .84$ (Sheldon et al., 2017). The internal consistency of this scale as a whole in this study was $\alpha = .77$. This scale has been correlated with subjective well-being ($r = .36, p < .001$), satisfaction with life ($r = .25, p < .001$), positive affect ($r = .29, p < .001$), and negative affect ($r = -.31, p < .001$; Sheldon et al., 2017). The full scale can be seen in Appendix F.

Academic major satisfaction. The Academic Major Satisfaction Scale (AMSS; Nauta, 2007) is a unidimensional scale consisting of six Likert scaled questions from 1 (strongly disagree) to 5 (strongly agree). An example item from this scale is “Overall, I am happy with the major I’ve chosen.” The mean of the scale was calculated such that a higher score indicates greater satisfaction with a major. In the two samples used to develop the AMSS, the internal consistencies were $\alpha = .94$ and $\alpha = .90$. The internal consistency of this scale in this study was $\alpha = .93$. Each item in the measure had an effect size of .5 or higher for predicting which students remained in their major versus changed their major over a two-year period (Nauta, 2007). Convergent validity estimates revealed a positive association with career decision self-efficacy ($r = .45, p < .001$) and negative associations with career choice anxiety ($r = -.50, p < .001$) and generalized career indecisiveness ($r = -.30, p < .001$). The scale can be seen in Appendix G.

Demographics. Also measured were demographic items: age, ethnicity, gender, year in school, GPA, and academic major (see Appendix H).

Procedure

Before the study was disseminated to participants, Iowa State University’s Institutional Review Board’s approval was obtained (See Appendix J). Participants were recruited using the

Department of Psychology's online research participation system, which manages undergraduate students' participation in department-associated research projects.

Undergraduate students who chose to participate received extra credit. Prior to completing the survey, students were presented with an informed consent statement, as shown by Appendix I. Students were then presented with demographic questions, the Academic Major Satisfaction Scale, the Work-related Basic Need Satisfaction subscales presented above, the Verbal Immediacy Behaviors Scale, the Nonverbal Immediacy Scale, and the Comprehensive-Relative Autonomy Index.

When responding to the modified W-BNS subscales presented above, the Verbal Immediacy Behaviors Scale, and the Nonverbal Immediacy Scale, participants were asked to answer the questions in relation to the most recent class they were in that they were taking for their major. When responding to the Academic Major Satisfaction Scale and the Comprehensive-Relative Autonomy Index, participants were asked to answer questions in relation to their major as a whole.

Hypotheses

Hypothesis 1: Both a fully and partially mediated model will yield a good fit to the data; however, the fully mediated model (Figure 1) will be a more parsimonious model than a partially mediated model (Figure 2).

Hypothesis 2: Verbal supportive faculty behaviors will directly predict perceived volitional autonomy in class (path a), perceived competence in class (path b) and relatedness in class (path c). Nonverbal supportive faculty behaviors will directly predict perceived volitional autonomy in class (path d), perceived competence in class (path e), and relatedness in class (path f).

Hypothesis 3: Perceived volitional autonomy in class will directly predict academic motivation (path g). Perceived competence in class will directly predict academic motivation (path h). Relatedness in class will directly predict academic motivation (path i).

Hypothesis 4: Academic motivation will directly predict academic major satisfaction (path j).

Hypothesis 5: Need satisfaction across all three needs will fully mediate relations between supportive faculty behaviors and academic motivation.

Perceived volitional autonomy in class will partially mediate the relations between:
 (a) verbal supportive faculty behaviors and academic motivation (path a, path g); and
 (b) nonverbal supportive faculty behaviors and academic motivation (path d, path g).

Perceived competence in class will partially mediate the relation between: (a) verbal supportive faculty behaviors and academic motivation (path b, path h); (b) nonverbal supportive faculty behaviors and academic major satisfaction (path e, path h).

Relatedness in class will partially mediate the relation between: (a) verbal supportive faculty behaviors and academic motivation (path c, path i); and (b) nonverbal supportive faculty behaviors and academic motivation (path f, path i).

Hypothesis 6: Academic motivation will fully mediate relations between need satisfaction and academic major satisfaction.

Academic motivation will fully mediate the relations between: (a) perceived volitional autonomy in class and academic major satisfaction (path g, path j); (b) perceived competence in class and academic major satisfaction (path h, path j); and (c) relatedness in class and academic major satisfaction (path i, path j).

Hypothesis 7: Need satisfaction and academic motivation combined will fully mediate relations between supportive faculty behaviors and academic major satisfaction.

Perceived volitional autonomy in class and academic motivation combined will partially mediate the relations between: (a) verbal supportive faculty behaviors and academic major satisfaction (path a, path g, path j); and (b) nonverbal supportive faculty behaviors and academic major satisfaction (path d, path g, path j).

Perceived competence in class and academic motivation combined will partially mediate the relations between: (a) verbal supportive faculty behaviors and academic major satisfaction (path b, path h, path j); and (b) nonverbal supportive faculty behaviors and academic major satisfaction (path e, path h, path j).

Perceived relatedness in class and academic motivation combined will partially mediate the relation between: (a) verbal supportive faculty behaviors and academic major satisfaction (path c, path i, path j); and (b) nonverbal supportive faculty behaviors and academic major satisfaction (path f, path i, path j).

CHAPTER 4: RESULTS

Preliminary Analyses

Univariate and multivariate outliers. To check for univariate outliers, z-scores were examined for each scale. Two univariate outliers were identified as having z-scores outside of the acceptable range (i.e., above 3.29 or below -3.29; Tabachnick & Fidell, 2001). These outliers were present on the scale measuring verbal supportive faculty behaviors and on the scale measuring perceived volitional autonomy in class; they were excluded from further analysis. Mahalanobis distances were used to check for multivariate outliers (Tabachnick & Fidell, 2001). Two multivariate outliers were identified ($p < .001$) and excluded from further analysis.

Missing data. First, items in which 80% or more of data is missing were checked. No items were omitted as a result of missing data. Second, participants who did not complete at least 80% of the items were dropped from the sample. Twenty participants were dropped from the sample for this reason. Participant responses were omitted on any measure where more than 50% of items were missing. Full information maximum likelihood (FIML; Arbuckle, 1996), estimating casewise parameters, would have been used to estimate the remaining missed items; however, there was no other missing data.

In the final sample of 331 participants, missing data ranged from a low of 0% to a high of 6.6% for the conceptual items. Little's (1988) missing completely at random (MCAR) test was conducted on the mean conceptual scale scores and indicated that data was not missing completely at random $\chi^2(38, N = 331) = 81.19, p < .001$. Dummy variables were created to examine possible selection bias. Independent t-tests were then conducted to check for differences on each scale between missing and nonmissing data; however, the number of missing cases was so low (range of 0–5 cases) that these t-tests were not meaningful. It was concluded that the

amount of missing data was small enough that any differences between missing data and nonmissing data would not be meaningful. Therefore, this supports the assumption that the data were likely missing at random and that maximum likelihood estimation would yield unbiased parameter estimates (Schlomer, Bauman, & Card, 2010).

Initial analyses. Means, standard deviations, and correlations between all variables under consideration are presented in Table 2. All variables used for main analyses correlated significantly with each other (see Table 2).

Among the measures used in main analyses, two correlations yielded large effect sizes: academic motivation and academic major satisfaction ($r = .76$) and perceived volitional autonomy in class and perceived competence in class ($r = .52$). Seven correlations yielded medium effects: verbal supportive faculty behaviors and relatedness in class ($r = .42$), nonverbal supportive faculty behaviors and perceived volitional autonomy in class ($r = .44$), nonverbal supportive faculty behaviors and perceived competence in class ($r = .25$), perceived volitional autonomy in class and relatedness in class ($r = .32$), perceived volitional autonomy in class and academic motivation ($r = .33$), perceived competence in class and academic motivation ($r = .39$), perceived competence in class and academic major satisfaction ($r = .42$), and academic motivation and academic major satisfaction ($r = .76$).

Grade point average (GPA) was also included in the table as a control variable. GPA correlated significantly with nonverbal faculty supportive behaviors ($r = .15$), perceived competence in class ($r = .19$), and academic motivation ($r = .14$).

Independent t-tests were conducted for each variable to test for differences between male and female participants. Significant differences were found on two scales. Female participants had higher scores on nonverbal supportive faculty behaviors than male participants did, with a

medium effect size [$t(327) = -3.31, p < .01, \text{Cohen's } d = .42$]. Female participants also had higher scores on academic motivation than male participants, with a medium effect size [$t(313) = -2.89, p < .01, \text{Cohen's } d = .39$]. Because differences were found on only two variables, it was considered unlikely that gender differences would have an impact on the main analyses.

Normative comparisons. To determine if this sample's means were comparable to other similar samples defined as within $\frac{1}{2}$ of standard deviation, means of this sample were compared to means from other relevant samples. The mean for verbal supportive faculty behaviors in this sample was within $\frac{1}{2}$ standard deviation of the mean for verbal supportive faculty behaviors in a sample of Iranian college students (Fallah, 2014). This sample's mean for nonverbal supportive faculty behaviors was also compared with a similar sample of college students and was within $\frac{1}{2}$ standard deviation as well (Wheless et al., 2011).

The means for perceived volitional autonomy in class, perceived competence in class, and relatedness in class in this sample were compared with the means from a similar sample of college students in Galvan (2017). All three means were within half a standard deviation of Galvan's (2017) means.

The mean for academic motivation in this sample was compared with the mean for academic motivation in a sample of international students in the United States (Yang, Zhang, & Sheldon, 2018). Because the scale was published relatively recently, it has not had widespread use, so there is not a normative sample more like the sample used in this study. Nonetheless, the academic motivation mean in this sample was within $\frac{1}{2}$ standard deviation of the mean in the Yang et al. (2018) sample.

Finally, the mean for academic major satisfaction in this sample was compared with the mean for academic major satisfaction in the sample used to develop the scale to measure

academic major satisfaction (Nauta, 2007). The mean in the Nauta (2007) sample was within ½ standard deviation of the mean in this sample.

Main Analyses

Measurement model. For the two scales that comprised subscales (verbal supportive faculty behaviors and academic motivation), their subscale means were used as indicators in the measurement model for the latent constructs of verbal supportive faculty behaviors and academic motivation respectively. That is, means of the individual friendliness subscale and the flexibility during lecture subscale from the VIBS were used to measure verbal supportive faculty behaviors, and the means of the amotivation, external motivation, negative introjection, positive introjection, identified motivation, and intrinsic motivation subscales from the C-RAI were used to measure academic motivation.

The remaining latent variables were created using parceling. Three parcels were created for each latent variable: nonverbal supportive faculty behaviors, perceived volitional autonomy in class, perceived competence in class, relatedness in class, and academic major satisfaction (Russell, Kahn, Spoth, & Altmaier, 1998). To create the parcels for each of these latent constructs, an exploratory factor analysis was conducted for each scale or subscale, extracting a single factor using maximum likelihood. The items were then rank-ordered on the basis of the absolute magnitude of their factor loadings, and triads of items were successively assigned to each of the three parcels, equalizing the average loadings of each parcel on the respective factor.

A confirmatory factor analysis was conducted to determine whether the measurement model showed an acceptable fit to the data before examining the structural models. Models were estimated using maximum likelihood in MPlus version 7.2 (Muthén & Muthén, 2012). Goodness of fit for the models was assessed using the guidelines of Hu & Bentler (1999), including a

comparative fit index (CFI) of .95 or greater, a root-mean-square error of approximation (RMSEA) of .06 or less, and a standardized root-mean-square residual (SRMR) of .08 or less.

The initial measurement model was not a good fit: $\chi^2 (209, N = 331) = 723.13, p < .001$, CFI = .87, RMSEA = .08, SRMR = .07. Modification indices were examined to determine whether allowing subscales within the model to correlate would improve the fit of the model. Based on modification indices, the negative introjections subscale was allowed to correlate with the external motivation subscale, and the model was run again. This produced an improved model, but the model was still not a good fit: $\chi^2 (208, N = 331) = 557.33, p < .001$, CFI = .91, RMSEA = .07, SRMR = .06. Modification indices were examined again, and the intrinsic motivation subscale was allowed to correlate with the identification subscale for a third measurement model.

Results indicated this measurement model was a good fit to the data: $\chi^2 (207, N = 331) = 422.10, p < .001$, CFI = .95, RMSEA = .056, SRMR = .06. The loadings of the measured variables on each latent variable were statistically significant ($ps < .05$; see Table 3), which suggests each latent variable has been adequately measured by its respective indicators. Standardized factor loadings for verbal supportive faculty behaviors ranged from .56 to .85. For nonverbal faculty supportive behaviors, standardized factor loadings ranged from .77 to .93. For perceived volitional autonomy in class, standardized factor loadings ranged from .56 to .85. For perceived competence in class, standardized factor loadings ranged from .81 to .88. For relatedness in class, standardized factor loadings ranged from .77 to .89. For academic motivation, standardized factor loadings ranged from .26 to -.86. For academic major satisfaction, standardized factor loadings ranged from .91 to .92.

To ensure that the modification indices added to the model were simply reducing residual error and not altering the model in a meaningful way, the measurement model with the two modification indices was compared with the measurement model without modification indices. For the measurement model without any modification indices, standardized factor loadings for verbal supportive faculty behaviors were .57 and .84. For nonverbal supportive faculty behaviors, standardized factor loadings were .88, .93, and .77. For perceived volitional autonomy in class, standardized factor loadings were .63, .56, and .85. For perceived competence in class, standardized factor loadings were .88, .82, and .81. For relatedness in class, standardized factor loadings were .87, .89, and .77. For academic motivation, standardized factor loadings were .80, .80, .29, $-.47$, $-.49$, and $-.83$. For academic major satisfaction, standardized factor loadings were .92, .92, and .92. When compared with standardized factor loadings produced in the measurement model which included the two modification indices (see Table 4), it is clear that the modification indices did not change the measurement model in a meaningful way.

Structural model. Structural Equation Modeling (SEM) was used to examine hypotheses using MPlus version 7.2 (Muthén & Muthén, 2012). The fully mediated model can be found in Figure 3, and the partially mediated model can be found in Figure 4. The predictor variables were verbal supportive faculty behaviors, nonverbal supportive faculty behaviors, perceived volitional autonomy in class, perceived competence in class, relatedness in class, and academic motivation. The main criterion variable was academic major satisfaction. Psychological needs (perceived volitional autonomy in class, perceived competence in class, and perceived relatedness in class) and academic motivation were the mediator variables.

Hypothesis 1. Both a partially and fully mediated model will yield a good fit to the data; however, a fully mediated model (Figure 1) will be more parsimonious than a partially mediated

model (Figure 2). A fully mediated model (Figure 3) was tested against a partially mediated model (Figure 4), using a chi-square difference test to see if the partially mediated model was not significantly different from the partially mediated model. If the fully mediated model is not a better fit for the data, then the fully mediated model is considered to be a better representation of the data, since it is more parsimonious. Goodness of fit for the models was assessed using the guidelines of Hu & Bentler (1999), including a comparative fit index (CFI) of .95 or greater, a root-mean-square error of approximation (RMSEA) of .06 or less, and a standardized root-mean-square residual (SRMR) of .08 or less.

Results indicated the partially mediated model was a good fit: $\chi^2 (211, N = 331) = 425.67, p < .001, CFI = .95, RMSEA = .055, SRMR = .06$. The fully mediated model was also found to be a good fit: $\chi^2 (214, N = 331) = 214, p < .001, CFI = .95, RMSEA = .055, SRMR = .06$. According to the guidelines of Hu and Bentler (1999), this is a good fit because the model has a comparative fit index (CFI) of .95 or greater, a root-mean-square error of approximation (RMSEA) of .06 or less, and a standardized root-mean-square residual (SRMR) of .08 or less. Results indicated that the partially mediated model was not a better fit for the data than the fully mediated model: $\chi^2 (3) = 2.34, p = .51$. This supports use of the fully mediated model in the following analyses, because the partially mediated model and fully mediated model are equally good fits to the data; however, the fully mediated model fits the data as well using fewer paths. In short, hypothesis 1 was supported.

Hypothesis 2. As shown in Figure 3, the fully mediated model was examined to determine whether the following paths were significant: (a) verbal supportive faculty behaviors to perceived volitional autonomy in class (path a), perceived competence in class (path b), and relatedness in class (path c). (b) Nonverbal supportive faculty behaviors to perceived volitional

autonomy in class (path d), perceived competence in class (path e), and relatedness in class (path f).

Verbal supportive faculty behaviors related to perceived competence in class and relatedness in class but did not significantly relate to perceived volitional autonomy in class, as shown in Figure 3. Nonverbal supportive faculty behaviors significantly related to perceived volitional autonomy in class, perceived competence in class, and relatedness in class. Hypothesis 2 was partially supported.

Hypothesis 3. As shown in Figure 3, the fully mediated model was examined to determine whether the following paths were significant: (a) perceived volitional autonomy in class to academic motivation (path g); (b) perceived competence in class to academic motivation (path h); and (c) relatedness in class to academic motivation (path i).

Perceived competence in class significantly related to academic motivation. Relatedness in class significantly related to academic motivation, as shown in Figure 3. Hypothesis 3 was partially supported. Perceived volitional autonomy in class did not significantly relate to academic motivation.

As shown in Figure 4, perceived volitional autonomy in class did not significantly predict academic major satisfaction. Perceived competence in class did not significantly predict academic major satisfaction. Relatedness in class did not significantly predict academic major satisfaction.

Hypothesis 4. As shown in Figure 3, the fully mediated model was examined to determine whether academic motivation significantly predicted academic major satisfaction (path j). The path was significant, as shown by Figure 3; hypothesis 4 was supported.

Hypothesis 5. Need satisfaction was expected to fully mediate relations between supportive faculty behaviors and academic motivation. Hypotheses 5 through 7 all concern the examination of indirect effects. They were examined through bootstrapping. Bootstrapping was used to determine if the indirect paths from supportive faculty behaviors through need satisfaction to motivation (paths a-g, d-g, b-h, e-h, c-i, f-i) were significant. Bootstrap tests using bias-corrected 95% confidence intervals of the unstandardized betas were used to test the significance of the mean indirect effects. The calculation was repeated with 1,000 samples to yield parameter estimates for total and specific indirect effects. A confidence interval not containing 0 indicated that the mean indirect effect across the samples was significant at an alpha of .05 (Preacher & Hayes, 2008). Bootstrap analysis provides greater statistical power and does not make any assumptions regarding multivariate normality (Preacher & Hayes, 2008).

Table 5 presents the magnitude and statistical significance of the specific and total indirect effects of supportive faculty behaviors on academic motivation through need satisfaction, using the bootstrapping procedure in the fully mediated model.

The first three indirect effects (1a–1c) in Table 5 address the significant indirect effect of verbal supportive faculty behaviors on academic motivation through need satisfaction. Verbal supportive faculty behaviors indirectly significantly related to academic motivation through perceived competence in class and relatedness in class. This is evidenced by the 95% bias-corrected confidence intervals (BC CI) for these two specific mean indirect effects not including 0. Verbal supportive faculty behaviors was not significantly indirectly related to academic motivation through perceived volitional autonomy in class, as evidenced by the 95% BC CI for this specific mean indirect effect including 0.

The next three indirect effects (2a–2c) in Table 5 address the significant indirect effect of faculty nonverbal supportive behaviors on academic motivation through need satisfaction. Nonverbal supportive faculty behaviors indirectly significantly related to academic motivation through perceived competence in class. This is evidenced by the 95% BC CI for this specific mean indirect effect not including 0. Nonverbal supportive faculty behaviors did not significantly indirectly relate to academic motivation through perceived volitional autonomy in class or relatedness in class, as evidenced by the 95% BC CI for these two specific mean indirect effects including 0. Hypothesis 5 was partially supported.

Hypothesis 6. Academic motivation was expected to fully mediate relations between need satisfaction and academic major satisfaction. Bootstrapping was used to determine if the indirect paths (paths g-j, h-j, i-j) were significant. Bootstrap tests using bias-corrected 95% confidence intervals of the unstandardized betas were used to test the significance of the mean indirect effects with the same procedures as were used for hypothesis 5.

Indirect effects 3a–3c in Table 5 address the indirect effect of need satisfaction on academic major satisfaction through academic motivation. Perceived competence in class and relatedness in class indirectly related to academic major satisfaction through academic motivation. This is evidenced by the 95% BC CI for these two specific mean indirect effects not including 0. Perceived volitional autonomy in class did not have a significant indirect relation with academic major satisfaction through academic motivation, as evidenced by the 95% BC CI for this specific mean indirect effect including 0. Hypothesis 6 was partially supported.

Hypothesis 7. Need satisfaction and academic motivation combined will fully mediate relations between supportive faculty behaviors and academic major satisfaction. Bootstrapping was used to determine if the indirect paths (paths a-g-j, d-g-j, b-h-j, e-h-j, c-i-j, f-i-j) were

significant. Bootstrap tests using bias-corrected 95% confidence intervals of the unstandardized betas were used to test the significance of the mean indirect effects with the same procedures as were used for hypothesis 5.

The indirect effects of faculty behaviors through need satisfaction and academic motivation combined on academic major satisfaction were addressed. Table 5 shows the indirect effect of verbal supportive faculty behaviors on academic major satisfaction through need satisfaction and academic motivation (4a–4c). Verbal supportive faculty behaviors indirectly predicted academic major satisfaction through perceived competence in class and academic motivation combined and through relatedness in class and academic motivation combined. This is evidenced by the 95% BC CI for these two specific mean indirect effects not including 0. Verbal supportive faculty behaviors did not significantly indirectly predict academic major satisfaction through perceived volitional autonomy in class and academic motivation combined, as evidenced by the 95% BC CI for this specific mean indirect effect including 0.

Table 5 also shows the indirect effect of nonverbal supportive faculty behaviors on academic major satisfaction through need satisfaction and academic motivation (5a–5c). Nonverbal supportive faculty behaviors indirectly predicted academic major satisfaction through perceived competence in class and academic motivation combined. This is evidenced by the 95% BC CI for this specific mean indirect effect not including 0. Nonverbal supportive faculty behaviors did not significantly indirectly predict academic major satisfaction through perceived volitional autonomy in class and academic motivation combined or through relatedness in class and academic motivation combined, as evidenced by the 95% BC CI for these two specific mean indirect effects including 0. In short, hypothesis 7 was partially supported.

Additional Analyses

Controlling for actual competence. Because perceived competence in class was a significant predictor of academic motivation, it was considered important to determine whether the relation between perceived competence in class and academic motivation is explained by actual competence—that is, whether academic motivation is more accurately predicted by actual success or by the feeling that one is capable of being successful. In this study, actual competence was measured using self-reported grade point average (GPA).

A model controlling for GPA was developed using the fully mediated model. Paths were added from GPA to both outcome variables (academic motivation and academic major satisfaction), and GPA was allowed to correlate with all other variables in the model (faculty behaviors and psychological needs). The originally fully mediated model can be seen in Figure 3. The model controlling for GPA can be seen in Figure 5. The model was a good fit to the data; $\chi^2(230, N = 331) = 446.62, p < .001, CFI = .95, RMSEA = .05, SRMR = .06$; because it meets the guidelines of Hu and Bentler (1999) of a comparative fit index (CFI) of .95 or greater, a root-mean-square error of approximation (RMSEA) of .06 or less, and a standardized root-mean-square residual (SRMR) of .08 or less.

Paths from GPA to the predictor variables were examined for significance. They were found to be nonsignificant. Correlations between GPA and other variables were examined. Correlations between GPA and verbal supportive faculty behaviors, perceived volitional autonomy in class, and relatedness in class were nonsignificant. Correlations between GPA and nonverbal faculty supportive behaviors and perceived competence in class were significant, as shown in Figure 5.

There was no difference between the fully mediated model without GPA and the fully mediated model with GPA in terms of which paths were significant. Verbal supportive faculty behaviors significantly predicted perceived competence in class and relatedness in class. Nonverbal supportive faculty behaviors significantly predicted perceived volitional autonomy in class, perceived competence in class, and relatedness in class. Perceived competence in class and relatedness in class significantly predicted academic motivation. Academic motivation significantly predicted academic major satisfaction.

Removal of perceived competence in class from the model. The finding that perceived volitional autonomy in class did not significantly predict academic motivation (Figure 3) was surprising, considering the importance of volitional autonomy in class to motivation in Self-Determination Theory (Deci & Ryan, 2000). It was considered possible that in this study, any variance that would have been accounted for by perceived volitional autonomy in class had been subsumed by the strong relation between the latent variables, perceived competence in class and academic motivation ($\rho = .60$; see Table 7). To test this possibility, a model was developed that excluded perceived competence in class. That model can be seen in Figure 6. The model was a good fit to the data; $\chi^2(159, N = 331) = 358.49, p < .001, CFI = .94, RMSEA = .06, SRMR = .06$; because it meets the guidelines of Hu and Bentler (1999) of a root-mean-square error of approximation (RMSEA) of .06 or less and a standardized root-mean-square residual (SRMR) of .08 or less. It does not meet the guideline of a comparative fit index (CFI) of .95 or greater; however, the fit was considered to be adequate for the purposes of this analysis.

In both the original fully mediated model and in the model without competence, a significant amount of variance in academic motivation was predicted, although the amount of

variance in academic motivation predicted was higher in the original fully mediated model ($R^2 = .27, p < .01$), than in the model without competence ($R^2 = .17, p < .01$).

In the model with competence (Figure 3), verbal supportive faculty behaviors significantly predicted perceived competence in class and relatedness in class but not perceived volitional autonomy in class. Likewise, in the model without competence (Figure 6), verbal supportive faculty behaviors significantly predicted relatedness in class but not perceived volitional autonomy in class. In the model with competence, nonverbal supportive faculty behaviors significantly predicted perceived volitional autonomy in class, perceived competence in class, and relatedness in class. Similarly, in the model without competence, nonverbal supportive faculty behaviors predicted both perceived volitional autonomy in class and relatedness in class. In both the models with and without competence, relatedness in class significantly predicted academic motivation, and academic motivation significantly predicted academic major satisfaction.

Additionally, there were differences in indirect effects in the models with and without competence. Table 6 presents the indirect effects for the model with competence removed. In the model with competence, verbal supportive faculty behaviors indirectly predicted academic motivation through perceived competence in class and relatedness in class (Table 5). Verbal supportive faculty behaviors indirectly predicted academic major satisfaction through the combination of perceived competence in class and academic motivation and the combination of relatedness in class and academic motivation. Nonverbal faculty behaviors predicted academic motivation indirectly through perceived competence in class, and predicted academic major satisfaction indirectly through the combination of relatedness in class and academic motivation.

In the model with competence, academic major satisfaction was indirectly predicted by perceived competence in class and relatedness in class through academic motivation.

In the model without competence, verbal supportive faculty behaviors indirectly predicted academic motivation through relatedness in class, and indirectly predicted academic major satisfaction through relatedness in class and academic motivation combined (Table 6. Nonverbal supportive faculty behaviors indirectly predicted academic motivation through perceived volitional autonomy in class and through relatedness in class. Nonverbal supportive faculty behaviors indirectly predicted academic major satisfaction through perceived volitional autonomy in class combined with academic motivation and through relatedness in class combined with academic motivation. Both perceived volitional autonomy in class and relatedness in class indirectly predicted academic major satisfaction through academic motivation.

In sum, although the amount of variance in academic motivation predicted in the original fully mediated model was higher than the amount predicted in the model without competence, the amount of variance in academic motivation predicted in both models was significant at the $p < .01$ level. In regards to direct effects, the main difference between the two models is that in the model with competence, perceived volitional autonomy in class does not predict academic motivation, and in the model without competence, perceived volitional autonomy in class did predict academic motivation. In regards to indirect effects, perceived volitional autonomy in class did not indirectly predict academic major satisfaction in the model with competence, but in the model without competence, perceived volitional autonomy in class indirectly predicted academic major satisfaction through academic motivation. Additionally, in the model without competence, two other indirect paths emerged that involved perceived volitional autonomy in

class and nonverbal supportive faculty behaviors and that did not exist in the model with competence. The first was the indirect effect of nonverbal supportive faculty behaviors on academic motivation through perceived volitional autonomy in class. The second was the indirect effect of nonverbal supportive faculty behaviors on academic major satisfaction through perceived volitional autonomy in class combined with academic motivation.

Adjusted position of faculty behaviors and psychological needs. An alternate model was developed to test the directionality of the relations between variables. The fully mediated model (Figure 3) was adjusted such that faculty behaviors and psychological needs changed places within the model. GPA was included as a control in the model as a predictor of academic motivation and academic major satisfaction and allowed to correlate with faculty behaviors and psychological needs variables. In the adjusted model (Figure 7), need satisfaction predicts perception of faculty behaviors, which predicts academic motivation, which predicts academic major satisfaction. The adjusted model was not a good fit: $\chi^2(231, N = 331) = 497.65, p < .001$, CFI = .93, RMSEA = .059, SRMR = .09. According to the guidelines of Hu and Bentler (1999), to be a good fit, the model would need to have a comparative fit index (CFI) of .95 or greater, a root-mean-square error of approximation (RMSEA) of .06 or less, and a standardized root-mean-square residual (SRMR) of .08 or less.

CHAPTER 5: DISCUSSION

Hypotheses

Hypothesis 1 was supported. The fully mediated model compared with the partially mediated model was more parsimonious. There were no direct relations between need satisfaction and academic major satisfaction. This suggests that the relation between need satisfaction and academic major satisfaction was indirect through academic motivation.

These findings have interesting implications for self-determination theory. Broadly, SDT describes how a specific environment affects an outcome through need satisfaction in that environment and motivation (Deci & Ryan, 2000). Greater need satisfaction and more intrinsic motivation should lead to better outcomes. However, the theory does not provide a completely clear picture of how these relations function. That is, within the theory, it is unclear whether need satisfaction should directly lead to more positive outcomes or whether the relation between need satisfaction and outcomes is fully mediated by motivation. Previous research in this area has found evidence that need satisfaction directly predicts positive academic outcomes (Cerasoli et al., 2016) and that the relation between need satisfaction and positive academic outcomes is mediated by motivation (Thomas, 2009). It was therefore hypothesized in this study that academic motivation would fully mediate the relation between need satisfaction and academic major satisfaction. That is, need satisfaction would directly predict academic major satisfaction but would also indirectly predict academic major satisfaction through academic motivation.

This hypothesis was supported. In fact, within the partially mediated structural equation model, there were no significant paths from perceived volitional autonomy in class, perceived competence in class, or relatedness in class to academic major satisfaction. Instead, academic motivation fully mediated the relation between need satisfaction and academic major

satisfaction. There are no previous studies which examine the relation of need satisfaction with academic major satisfaction and no previous studies which include motivation as a mediator between need satisfaction and academic major satisfaction. There is research on the relations between perceived need satisfaction with other positive academic outcomes, but the results have been mixed, some suggesting direct relations between need satisfaction and positive academic outcomes (such as academic performance; Cerasoli et al., 2016), and some suggesting indirect relations between need satisfaction and positive academic outcomes (the relation between self-efficacy and academic adjustment mediated by intrinsic motivation; Thomas, 2009). This study provides clarity about the relations between need satisfaction, academic motivation, and academic major satisfaction, and it suggests the importance of including academic motivation as a mediator when need satisfaction is studied.

Hypothesis 2 was mostly supported. Verbal supportive faculty behaviors significantly predicted perceived competence in class and relatedness in class but not perceived volitional autonomy in class. Nonverbal supportive faculty behaviors significantly predicted all three need satisfaction variables (perceived volitional autonomy in class, perceived competence in class, and relatedness in class). These findings are in line with SDT. SDT suggests that what happens in an environment has an impact on the extent to which we feel our psychological needs in that context are met (Deci & Ryan, 2000). These findings are also consistent with previous research that perceived competence is related to verbal and nonverbal supportive faculty behaviors (Houser & Frymier, 2009; Cakir, 2015). There is not previous research directly connecting verbal and nonverbal supportive faculty behaviors with perceived volitional autonomy in class or relatedness in class; however, previous research has found relations between perceived volitional autonomy in class, relatedness in class, and student perceptions of faculty (Schenkenfelder,

2017). This study provides support for these previous findings; in this sample, the extent to which students felt they were able to accomplish difficult tasks and were connected to others in the class was clearly related to how they perceived faculty behaved in class both verbally and nonverbally.

Nonverbal supportive faculty behaviors did predict volitional autonomy in class, but faculty verbal behaviors did not. The finding concerning nonverbal behaviors is consistent with SDT and with studies showing that other types of faculty behaviors have been consistently moderately related to perceived volitional autonomy (e.g., Chen & Jang, 2010; Cui, Yao, & Zhang, 2017; Schenkenfelder, 2017). It is possible that the specific types of verbal supportive behaviors measured in this study are experienced as controlling instead of autonomy supportive. For example, calling on students even when they have not indicated they want to talk (an item from the VIBS) could be positively related with higher levels of relatedness and perceived competence in class but not with perceived volitional autonomy in class. In that case, calling on the student might increase their sense of relatedness with faculty (because the faculty member has initiated a spontaneous interaction with them) and their perceived competence in class (when they find they are able to answer the question) but decrease perceived volitional autonomy in class because the student was not allowed to choose whether or not to answer the question. If this is the case, nonverbal supportive faculty behaviors may be positively related to perceived volitional autonomy in class because they are not as direct. These behaviors do not involve faculty asking a student to do something and do not usually even involve interacting directly with a student. Instead, nonverbal supportive behaviors involve speaking and interacting in ways that invite interest and engagement but do not demand a response (for example, using gestures or modulating voice tone).

Previous research linking student perceptions of faculty with perceived volitional autonomy in class has found consistent relations between the two (e.g., Chen & Jang, 2010); however, none of these studies have examined the construct of verbal supportive faculty behaviors specifically. Instead, they have measured variables like perceived instructor autonomy support (Chen & Jang, 2010), perceived instructor enthusiasm (Cui, Yao, & Zhang, 2017), and non-classroom interactions (Schenkenfelder, 2017), which may be behaviors that are more supportive of student autonomy than the verbal supportive faculty behaviors measured here. If this is the reason for the lack of significant relation between verbal supportive faculty behaviors and perceived volitional autonomy in class, it would suggest there are some positive faculty behaviors which support perceived volitional autonomy and some faculty behaviors which are also positive (because they support perceived competence in class and relatedness in class) but do not support perceived volitional autonomy in class. It will be important for future research to examine this possibility further.

Hypothesis 3 was partially supported as well. Perceived competence in class and relatedness in class predicted academic motivation. The relations between perceived competence in class, relatedness in class, and academic motivation provide support for the relations hypothesized by these variables in SDT (Deci & Ryan, 2000). The relation between perceived competence in class and academic motivation found in this study is more robust than the small to moderate relations between perceived competence in class and academic motivation found in past research (e.g., Kerssen-Griep et al., 2003; Maherzi, 2011). The relation between relatedness in class and academic motivation is consistent with previous research, that has found a relation between the two (Kerssen-Griep et al., 2003).

In contrast, perceived volitional autonomy in class did not significantly predict academic motivation. This finding is surprising given the theoretical relation between volitional autonomy and motivation in SDT: motivation that is more autonomous is more self-determined, more intrinsic, and leads to better outcomes of all kinds (Deci & Ryan, 1980, 1991). However, the lack of a significant relation between perceived volitional autonomy in class and academic motivation in this study is consistent with previous research, which at times has found no relation between perceived volitional autonomy and academic motivation (Chen & Jang, 2010) and at times has found a small to moderate relation between perceived volitional autonomy and academic motivation (Kerssen-Griep et al., 2003; Maherzi, 2011). The relation between perceived volitional autonomy in class and academic motivation was explored further in an additional analysis where perceived competence in the classroom was removed from the fully mediated model. A discussion of this additional analysis can be seen below.

Hypothesis 4 was supported. Academic motivation did significantly predict academic major satisfaction. This is in line with the relation SDT suggests should exist between the two and with previous research connecting motivation to positive outcomes for students. A core principle of SDT is that the more intrinsically motivated we are, the more successful and happier we will be with a variety of outcomes (Deci & Ryan, 2000). This is the first study to directly address a link between academic motivation and academic major satisfaction. Previous research has connected motivation to positive outcomes for students, including GPA (e.g., Bailey & Phillips, 2016; Guiffrida et al., 2013; Kusurkar, Ten Cate, Vos, Westers, & Croiset, 2013; Roksa & Whitley, 2017) and intention to persist in college (e.g., Guiffrida et al., 2013; Kusurkar et al., 2011).

It should be noted that one potential criticism of this finding would be to point out how high the relation between academic motivation and academic major satisfaction is ($\beta = .96$) and suggest that they are, as measured in this study, the same construct. This is a valid concern; there are some conceptual similarities between academic motivation and academic major satisfaction. Academic motivation addresses the extent to which a student feels a desire to complete tasks associated with their major. Academic major satisfaction addresses the extent to which a student enjoys being in their major. However, it should be considered first of all that this is the standardized beta weight, so some residual error has been removed, meaning the actual relation between the two may not be as large. More importantly, though, academic motivation was measured in such a way that it can be demonstrated that the entire construct does differ substantially from academic major satisfaction.

Academic motivation was measured using six subscales: amotivation, external motivation, negative introjection, positive introjection, identified motivation, and intrinsic motivation. When the individual subscales are correlated with academic major satisfaction, all correlations are significant at the $p < .001$ level, but differences can be seen in the effect size of those correlations (see Table 2). Correlations with academic major satisfaction range from .22 (positive introjection) to $r = -.80$ (amotivation). This suggests that there are some subscales which are measuring constructs conceptually similar to academic major satisfaction but also some subscales which are measuring constructs distinct from academic major satisfaction. Indeed, the highest correlations are with the subscales that are most conceptually similar to academic major satisfaction: intrinsic motivation (the desire to do something because you enjoy it) and amotivation (the lack of desire to do something). Intrinsic motivation is correlated with academic major satisfaction at $r = .69$, and amotivation is correlated with academic major

satisfaction at $r = -.80$. So there are some constructs contained within academic motivation which are conceptually similar to academic major satisfaction; however, there are also correlations which are significantly lower (positive introjection, $r = .22$; external motivation, $r = -.38$). This means that academic major satisfaction is a distinct construct from academic motivation as a whole because academic motivation is made up of both subscales which share some similarity to academic major satisfaction and subscales which are clearly distinct from academic major satisfaction.

Hypothesis 5 was partially supported. Verbal and nonverbal supportive faculty behaviors had an indirect effect on academic motivation through perceived competence in class. Verbal supportive faculty behaviors also had an indirect effect on academic motivation through relatedness in class. Generally, this suggests that how faculty in the classroom behave is related to the academic motivation of their students; however, this relation is indirect. In this model, faculty behaviors are indirectly related to academic motivation through student perceptions of competence in class and relatedness in class. No previous research has addressed the indirect relation of faculty behaviors on motivation through need satisfaction, but previous research has provided support for the general idea that the relation between supportive faculty behaviors and academic motivation is indirect through variables like classroom climate and perception of the instructor (Kelly et al., 2015; Lin et al., 2017). This finding extends that research, providing support for SDT, which states that the environment has an indirect impact on motivation through its impact on need satisfaction (Deci & Ryan, 2000). Previous research has provided evidence which suggested an indirect relation between the perception of supportive faculty behaviors (the environmental factor) and academic motivation. This finding not only clarified that the relation

between supportive faculty behaviors and academic motivation is indirect, but also found evidence that it is mediated by perceived competence in class and relatedness in class.

It is unclear why relatedness in class mediated the relation between faculty verbal behaviors and academic motivation but not nonverbal behaviors and academic motivation. The difference is likely due to a smaller relation between nonverbal behaviors and relatedness in class than between verbal behaviors and relatedness in class. The smaller relation between nonverbal behaviors and relatedness in class may be due to the kinds of behaviors that are being measured. Verbal supportive faculty behaviors, as measured by the VIS, include things like initiating discussions with students and using humor in class, which can be seen to be clearly and directly building a sense of relatedness in the classroom by engaging interpersonally with students. In contrast, nonverbal supportive faculty behaviors, as measured by the NIS, include things like making eye contact while speaking, gesturing while speaking, and using a variety of vocal expressions while speaking. These behaviors likely help students feel engaged in class and engage with the material being presented, but they do not involve connecting interpersonally in the same clear way that behaviors measured by the VIS do. Nonverbal supportive faculty behaviors may be less strongly related to relatedness in class than verbal supportive faculty behaviors because the nonverbal behaviors do not build interpersonal connectedness as directly.

Regarding perceived autonomy in class, the path to academic motivation was null, so no indirect effects could emerge. This null path is discussed in more detail in hypothesis 3 and also addressed in an additional analysis which removed perceived competence in class from the fully mediated model.

There is no previous research which addresses the indirect relations of faculty behaviors on academic motivation through need satisfaction in class. Because of this gap in research, it is

not clear whether the null indirect effects through perceived volitional autonomy in class and relatedness in class are an anomaly and not generalizable beyond this sample or whether these null indirect effects indicate that perceived volitional autonomy in class and relatedness in class do not mediate the relation between faculty behaviors and academic motivation. If the latter is true, then one implication is that perceived competence in class is the only consistent mediator between faculty behaviors (both verbal and nonverbal) and academic motivation. This is especially interesting considering that the faculty behaviors measured here were relatively subtle. The verbal behaviors included things like using students' names, providing feedback on work, and using humor in class. The nonverbal behaviors included things like using vocal variety, using gestures, and smiling. These simple, relatively subtle behaviors were related to students' perceptions of their own competence in class, which were related to students' level of motivation for their major.

Hypothesis 6 was partially supported. Perceived competence in class and relatedness in class indirectly predicted academic major satisfaction through academic motivation. As shown in the partially mediated model, the direct paths from perceived volitional autonomy in class, perceived competence in class, and relatedness in class to academic major satisfaction were null. These results are in line with what SDT predicts about the impact of need satisfaction on outcomes—that it should be indirect, through motivation, and suggest that it is important to include motivation as a mediator when studying the relation between need satisfaction and any outcome variable (Deci & Ryan, 2000).

Previous research has found the relation between need satisfaction and academic major satisfaction to be partially mediated by variables including social connectedness (Allen et al., 2008), GPA (Krumrei-Mancuso et al., 2013), and intrinsic motivation (Thomas, 2009). In this

study, the relations between perceived competence in class, relatedness in class, and academic major satisfaction were fully mediated; the indirect effects were the only effects. This may be because of the use of academic motivation as the mediator. One other study used intrinsic motivation as a mediator, and it partially mediated the relation between need satisfaction and academic major satisfaction; however, this study used a measure which captured the full range of motivation (not just intrinsic motivation), which may have allowed academic motivation to fully mediate the relation between need satisfaction and academic major satisfaction. Further research using this measure which captures the full range of motivation will need to be conducted in order to provide clarity about whether or not this is the case.

Perceived volitional autonomy in class did not indirectly predict academic major satisfaction through academic motivation in part because of the null path from autonomy to motivation. These findings, that perceived volitional autonomy did not predict academic major satisfaction through academic motivation, are surprising given the strong theoretical relation between academic motivation and perceived volitional autonomy. Previous research has addressed the relation between perceived volitional autonomy and academic motivation and found no relation (Chen & Jang, 2010) or small to moderate relations (Kerssen-Griep et al., 2003; Maherzi, 2011).

It is important to note that when perceived competence in class was removed from the model, the indirect path from perceived volitional autonomy in class to academic major satisfaction through motivation became significant. This suggests a more nuanced view, that the strong relation between perceived volitional autonomy in class and perceived competence in class means there is some shared variance in academic motivation that either of them could account for. Further study is warranted to gain a clearer understanding of where the two variables

overlap and differ in predicting variance in academic motivation before the indirect effects from the two variables to academic major satisfaction through academic motivation can be better understood.

Hypothesis 7 was partially supported. Perceived competence in class and academic motivation combined fully mediated the relation of verbal and nonverbal supportive faculty behaviors. Relatedness in class and academic motivation also fully mediated the relation of verbal supportive faculty behaviors and academic motivation but not nonverbal supportive faculty behaviors. SDT suggests that each of the three needs in class combined with academic motivation should fully explain the relationship between faculty behaviors and academic major satisfaction. Therefore, these results partially support SDT in that perceived competence in class and academic motivation should (and did) fully explain the relationships between supportive faculty behaviors and academic major satisfaction, and relatedness in class and academic motivation should (and did) fully explain the relationships between supportive faculty behaviors and academic major satisfaction (Deci & Ryan, 2000).

This is the first study to examine the relation between faculty behaviors and academic major satisfaction using the full SDT model, which includes both need satisfaction and academic motivation. This means there is not a clear framework of previous research with which to understand these findings. However, previous research has found that student interactions with faculty have an indirect relation with academic major satisfaction through perceived competence and perceived volitional autonomy (Schenkenfelder, 2017). There is also evidence that the relation between supportive faculty behaviors and other academic outcomes (such as perceived learning) is mediated by academic motivation (Pribyl et al., 2004). This study extends these findings by providing evidence that perceived competence in class and academic motivation

combined and relatedness in class and motivation combined fully mediate the relation between faculty behaviors and academic major satisfaction.

The absence of significant links between perceived volitional autonomy in class and both verbal supportive faculty behaviors and academic motivation was surprising. The findings are counter to SDT's assertion of the role of volitional autonomy in class as a mediator. These findings are also counter to other research which has found consistent relations between perceived volitional autonomy and other kinds of positive perceptions of faculty (Chen & Jang, 2010; Cui, Yao, & Zhang, 2017; Schenkenfelder, 2017). These findings are more consistent with previous research which has at times found null relations between perceived volitional autonomy and academic motivation (Chen & Jang, 2010) and at times found a small to moderate relation between perceived volitional autonomy and academic motivation (Kerssen-Griep et al., 2003; Maherzi, 2011).

Additional Analyses

Controlling for actual competence. Additional analyses also provided interesting insight to the results. Grade point average was added to the fully mediated model in order to control for the effects of actual competence on academic motivation and academic major satisfaction. It was expected that GPA would likely have some relation with academic motivation and academic major satisfaction and might even account for some of the variance predicted by perceived competence in academic motivation.

This was not the case. GPA predicted neither academic motivation nor academic major satisfaction. This suggests that the perception of competence is more important than actual success. It may be that no matter how successful a student actually is, if they view themselves as incompetent, they will be less motivated. And vice versa, if a student believes they are good at

the tasks their major requires of them, it may not matter how poorly they actually perform; they will continue to be motivated.

It is important to note, though, that the lack of relation between GPA and academic motivation and academic major satisfaction found here may be due to external factors. Self-reported GPA may not be the best measure of actual competence for a number of reasons. One is simply that students may be uncertain of their cumulative GPA at any given point in time. They may be estimating it, leading to less variance (because they reported a 3.7 instead of a 3.73) or to inaccuracy due to biased estimations (if someone sees herself as successful, she may estimate her GPA as higher than it actually is). Additionally, cumulative GPA may not be directly related enough to a student's experience in a major. For example, their GPA may be relatively high because of success in general education classes instead of success in classes within their major. These limitations should temper the understanding of the relation between perceived competence, actual competence, and academic motivation suggested in this study.

Removal of perceived competence in class from the model. A second additional analysis was conducted because of the strong relation between perceived volitional autonomy in class and competence in class ($\rho = .60$). A model which did not include perceived competence in class, shown in Figure 6, was examined. In this new analysis, perceived volitional autonomy in class emerged as a significant predictor of academic motivation. In the original model, this path was not significant, as shown in Figure 3. Additionally, three indirect paths emerged which were also nonsignificant in the original model: first, an indirect effect from perceived volitional autonomy in class to academic major satisfaction through academic motivation; second, an indirect effect from nonverbal supportive faculty behaviors to academic motivation through perceived volitional autonomy in class; and last, an indirect effect from nonverbal supportive

faculty behaviors to academic major satisfaction though perceived volitional autonomy in class combined with academic motivation.

The variance accounted for in academic motivation in the original model versus the model without perceived competence in class was 27% versus 17%. Although more variance was accounted for in the model which included perceived competence in class than in the model without perceived competence in class, in both models the amount of variance accounted for was significant at the $p < .01$ level. This suggests that there is shared variance in academic motivation that either perceived volitional autonomy in class or perceived competence in class could account for in the model, and removing perceived competence in class from the model allowed perceived volitional autonomy to account for that variance.

This suggests a more nuanced understanding than simply concluding perceived volitional autonomy in class is irrelevant for understanding academic motivation. Instead, it is likely perceived volitional autonomy in class and perceived competence in class are closely enough related that the amount of shared variance they both predict in academic motivation is relatively high. It is easy to see how feeling confident in your academic abilities and feeling able to accomplish tasks the way you want to are closely connected. It is important to consider that this finding may not be generalizable beyond an academic environment, because the academic environment provides different kinds of incentives (grades, getting a good job when you graduate) than, for example, a job environment (where incentives might include money or a promotion).

It is interesting to note that one path involving perceived volitional autonomy in class did not change from the model which included perceived competence in class to the model which did not include perceived competence in class. Namely, the path from verbal supportive faculty

behaviors remained nonsignificant in both models. Removing perceived competence in class from the model allowed perceived volitional autonomy in class to significantly relate (directly and indirectly) to the other variables it would be expected to relate to (academic motivation, academic major satisfaction); however, this did not allow perceived volitional autonomy in class to significantly relate to verbal supportive faculty behaviors. This provides support for the explanation of the null relation between verbal supportive faculty behaviors and perceived volitional autonomy in class suggested above (see the discussion for hypothesis 2), as opposed to the null relation being the result of error variance.

Adjusted position of faculty behaviors and psychological needs. A final additional analysis was conducted wherein the original fully mediated model was adjusted such that faculty behaviors and psychological needs changed places within the model. In the adjusted model, psychological needs in class (perceived volitional autonomy, perceived competence, relatedness) predicted perceptions of faculty behaviors (verbal supportive faculty behaviors, nonverbal supportive faculty behaviors), which predicted academic motivation, which predicted academic major satisfaction. This model did not provide a good fit to the data. This alternative model for understanding the relations between the variables under consideration in this study was not a good fit and so did not provide a viable alternative to the original SDT model of the relations between variables. This does not mean that there couldn't be another model of the relations between the variables under consideration in this study which would provide a viable alternative to the SDT model examined here, only that this particular model was not that viable alternative.

Conclusions. This was the first study to examine relations between all the variables included here: verbal and nonverbal supportive faculty behaviors, need satisfaction in class (perceived volitional autonomy in class, perceived competence in class, relatedness in class),

academic motivation, and academic major satisfaction. There is previous research addressing variables related to those used in this study. This study attempted to clarify the relationships found in previous research and to expand those findings.

Of greatest interest in this study was the relation between supportive faculty behaviors and academic major satisfaction. There is no previous research which involves these two variables, although there is previous research which has found both direct (Witt et al., 2004) and indirect (e.g., Schenkenfelder, 2017) relations between variables which are conceptually related to supportive faculty behaviors and academic major satisfaction. This study used the framework of SDT to clarify the relation between the two, and found that the relation between supportive faculty behaviors and academic major satisfaction was indirect, fully mediated by some need satisfaction variables and by academic motivation. Specifically, verbal supportive faculty behaviors indirectly predicted academic major satisfaction through two paths: perceived competence in class and motivation combined, and relatedness in class and motivation combined. Nonverbal supportive faculty behaviors indirectly predicted academic major satisfaction through perceived competence in class and motivation combined. These findings confirm that supportive faculty behaviors are indirectly related to academic major satisfaction and clarify the mechanism by which that relation exists.

The ways in which verbal supportive faculty behaviors and nonverbal supportive faculty behaviors differed in this study are interesting to note. The relation between verbal supportive faculty behaviors and perceived volitional autonomy in class was null, whereas the relation between nonverbal supportive faculty behaviors and perceived volitional autonomy in class was significant. The null path from verbal supportive faculty behaviors to perceived volitional autonomy remained in class even when perceived competence in class was removed from the

model. Additionally, verbal supportive faculty behaviors had a significant indirect relation with academic motivation through relatedness in class, and with academic major satisfaction through relatedness in class and academic motivation combined. Nonverbal supportive faculty behaviors did not have a significant indirect relation with academic motivation through relatedness in class, or with academic major satisfaction through relatedness in class and academic motivation combined. The differences in how the two types of supportive faculty behaviors relate to the different kinds of need satisfaction are likely due to the fact that verbal supportive faculty behaviors and nonverbal supportive faculty behaviors are qualitatively different types of behaviors. Verbal supportive faculty behaviors, as measured by the VIBS, involve speaking directly with students about themselves and things they are interested in and asking them to actively engage in class. Nonverbal supportive faculty behaviors, as measured by the NIS, involve speaking in a way that is interesting and engaging but does not necessarily require direct interaction with, or response from, students. This highlights the idea that different types of faculty behaviors in the classroom may lead to different needs being satisfied.

Implications

The main analyses in this study support the idea that faculty behavior in the classroom has an impact on students' satisfaction with their major; however, this impact is not direct. Supportive faculty behaviors in the classroom appear to relate directly to need satisfaction in the classroom and indirectly to academic motivation and academic major satisfaction. These results have implications for those in the university setting who want students to have a positive, successful college experience. This includes faculty, the people who train faculty to teach, and counseling psychologists who work with college students struggling with vocational concerns.

The takeaways for faculty and those who train them to teach are relatively straightforward. Faculty behaviors in the classroom are related to students' academic motivation and academic major satisfaction, outcomes which have value in and of themselves but which are also related to student success and retention (Nauta, 2007; Robbins et al., 2004). These outcomes are related to student perceptions of need satisfaction in class—in this study, perceived competence in class and relatedness in class. This suggests faculty should strive not just to teach material accurately but also to engage with students in ways that support their feelings of being competent and connected with faculty.

This study does not suggest that faculty lie to students, telling them they are competent when they are not, or forgo teaching the material to strengthen relatedness by playing team-building games, or any of the other things faculty fear they are being asked to do when it is suggested they take the student experience into account. Instead, it suggests faculty engage in nonverbal behaviors like using gestures and modulating voice tone which help students get interested and stay engaged with class material. It also suggests faculty be intentional about the ways in which they engage with their students verbally. The verbal behaviors in this study included things like calling on students even when they do not raise their hands and discussing topics the class seems to be interested in, even if it was not part of the original lesson plan. In short, these results suggest there are good outcomes associated with faculty making an effort to encourage their students to be engaged in class and invite students in through the way they speak and what they say to students.

Finally, these results suggest counseling psychologists helping college students with vocational concerns may want to attend to the academic environment their clients are working in. A lack of faculty support in classes could be part of why any given client is struggling in their

major. It is important to recognize the importance of attending not just to finding a major that matches a client's interests or values but also to validating and navigating difficulties a client might be having due to the academic environment. It is important to help clients identify when their difficulty in a major is due to a lack of interest, so they can switch to a major they are interested in, and when their difficulty in a major is due to lack of environmental support, so they can develop strategies for pursuing their interests despite the lack of support.

In this process, it is important to recognize the confusion that may result from the fact that the relation between faculty behaviors and academic major satisfaction is indirect. Because this relation is indirect, clients may have difficulty recognizing that this aspect of the environment is related to a lack of satisfaction. The results of this study suggest that if a client does not feel motivated in their major, or if a client seems to feel they do not have volitional autonomy in class, are not competent, or are lacking relatedness in their classes, there might be benefit in the counselor asking about how the client perceives the faculty in the classes they are taking. The evidence in this study suggests that student perceptions of supportive faculty behaviors may be directly related to need satisfaction and indirectly related to academic motivation, so asking about their experiences with faculty in the classroom might provide additional insight into the client's experience. This insight can then drive decisions about which interventions may be most useful.

The strategies for helping a client find a new major when they are simply uninterested in their major are different from the strategies for helping a client make a decision about what to do when their academic environment is contributing to their dissatisfaction with their major. When a client is uninterested in their major, the focus is on finding a major they are interested in or a career path they are interested in, so a major can be identified that is related to that career path.

When navigating a situation where the difficulty is related to the academic environment, strategies might include helping the client find support outside the classroom (by reaching out to faculty outside the classroom or connecting with other students or tutors) or developing ways for the client to build a sense of autonomy, competence, and relatedness in class independently. If these strategies are ineffective or a client is nearing graduation and simply wants to make the best of a bad situation, mindfulness strategies for tolerating unpleasant situations, such as those developed in Acceptance and Commitment Therapy, also might be effective (Hayes, Strosahl, & Wilson, 1999). Alternately, a client might choose not to continue in a major where they do not feel supported. The counselor might then help the student research whether they would have a similar experience in the same major if they transferred to another college or university, or help them explore whether there is another major at the same college or university which would allow them to continue studying what they are interested in or would allow them to pursue a similar career path.

Limitations

In addition to the limitations discussed above regarding use of self-reported GPA as a measure of actual competence, this study is limited in terms of its generalizability. About 75% of the sample is made up of female students, and about 83% of the sample identified as white/Caucasian. Moreover, the students are from a large research-focused university. It is important to recognize that different types of students have different experiences in college (Allen, 1992; Wilds, 2000). It should not be assumed, for example, that because the faculty behaviors we measured predicted need satisfaction with this sample, those behaviors will predict need satisfaction in all samples. People coming from one type of cultural context might interpret

those behaviors as supportive and positive, but others coming from another cultural context might find them odd or off-putting.

Along with lower generalizability due to the demographics of the sample, it is important to consider that these results may not be generalizable beyond the context of a large research-focused university. Although faculty behaviors likely have an impact on academic outcomes (including academic major satisfaction) no matter what type of college a person attends, it may be that in different contexts, there are different behaviors that have more of an impact. For example, at a small liberal arts college, students may expect more interaction with faculty outside of the classroom, so in that context, it may be important to examine faculty behaviors both inside and outside of the classroom.

Additionally, this study focused on student reports of their own experiences. From this study, we can learn about how students perceive faculty behaviors and how those perceptions are related to need satisfaction, academic motivation, and academic major satisfaction. Student perceptions are not the same thing as objective reality, however. This study does not provide evidence about the impact of actual faculty behaviors on student need satisfaction and outcomes.

Finally, this study was cross-sectional, and no causal conclusions can be made. This study provides evidence that students who perceive more supportive faculty behaviors are also more likely to have higher academic major satisfaction, but it does not provide evidence that if faculty increase the number of supportive behaviors they use in the class, students will become more satisfied.

Future Directions

As discussed above, one limitation of this study is its generalizability. In order to generalize the findings beyond this sample, future research will need to address this problem by conducting similar studies in a variety of settings and with a variety of populations.

Further research addressing the relation between academic motivation and academic major satisfaction also would be warranted. The large relation between the two variables in the structural equation model suggests there may be overlap in the two concepts. This relation is complicated by the fact that the correlations between academic major satisfaction and the subscales in the C-RAI differed substantially, ranging from $r = .22$ to $r = -.80$. This suggests that the subscales of the C-RAI may not relate to academic major satisfaction in consistent ways. The relation between the subscales of this measure and academic major satisfaction should be explored further in future research.

In addition, as discussed above, this study addresses student perceptions of faculty behaviors, not the objective reality of how faculty are behaving. It would be interesting to conduct a study where trained raters attend classes and the students in those classes are asked to report on their need satisfaction, academic motivation, and academic major satisfaction. This would provide more concrete information on what is different between classrooms where students feel a sense of need satisfaction and classrooms where they do not feel a sense of need satisfaction.

This approach would also provide evidence about the potential difference between the perceptions of faculty behavior and the actual faculty behavior. It is possible that, as with perceived competence and actual competence, student perceptions of faculty are more salient than faculty's actual behavior.

One final area for future exploration would be integrating additional outcomes that drive decision making for students and universities. There would be value in gathering longitudinal data about graduation rates or post-graduation job satisfaction. The current study provides insight into how faculty behaviors relate to the experience of students while they are in college. This is valuable, but a longitudinal approach measuring outcomes such as graduation rates or job satisfaction would provide information about how faculty behaviors during college may contribute to outcomes past college.

REFERENCES

- Allen, J. L., Long, K. M., O'Mara, J., & Judd, B. B. (2008). Students' predispositions and orientations toward communication and perceptions of instructor reciprocity and learning. *Communication Education, 57*(1), 20-40. doi:10.1080/03634520701670908
- Allen, J., Robbins, S. B., Casillas, A., & Oh, I. (2008). Third-year college retention and transfer: Effects of academic performance, motivation, and social connectedness. *Research in Higher Education, 49*(7), 647-664.
- Allen, W. R. (1992). The color of success: African-American college student outcomes at predominantly white and historically black public colleges and universities. *Harvard Educational Review, 62*(1), 26-44.
- An, B. P. (2015). The role of academic motivation and engagement on the relationship between dual enrollment and academic performance. *Journal of Higher Education, 86*(1), 98-126.
- Bailey, T. H., & Phillips, L. J. (2016). The influence of motivation and adaptation on students' subjective well-being, meaning in life and academic performance. *Higher Education Research and Development, 35*(2), 201-216.
- Balwant, P. T. (2016). Transformational instructor-leadership in higher education teaching: A meta-analytic review and research agenda. *Journal of Leadership Studies, 9*(4), 20-42. doi:10.1002/jls.21423
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215. doi:10.1037/0033-295X.84.2.191
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: W H Freeman/Times Books/Henry Holt & Co.
- Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin, 117*(3), 497-529.
- Burroughs, N. F. (2007). A reinvestigation of the relationship of teacher nonverbal immediacy and student compliance-resistance with learning. *Communication Education, 56*(4), 453-475.
- Cakir, S. G. (2015). The effects of teacher immediacy and student burnout on empowerment and resistance among Turkish pre-service teachers. *Learning and Individual Differences, 40*, 170-175. doi:10.1016/j.lindif.2015.05.002
- Cerasoli, C. P., Nicklin, J. M., & NassreIrgawi, A. S. (2016). Performance, incentives, and needs for autonomy, competence, and relatedness: A meta-analysis. *Motivation and Emotion, 40*(6), 781-813. doi:10.1007/s11031-016-9578-2

- Chen, K., & Jang, S. (2010). Motivation in online learning: Testing a model of self-determination theory. *Computers in Human Behavior, 26*(4), 741-752. doi:10.1016/j.chb.2010.01.011
- Chesebro, J. L., & McCroskey, J. C. (2001). The relationship of teacher clarity and immediacy with student state receiver apprehension, affect and cognitive learning. *Communication Education, 50*(1), 59-68. doi:10.1080/03634520109379232
- Chou, C.-P., & Bentler, P. M. (1995). Estimates and tests in structural equation modeling. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues, and applications* (pp. 37– 54). Thousand Oaks, CA: Sage, 1995.
- Christensen, L. J., & Menzel, K. E. (1998). The linear relationship between student reports of teacher immediacy behaviors and perceptions of state motivation, and of cognitive, affective and behavioral learning. *Communication Education, 47*(1), 82-90. doi:10.1080/03634529809379112
- Christophel, D. M. (1990). The relationships among teacher immediacy behaviors, student motivation, and learning. *Communication education, 39*(4), 323-340.
- Cokley, K. (2000). Perceived faculty encouragement and its influence on college students. *Journal of College Student Development, 41*(3), 348-352.
- Cokley, K., Komarraju, M., Patel, N., Castillon, J., Rosales, R., Pickett, R., . . . Pang, L. (2004). Construction and initial validation of the student-professor interaction scale. *College Student Affairs Journal, 24*(1), 32-50.
- Creasey, G., Jarvis, P., & Gadke, D. (2009). Student attachment stances, instructor immediacy, and student-instructor relationships as predictors of achievement expectancies in college students. *Journal of College Student Development, 50*(4), 353-372.
- Credé, M., & Phillips, L. A. (2011). A meta-analytic review of the motivated strategies for learning questionnaire. *Learning and Individual Differences, 21*(4), 337-346. doi:10.1016/j.lindif.2011.03.002
- Cui, G., Yao, M., & Zhang, X. (2017). The dampening effects of perceived teacher enthusiasm on class-related boredom: The mediating role of perceived autonomy support and task value. *Frontiers in Psychology, 8*, 11.
- Dahling, J. J., & Thompson, M. N. (2012). Detrimental relations of maximization with academic and career attitudes. *Journal of Career Assessment, 21*(2), 278-294. doi:10.1177/1069072712471322
- Crisp, G., & Cruz, I. (2009). Mentoring college students: A critical review of the literature between 1990 and 2007. *Research in Higher Education, 50*(6), 525-545.
- Deci, E. L., & Ryan, R. M. (1980). The empirical exploration of intrinsic motivational processes. *Advances in Experimental Social Psychology, 13*, 39-80.

- Deci, E. L., & Ryan, R. M. (1991). A motivational approach to self: Integration in personality. *Nebraska Symposium on Motivation: Perspectives on Motivation*, 38, 237-288.
- Deci, E. L., Vallerand, R. J., Pelletier, L. G., & Ryan, R. M. (1991). Motivation and education: The self-determination perspective. *Educational Psychologist*, 26(3-4), 325-346. doi:10.1207/s15326985ep2603&4_6
- Deemer, E. D. (2015). Women's science major satisfaction: Regulatory focus and the critical mass hypothesis. *Journal of Career Development*, 42(1), 60-71. doi:10.1177/0894845314543190
- Fallah, N. (2014). Willingness to communicate in English, communication self-confidence, motivation, shyness and teacher immediacy among Iranian English-major undergraduates: A structural equation modeling approach. *Learning and Individual Differences*, 30, 140-147.
- Filak, V. F., & Sheldon, K. M. (2003). Student psychological need satisfaction and college teacher-course evaluations. *Educational Psychology*, 23(3), 235-247. doi:10.1080/0144341032000060084
- Finn, A. N., & Schrodtt, P. (2012). Students' perceived understanding mediates the effects of teacher clarity and nonverbal immediacy on learner empowerment. *Communication Education*, 61(2), 111-130.
- Galvan, M. (2017). Learning for earning: Relating extrinsic motivation to academic commitment (Order No. 10277038). Available from ProQuest Dissertations & Theses Global: Health & Medicine; ProQuest Dissertations & Theses Global: Social Sciences. (1906303421).
- Garriott, P. O., Hudyma, A., Keene, C., & Santiago, D. (2015). Social cognitive predictors of first- and non-first-generation college students' academic and life satisfaction. *Journal of Counseling Psychology*, 62(2), 253.
- Goodboy, A. K., Weber, K., & Bolkan, S. (2009). The effects of nonverbal and verbal immediacy on recall and multiple student learning indicators. *Journal of Classroom Interaction*, 44(1), 4-12.
- Gorham, J. (1998). The relationship between verbal teacher immediacy behaviors and student learning. *Communication Education*, 37(1), 40-53. doi:10.1080/03634528809378702
- Guay, F., Ratelle, C., Larose, S., Vallerand, R. J., & Vitaro, F. (2013). The number of autonomy-supportive relationships: Are more relationships better for motivation, perceived competence, and achievement? *Contemporary Educational Psychology*, 38(4), 375-382. doi:10.1016/j.cedpsych.2013.07.005
- Guiffrida, D. A., Lynch, M. F., Wall, A. F., & Abel, D. S. (2013). Do reasons for attending college affect academic outcomes? A test of a motivational model from a self-determination theory perspective. *Journal of College Student Development*, 54(2), 121-139. doi:10.1353/csd.2013.0019

- Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (1999). *Acceptance and commitment therapy: An experiential approach to behavior change*. New York, NY: Guilford Press.
- Houser, M. L., & Frymier, A. B. (2009). The role of student characteristics and teacher behaviors in students' learner empowerment. *Communication Education, 58*(1), 35-53.
- Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1-55.
- Jadidian, A., & Duffy, R. D. (2012). Work volition, career decision, self-efficacy, and academic satisfaction: An examination of mediators and moderators. *Journal of Career Assessment, 20*(2), 154-165. doi:10.1177/1069072711420851
- Kelly, S., Rice, C., Wyatt, B., Ducking, J., & Denton, Z. (2015). Teacher immediacy and decreased student quantitative reasoning anxiety: The mediating effect of perception. *Communication Education, 64*(2), 171-186. doi:10.1080/03634523.2015.1014383
- Kerssen-Griep, J., Hess, J. A., & Trees, A. R. (2003). Sustaining the desire to learn: Dimensions of perceived instructional facework related to student involvement and motivation to learn. *Western Journal of Communication, 67*(4), 357-381. doi:10.1080/10570310309374779
- Komarraju, M., Musulkin, S., & Bhattacharya, G. (2010). Role of student-faculty interactions in developing college students' academic self-concept, motivation, and achievement. *Journal of College Student Development, 51*(3), 332-342.
- Krumrei-Mancuso, E., Newton, F. B., Kim, E., & Wilcox, D. (2013). Psychosocial factors predicting first-year college student success. *Journal of College Student Development, 54*(3), 247-266.
- Kusurkar, R. A., Ten Cate, T. J., van Asperen, M., & Croiset, G. (2011). Motivation as an independent and a dependent variable in medical education: A review of the literature. *Medical Teacher, 33*(5), e242-e262. doi:10.3109/0142159X.2011.558539
- Kusurkar, R. A., Ten Cate, T. J., Vos, M. C., Westers, P., & Croiset, G. (2013). How motivation affects academic performance: A structural equation modelling analysis. *Advances in Health Sciences Education, 18*(1), 57-69.
- LaBelle, S., Martin, M. M., & Weber, K. (2013). Instructional dissent in the college classroom: Using the instructional beliefs model as a framework. *Communication Education, 62*(2), 169-190.
- Larson, L. M., Toulouse, A. L., Ngumba, W. E., Fitzpatrick, L. A., & Heppner, P. P. (1994). The development and validation of coping with career indecision. *Journal of Career Assessment, 2*(2), 91-110.
- Leach, J. K., & Patall, E. A. (2013). Maximizing and counterfactual thinking in academic major decision making. *Journal of Career Assessment, 21*(3), 414-429. doi:10.1177/1069072712475178

- Lin, Y., Durbin, J. M., & Rancer, A. S. (2017). Perceived instructor argumentativeness, verbal aggressiveness, and classroom communication climate in relation to student state motivation and math anxiety. *Communication Education*, 66(3), 330-349. doi:10.1080/03634523.2016.1245427
- Little, R. J. A. (1988). A test of missing completely at random for multivariate data with missing values. *Journal of the American Statistical Association*, 83, 1198–1202. doi:10.2307/2290157
- Long, J. D., Gaynor, P., Erwin, A., & Williams, R. L. (1994). The relationship of self-management to academic motivation, study efficiency, academic satisfaction, and grade point average among prospective education majors. *Psychology: A Journal of Human Behavior*, 31(1), 22-30.
- Maherzi, S. (2011). Perceptions of classroom climate and motivation to study English in Saudi Arabia: Developing a questionnaire to measure perceptions and motivation. *Electronic Journal of Research in Educational Psychology*, 9(2), 765-798.
- Martin, A. J., & Dowson, M. (2009). Interpersonal relationships, motivation, engagement, and achievement: Yields for theory, current issues, and educational practice. *Review of Educational Research*, 79(1), 327-365.
- Mazer, J. P., & Stowe, S. A. (2016). Can teacher immediacy reduce the impact of verbal aggressiveness? Examining effects on student outcomes and perceptions of teacher credibility. *Western Journal of Communication*, 80(1), 21-37. doi:10.1080/10570314.2014.943421
- McCroskey, J. C., Richmond, V. P., & Bennett, V. E. (2006). The relationships of student end-of-class motivation with teacher communication behaviors and instructional outcomes. *Communication Education*, 55(4), 403-414. doi: 10.1080/03634520600702562
- McIlveen, P., Beccaria, G., & Burton, L. J. (2013). Beyond conscientiousness: Career optimism and satisfaction with academic major. *Journal of Vocational Behavior*, 83, 229-236. <http://dx.doi.org/10.1016/j.jvb.2013.05.005>
- McIlveen, P., Burton, L. J., & Beccaria, G. (2013). A short form of the career futures inventory. *Journal of Career Assessment*, 21(1), 127-138. doi:10.1177/1069072712450493
- Mueller, R. O. (1997). Structural equation modeling: Back to basics. *Structural Equation Modeling*, 4(4), 353-369. doi: 10.1080/10705519709540081
- Muthén, L. K., & Muthén, B. O. (2012). *Mplus user's guide* (7th ed.). Los Angeles, CA: Muthén & Muthén.
- Myers, S. A., Goldman, Z. W., Atkinson, J., Ball, H., Carton, S. T., Tindage, M. F., & Anderson, A. O. (2016). Student civility in the college classroom: Exploring student use and effects of classroom citizenship behavior. *Communication Education*, 65(1), 64-82. doi:10.1080/03634523.2015.1061197

- Myers, S. A., & Goodboy, A. K. (2014). College student learning, motivation, and satisfaction as a function of effective instructor communication behaviors. *Southern Communication Journal*, 79(1), 14-26.
- Nauta, M. M. (2007). Assessing college students' satisfaction with their academic majors. *Journal of Career Assessment*, 15, 446-462. doi:10.1177/1069072707305762
- Newman, C. B., Wood, J. L., & Harris, F. III (2015). Black men's perceptions of sense of belonging with faculty members in community colleges. *Journal of Negro Education*, 84(4), 564-577. doi:10.7709/jnegroeducation.84.4.0564
- Paradnikė, K., & Bandzevičienė, R. (2015). Autonomy as a personal resource for students occupational well-being. *International Journal of Psychology: A Biopsychosocial Approach / Tarptautinis Psichologijos Žurnalas: Biopsichosocialinis Požiūris*, 17, 97-115. doi:10.7220/2345-024X.17.6
- Park, H. S., Lee, S. A., Yun, D., & Kim, W. (2009). The impact of instructor decision authority and verbal and nonverbal immediacy on Korean student satisfaction in the US and South Korea. *Communication Education*, 58(2), 189-212.
- Pascarella, E. T., & Terenzini, P. T. (2005). *How college affects students: A third decade of research* (Vol. 2). Indianapolis, IN: Jossey-Bass.
- Patall, E. A., Cooper, H., & Robinson, J. C. (2008). The effects of choice on intrinsic motivation and related outcomes: A meta-analysis of research findings. *Psychological Bulletin*, 134(2), 270-300. doi:10.1037/0033-2909.134.2.270
- Pesch, K. M., Larson, L. M., & Surapaneni, S. (2015). Parental autonomy support and career well-being: Mediating effects of perceived academic competence and volitional autonomy. *Journal of Career Assessment*, 1-16. doi:10.1177/1069072715599392
- Preacher, K., & Hayes, A. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40, 879-891. doi:10.3758/BRM.40.3.879
- Pribyl, C. B., Sakamoto, M., & Keaten, J. A. (2004). The relationship between nonverbal immediacy, student motivation, and perceived cognitive learning among Japanese college students. *Japanese Psychological Research*, 46(2), 73-85. doi:10.1111/j.0021-5368.2004.00238.x
- Richardson, M., Abraham, C., & Bond, R. (2012). Psychological correlates of university students' academic performance: A systematic review and meta-analysis. *Psychological Bulletin*, 138(2), 353-387. doi:10.1037/a0026838
- Richmond, V. P., McCroskey, J. C., & Johnson, A. D. (2003). Development of the nonverbal immediacy scale (NIS): Measures of self-and other-perceived nonverbal immediacy. *Communication Quarterly*, 51(4), 504-517.

- Robbins, S. B., Lauver, K., Le, H., Davis, D., Langley, R., & Carlstrom A. (2004). Do psychosocial and study skill factors predict college outcomes? A meta-analysis. *Psychological Bulletin*, 130, 261-288. doi:10.1037/0033-2909.130.2.261
- Roksa, J., & Whitley, S. E. (2017). Fostering academic success of first-year students: Exploring the roles of motivation, race, and faculty. *Journal of College Student Development*, 58(3), 333-348.
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1), 68-78. doi:10.1037/110003-066X.55.1.68
- Schenkenfelder, M. C. (2017). Predicting academic major satisfaction using environmental factors and self-determination theory (Master's thesis). Retrieved from ProQuest Dissertations & Theses Global.
- Schlomer, G. L., Bauman, S., & Card, N. A. (2010). Best practices for missing data management in counseling psychology. *Journal of Counseling Psychology*, 57(1), 1-10. doi:10.1037/a0018082
- Sheldon, K. M., Osin, E. N., Gordeeva, T. O., Suchkov, D. D., & Sychev, O. A. (2017). Evaluating the dimensionality of self-determination theory's relative autonomy continuum. *Personality and Social Psychology Bulletin*, 43(9), 1215-1238. doi:10.1177/0146167217711915
- Sovet, L., Park, M. S.-A., & Jung, S. (2014). Validation and psychometric properties of academic major satisfaction scale among Korean college students. *Social Indicators Research*, 119, 1121-1131. doi:10.1007/s11205-013-0537-y
- Stolk, J., & Harari, J. (2014). Student motivations as predictors of high-level cognitions in project-based classrooms. *Active Learning in Higher Education*, 15(3), 231-247. doi:10.1177/1469787414554873
- Strayhorn, T. L. (2010). Majority as temporary minority: Examining the influence of faculty-student relationships on satisfaction among white undergraduates at historically black colleges and universities. *Journal of College Student Development*, 51(5), 509-524. doi:10.1353/csd.2010.0007
- Strayhorn, T. L. (2012). Satisfaction and retention among African American men at two-year community colleges. *Community College Journal of Research and Practice*, 36(5), 358-375.
- Tabachnick, B. D., & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed.). Needham Heights, MA: Allyn & Bacon.

- Taylor, G., Jungert, T., Mageau, G. A., Schattke, K., Dedic, H., Rosenfield, S., & Koestner, R. (2014). A self-determination theory approach to predicting school achievement over time: The unique role of intrinsic motivation. *Contemporary Educational Psychology*, 39(4), 342-358.
- Thomas, D. M., Love, K. M., Roan-Belle, C., Tyler, K. M., Brown, C. L., & Garriott, P. O. (2009). Self-efficacy, motivation, and academic adjustment among African American women attending institutions of higher education. *Journal of Negro Education*, 159-171.
- Titsworth, S., McKenna, T. P., Mazer, J. P., & Quinlan, M. M. (2013). The bright side of emotion in the classroom: Do teachers' behaviors predict students' enjoyment, hope, and pride? *Communication Education*, 62(2), 191-209.
- Trenshaw, K. F., Revelo, R. A., Earl, K. A., & Herman, G. L. (2016). Using self-determination theory principles to promote engineering students' intrinsic motivation to learn. *International Journal of Engineering Education*, 32(3), 1194-1207.
- Trolian, T. L., Jach, E. A., Hanson, J. M., & Pascarella, E. T. (2016). Influencing academic motivation: The effects of student-faculty interaction. *Journal of College Student Development*, 57(7), 810-826. doi:10.1353/csd.2016.0080
- Turner, E. A., Chandler, M., & Heffer, R. W. (2009). The influence of parenting styles, achievement motivation, and self-efficacy on academic performance in college students. *Journal of College Student Development*, 50(3), 337-346.
- Umbach, P. D., & Porter, S. R. (2002). How do academic departments impact student satisfaction?: Understanding the contextual effects of departments. *Research in Higher Education*, 43(2), 209-234.
- Vallade, J. I., & Malachowski, C. M. (2015). Instructor misbehavior and forgiveness: An examination of student communicative outcomes in the aftermath of instructor misbehavior. *Communication Education*, 64(3), 301-324.
- Vallerand, R. J. (1997). Toward a hierarchical model of intrinsic and extrinsic motivation. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 29, pp. 271-360). San Diego, CA: Academic Press. doi:10.1016/S0065-2601(08)60019-2
- Vallerand, R. J., Pelletier, L. G., Blais, M. R., Brière, N. M., Senecal, C., & Vallières, E. F. (1992). The academic motivation scale: A measure of intrinsic, extrinsic, and amotivation in education. *Educational and Psychological Measurement*, 52(4), 1003-1017. doi:10.1177/0013164492052004025
- Vallerand, R. J., & Ratelle, C. F. (2002). Intrinsic and extrinsic motivation: A hierarchical model. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 37-63). Rochester, NY: University of Rochester Press.

- Van den Broeck, A., Vansteenkiste, M., De Witte, H., Soenens, B., & Lens, W. (2010). Capturing autonomy, competence, and relatedness at work: Construction and initial validation of the work-related basic need satisfaction scale. *Journal of Occupational and Organizational Psychology*, 83(4), 981-1002. doi:10.1348/096317909X481382
- Wach, F., Karbach, J., Ruffing, S., Brünken, R., & Spinath, F. M. (2016). University students' satisfaction with their academic studies: Personality and motivation matter. *Frontiers in Psychology*, 7, 12.
- Wei, F. F., & Wang, K. Y. (2010). Students' silent messages: Can teacher verbal and nonverbal immediacy moderate student use of text messaging in class? *Communication Education*, 59(4), 475-496.
- Wheless, V. E., Witt, P. L., Maresh, M., Bryand, M. C., & Schrodt, P. (2011). Instructor credibility as a mediator of instructor communication and students' intent to persist in college. *Communication Education*, 60(3), 314-339.
- Wighting, M. J., Liu, J., & Rovai, A. P. (2008). Distinguishing sense of community and motivation characteristics between online and traditional college students. *Quarterly Review of Distance Education*, 9(3), 285-295.
- Wilds, D. J. (2000). *Minorities in higher education, 1999-2000: Seventeenth annual status report*. Washington, DC: American Council on Education.
- Wilson, J. H., & Locker, L. (2008). Immediacy scale represents four factors: Nonverbal and verbal components predict student outcomes. *Journal of Classroom Interaction*, 42(2), 4-10.
- Witt, P. L., Wheless, L. R., & Allen, M. (2004). A meta-analytical review of the relationship between teacher immediacy and student learning. *Communication Monographs*, 71(2), 184-207. doi:10.1080/036452042000228054
- Yang, Y., Zhang, Y., & Sheldon, K. M. (2018). Self-determined motivation for studying abroad predicts lower culture shock and greater well-being among international students: The mediating role of basic psychological needs satisfaction. *International Journal of Intercultural Relations*, 63, 95.
- Yoshida, M., Tanaka, M., Mizuno, K., Ishii, A., Nozaki, K., Urakawa, A., . . . Watanabe, Y. (2008). Factors influencing the academic motivation of individual college students. *International Journal of Neuroscience*, 118(10), 1400-1411. doi:10.1080/00207450701242982
- Young, A., Johnson, G., Hawthorne, M., & Pugh, J. (2011). Cultural predictors of academic motivation and achievement: A self-deterministic approach. *College Student Journal*, 45(1), 151-163.

Table 1
Demographic Characteristics of the Sample

Characteristic	Percentage	Characteristic	Percentage
Age (in years)		Class Standing	
18	40.2	Freshman	47.1
19	26.9	Sophomore	27.5
20	16.0	Junior	14.2
21	9.7	Senior	10.3
22 and older	4.2	Other specified	0.6
Did not specify	3.0	Prefer not to answer	0.3
Gender Identity		Grade Point Average	
Female	74.9	4.0	13.2
Male	24.5	3.0–3.9	71.2
Nonbinary	0.3	2.0–2.9	13.5
Prefer not to answer	0.3	1.0–1.9	2.1
Race		0.0–0.9	0.0
White/Caucasion	83.4	Did not specify	26.6
Asian American/Pacific Islander	5.7	Declared a major	
Hispanic or Latino/a	4.5	Yes	82.8
Native American	0	No	15.4
African American	1.2	Prefer not to answer	1.8
Other specified	4.2		
Prefer not to answer	0.9		

Table 2
Summary of Means, Standard Deviations, and Correlations for All Variables under Examination

	1	2	3	4	5
1. Faculty Supportive Verbal Behaviors	.86				
2. Faculty Supportive Nonverbal Behaviors	.17**	.87			
3. Perceived Volitional Autonomy in class	.11*	.44***	.71		
4. Perceived Competence in class	.25***	.31***	.52***	.89	
5. Relatedness in class	.42***	.24***	.32***	.26***	.87
6. Academic Motivation	.14*	.22***	.33***	.39***	.25***
7. Intrinsic Motivation	.09**	.11	.28***	.37***	.21***
8. Identified Motivation	.18**	.15**	.27***	.37***	.27***
9. Positive Introjection	.18**	.11*	.08	.12*	.15**
10. Negative Introjection	.04	-.16**	-.23***	-.19**	-.04
11. External Motivation	.08	-.24***	-.23***	-.17**	-.05
12. Amotivation	-.07	-.18**	-.27***	-.38***	-.26***
13. Academic Major Satisfaction	.15**	.14*	.28***	.42***	.25***
14. Grade Point Average	.03	.15*	.08	.19**	.08
<i>M</i>	3.45	3.77	3.68	3.71	3.22
<i>SD</i>	.87	.46	.67	.89	.94
Range	1.46- 6.00	2.23- 4.73	1.83- 5.00	1.00- 5.00	1.00- 5.00

Note. $N = 331$. * indicates correlation significant at $p < .05$, ** indicates correlation significant at $p < .01$, *** indicates correlation significant at $p < .001$. Cronbach's alphas are presented in the diagonal.

Table 2. (continued)

6	7	8	9	10	11	12	13	14
.77								
.82**	.86							
.84**	.82***	.93						
.48***	.31***	.38***	.90					
-.58***	-.31***	-.28***	.15**	.86				
-.65***	-.31***	-.33***	-.01	.75***	.90			
-.79***	-.58***	-.61***	-.18**	.42***	.49***	.91		
.76***	.69***	.66***	.22***	-.41***	-.38***	-.80***	—	
.14*	.14*	.18**	.12	.04	-.05	-.08	.06	—
4.18	4.20	4.20	3.46	1.58	1.45	1.79	3.97	3.40
.91	.98	.95	1.13	.88	.72	.97	.97	.55
-4.50-	1.00-	1.00-	1.00-	1.00-	1.00-	1.00-	1.00-	1.70-
12.00	5.00	5.00	5.00	5.00	4.50	5.00	5.00	4.00

Table 3

Factor Loadings for the Measurement Model

Measure and variable	Unstandardized factor loading	SE	Z	Standardized factor loading
Verbal supportive faculty behaviors				
Individual Friendliness	1.00	.07	11.66	.85*
Flexibility During Lecture	.48	.06	9.44	.56*
Nonverbal supportive faculty behaviors				
Nonverbal Behaviors Parcel 1	1.00	.02	45.60	.88*
Nonverbal Behaviors Parcel 2	1.05	.02	49.61	.93*
Nonverbal Behaviors Parcel 3	.81	.03	27.40	.77*
Perceived volitional autonomy				
Autonomy Parcel 1	1.00	.04	15.30	.63*
Autonomy Parcel 2	.81	.06	9.61	.56*
Autonomy Parcel 3	1.10	.05	17.04	.85*
Perceived competence				
Competence Parcel 1	1.00	.03	35.28	.88*
Competence Parcel 2	.94	.03	25.88	.82*
Competence Parcel 3	.90	.04	21.94	.81*
Relatedness				
Relatedness Parcel 1	1.00	.02	44.45	.87*
Relatedness Parcel 2	1.01	.02	43.21	.89*
Relatedness Parcel 3	.97	.03	26.14	.77*
Academic motivation				
Intrinsic Motivation	1.00	.04	16.65	.72*
Identification	.96	.04	17.43	.72*
Positive Introjection	.41	.06	4.06	.26*
Negative Introjection	-.57	.06	-8.12	-.45*
External Motivation	-.47	.05	-8.57	-.46*
Amotivation	-1.20	.02	-36.59	-.86*
Academic major satisfaction				
Major Satisfaction Parcel 1	1.00	.02	58.17	.92*
Major Satisfaction Parcel 2	.88	.02	59.42	.91*
Major Satisfaction Parcel 3	1.17	.01	72.61	.92*

Note. $N = 331$. * $p < .001$

Table 4

Factor Loadings for the Measurement Model without Modification Indices

Measure and variable	Unstandardized factor loading	SE	Z	Standardized factor loading
Verbal supportive faculty behaviors				
Individual Friendliness	1.00	.07	12.21	.85
Flexibility During Lecture	.49	.06		.56
Nonverbal supportive faculty behaviors				
Nonverbal Behaviors Parcel 1	1.00	.02	45.10	.88
Nonverbal Behaviors Parcel 2	1.05	.02	49.59	.93
Nonverbal Behaviors Parcel 3	.82	.03	27.31	.77
Perceived volitional autonomy				
Autonomy Parcel 1	1.00	.04	15.32	.63
Autonomy Parcel 2	.81	.06	9.79	.56
Autonomy Parcel 3	1.10	.05	17.21	.85
Perceived competence				
Competence Parcel 1	1.00	.03	35.03	.88
Competence Parcel 2	.95	.03	26.17	.82
Competence Parcel 3	.90	.04	21.99	.81
Relatedness				
Relatedness Parcel 1	1.00	.02	44.75	.87
Relatedness Parcel 2	1.01	.02	43.91	.89
Relatedness Parcel 3	.97	.03	26.36	.77
Academic motivation				
Intrinsic Motivation	1.00	.05	16.52	.81
Identification	.97	.05	17.52	.81
Positive Introjection	.42	.07	4.33	.29
Negative Introjection	-.52	.06	-7.70	-.46
External Motivation	-.44	.05	-8.86	-.48
Amotivation	-1.03	.04	-23.44	-.83
Academic major satisfaction				
Major Satisfaction Parcel 1	1.00	.02	56.46	.92
Major Satisfaction Parcel 2	.89	.02	58.40	.92
Major Satisfaction Parcel 3	1.17	.01	70.68	.92

Note. $N = 331$. * $p < .001$

Table 5

Bootstrap Analysis of Magnitude and Statistical Significance of Indirect Effects (Fully Mediated Model)

Indirect Effects			β and product	Mean Indirect Effect (b) ^a	SE of Mean ^a	95% BC CI Lower, Upper ^a
1a. Verbal Supportive Faculty Behaviors	Perceived Volitional Autonomy in class	Academic Motivation	(.005) X (.06) = .0003	<.001	.01	-.02, .02
1b. Verbal Supportive Faculty Behaviors	Perceived Competence in class	Academic Motivation	(.25) X (.39) = .10	.10	.03	.04, .16*
1c. Verbal Supportive Faculty Behaviors	Relatedness in class	Academic Motivation	(.47) X (.19) = .05	.09	.04	.02, .16*
2a. Nonverbal Supportive Faculty Behaviors	Perceived Volitional Autonomy in class	Academic Motivation	(.51) X (.06) = .03	.03	.05	-.07, .13
2b. Nonverbal Supportive Faculty Behaviors	Perceived Competence in class	Academic Motivation	(.31) X (.39) = .12	.12	.03	.06, .18*
2c. Nonverbal Supportive Faculty Behaviors	Relatedness in class	Academic Motivation	(.16) X (.19) = .03	.03	.02	-.001, .06
3a. Perceived Volitional Autonomy in class	Academic Motivation	Academic Major Satisfaction	(.06) X (.97) = .06	.06	.09	-.12, .23

Note. $N = 331$. BC CI = Bias-Corrected Confidence Interval. ^aThese values are based on the standardized path coefficients. *95% Confidence interval does not include zero and therefore is significant at $p < .05$.

Table 5. (continued)

3b. Perceived Competence in class	Academic Motivation	Academic Major Satisfaction		(.39) X (.97) = .37	.37	.08	.22, .53*
3c. Relatedness in class	Academic Motivation	Academic Major Satisfaction		(.19) X (.97) = .18	.18	.07	.04, .32*
4a. Verbal Supportive Faculty Behaviors	Perceived Volitional Autonomy in class	Academic Motivation	Academic Major Satisfaction	(.005) X (.06) X (.97) = .0002	<.001	.01	-.02, .02
4b. Verbal Supportive Faculty Behaviors	Perceived Competence in class	Academic Motivation	Academic Major Satisfaction	(.25) X (.39) X (.97) = .09	.09	.03	.04, .15*
4c. Verbal Supportive Faculty Behaviors	Relatedness in class	Academic Motivation	Academic Major Satisfaction	(.47) X (.19) X (.97) = .08	.08	.03	.02, .15*
5a. Nonverbal Supportive Faculty Behaviors	Perceived Volitional Autonomy in class	Academic Motivation	Academic Major Satisfaction	(.51) X (.06) X (.97) = .03	.03	.05	-.06, .12
5b. Nonverbal Supportive Faculty Behaviors	Perceived Competence in class	Academic Motivation	Academic Major Satisfaction	(.31) X (.39) X (.97) = .12	.12	.03	.05, .18*
5c. Nonverbal Supportive Faculty Behaviors	Relatedness in class	Academic Motivation	Academic Major Satisfaction	(.16) X (.19) X (.97) = .03	.03	.02	-.001, .06

Table 6

Bootstrap Analysis of Magnitude and Statistical Significance of Indirect Effects of the Fully Mediated Model without Competence

Indirect Effects		β and product	Mean Indirect Effect (b) ^a	SE of Mean ^a	95% BC CI Lower, Upper ^a	
1a. Verbal Supportive Faculty Behaviors	Perceived Volitional Autonomy in class	Academic Motivation	(-.007) X (.28) = -.002	-0.002	.02 -.03, .03	
1c. Verbal Supportive Faculty Behaviors	Relatedness in class	Academic Motivation	(.48) X (.21) = .10	.10	.04 .02, .14*	
2a. Nonverbal Supportive Faculty Behaviors	Perceived Volitional Autonomy in class	Academic Motivation	(.50) X (.28) = .14	.14	.04 .10, .34*	
2c. Nonverbal Supportive Faculty Behaviors	Relatedness in class	Academic Motivation	(.15) X (.21) = .03	.03	.02 .01, .12*	
3a. Perceived Volitional Autonomy in class	Academic Motivation	Academic Major Satisfaction	(.28) X (.96) = .26	.26	.07 .19, .61*	
3c. Relatedness in class	Academic Motivation	Academic Major Satisfaction	(.21) X (.96) = .20	.20	.07 .05, .36*	
4a. Verbal Supportive Faculty Behaviors	Perceived Volitional Autonomy in class	Academic Motivation	Academic Major Satisfaction	(-.007) X (.28) X (.96) = -.002	-0.002	.02 -.04, .04

Note. $N = 96$. BC CI = Bias-Corrected Confidence Interval. ^aThese values are based on the standardized path coefficients. *95% Confidence interval does not include zero and therefore is significant at $p < .05$.

Table 6. (continued)

4c. Verbal Supportive Faculty Behaviors	Relatedness in class	Academic Motivation	Academic Major Satisfaction	(.48) X (.21) X (.96) = .10	.10	.04	.03, .17*
5a. Nonverbal Supportive Faculty Behaviors	Perceived Volitional Autonomy in class	Academic Motivation	Academic Major Satisfaction	(.50) X (.28) X (.96) = .13	.13	.04	.13, .44*
5c. Nonverbal Supportive Faculty Behaviors	Relatedness in class	Academic Motivation	Academic Major Satisfaction	(.15) X (.21) X (.96) = .03	.03	.02	.01, .15*

Table 7
Correlations among Latent Variables

	1	2	3	4	5	6	7
1. Verbal supportive faculty behaviors	—						
2. Nonverbal supportive faculty behaviors	.20*	—					
3. Perceived volitional autonomy in class	.11	.51**	—				
4. Perceived competence in class	.31**	.36**	.60**	—			
5. Perceived relatedness in class	.50**	.25**	.40**	.26**	—		
6. Academic motivation	.22**	.22**	.37**	.47**	.31**	—	
7. Academic major satisfaction	.21**	.21**	.35**	.45**	.29**	.96**	—

Note. $N = 331$, * $p < .01$, ** $p < .001$.

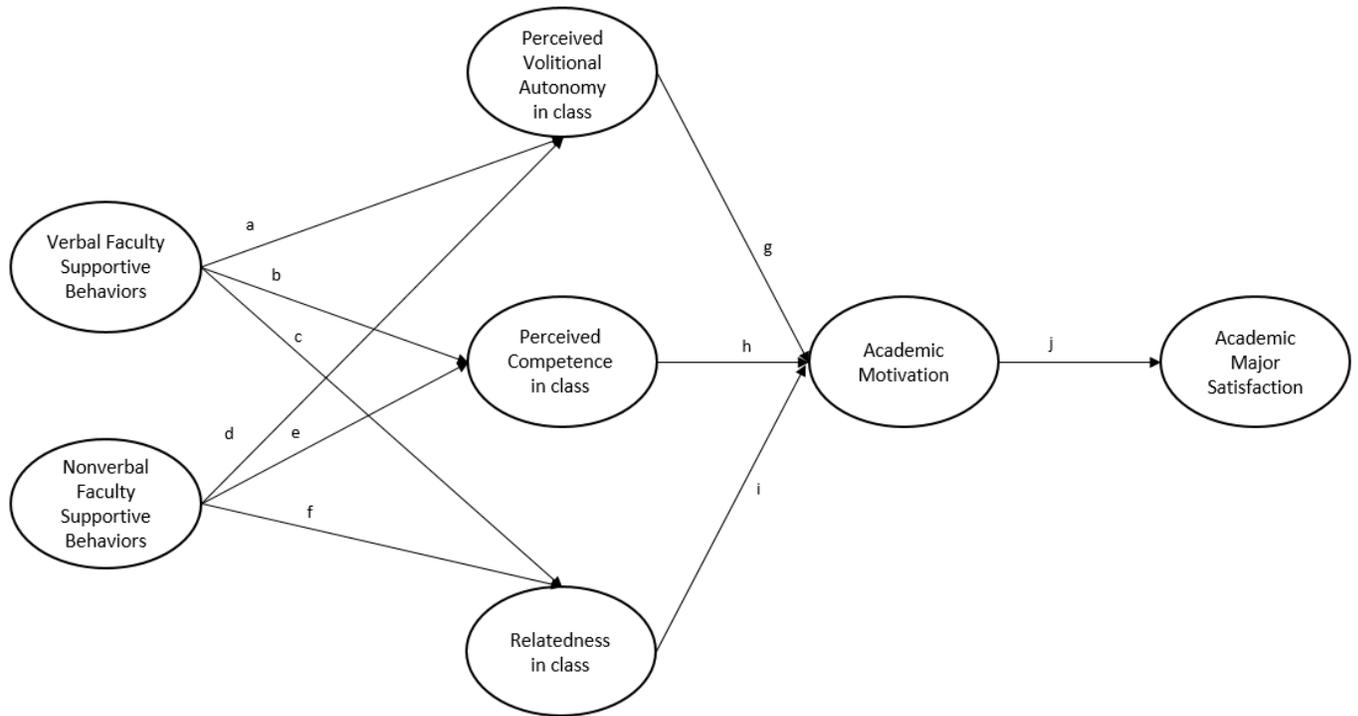


Figure 1: *The proposed fully mediated model.*

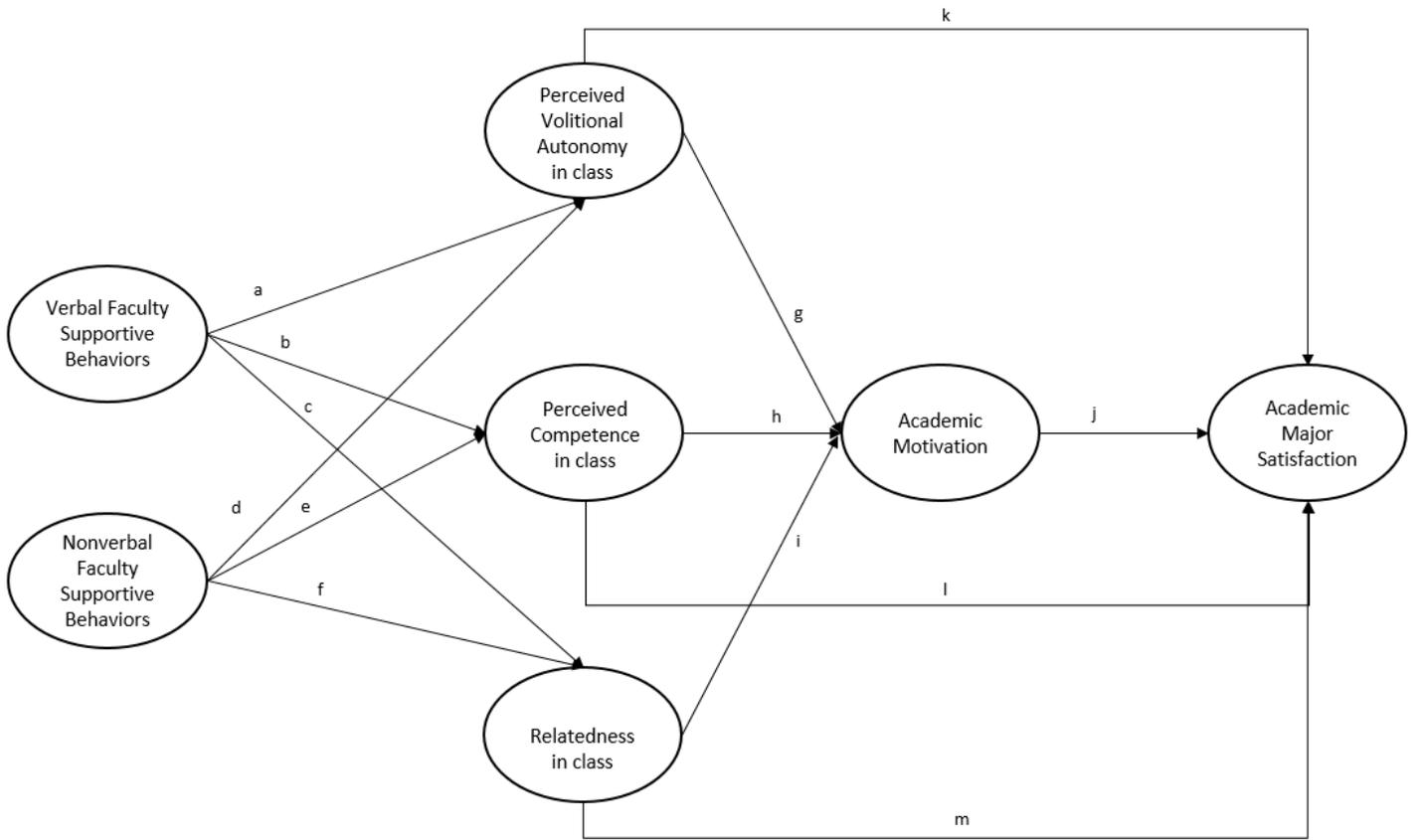


Figure 2: *The alternative partially mediated model.*

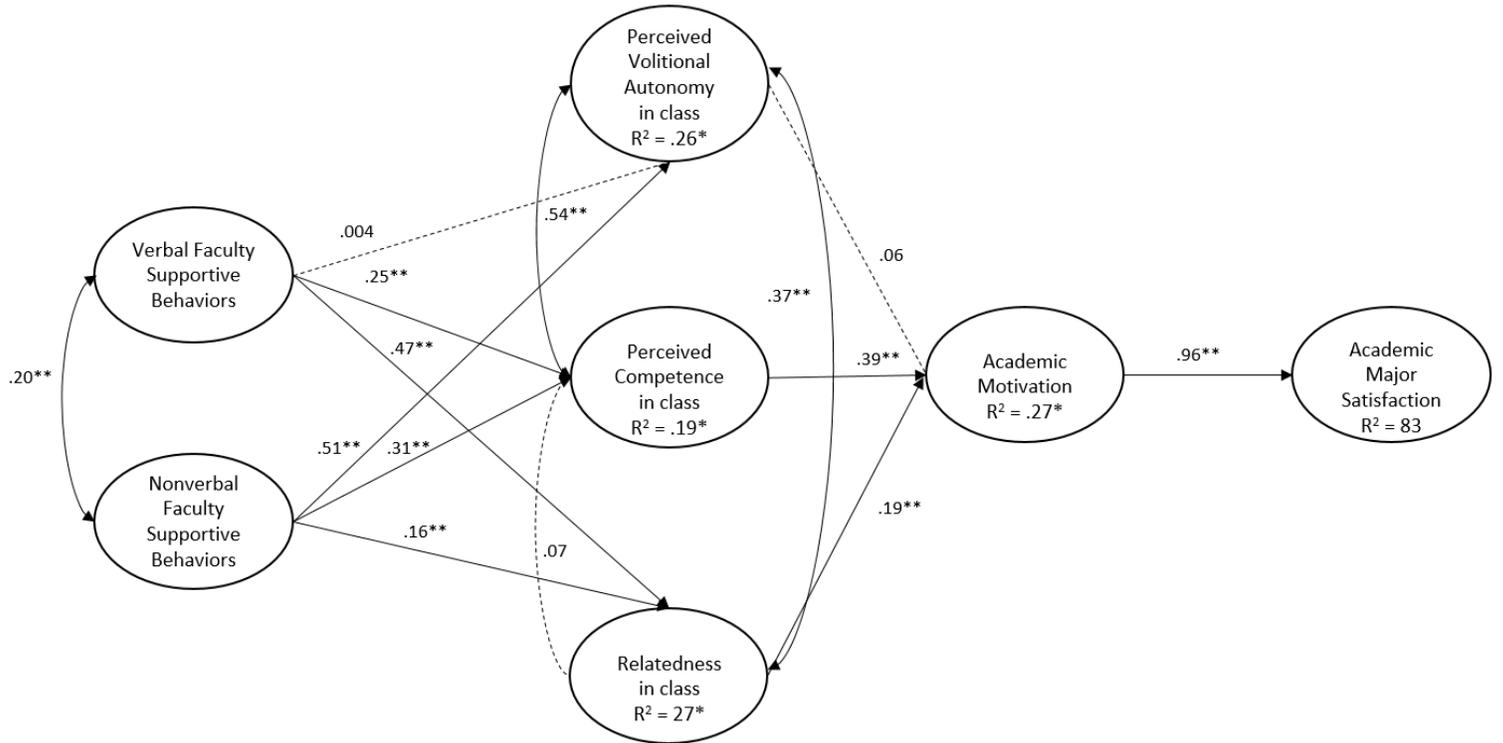


Figure 3: *The fully mediated model.*

Note. $N = 332$, $*p < .05$, $**p < .01$.

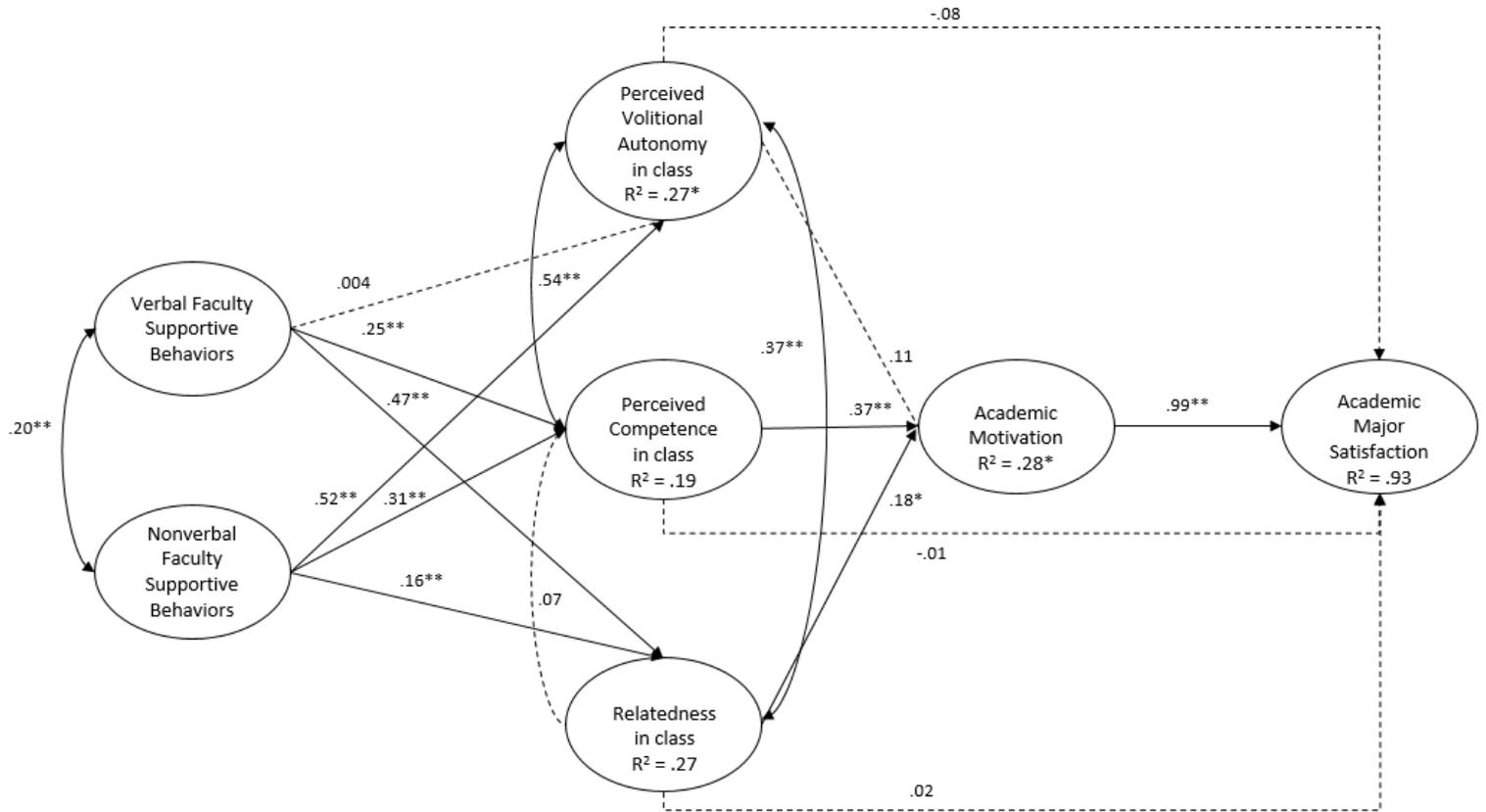


Figure 4: *The partially mediated model.*

Note. $N = 332$, * $p < .05$, ** $p < .01$.

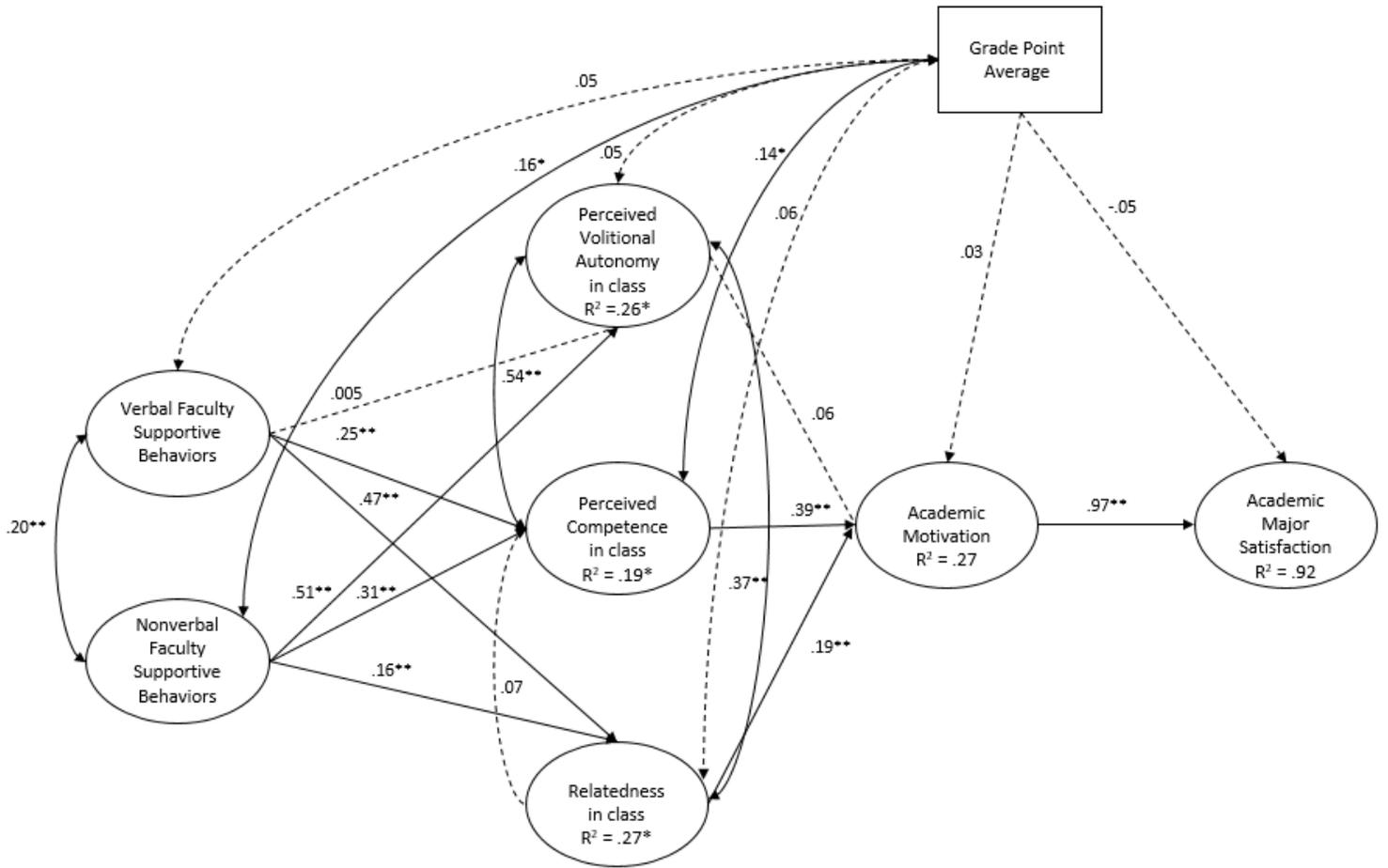


Figure 5: Fully mediated model controlling for grade point average.

Note. $N = 332$, $*p < .05$, $**p < .01$.

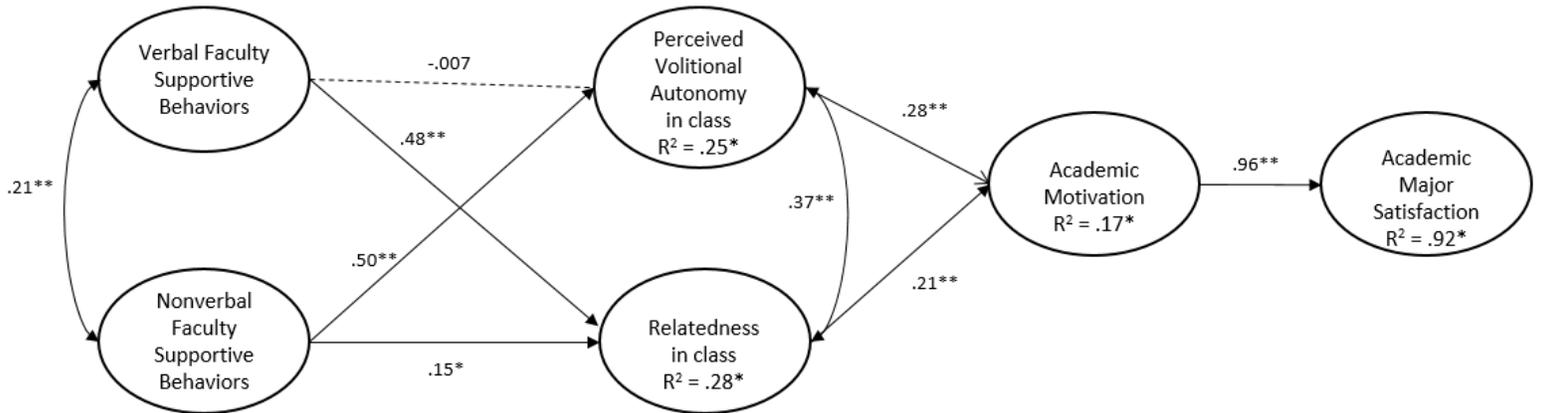


Figure 6: Fully mediated model with competence removed.

Note. $N = 332$, * $p < .05$, ** $p < .01$.

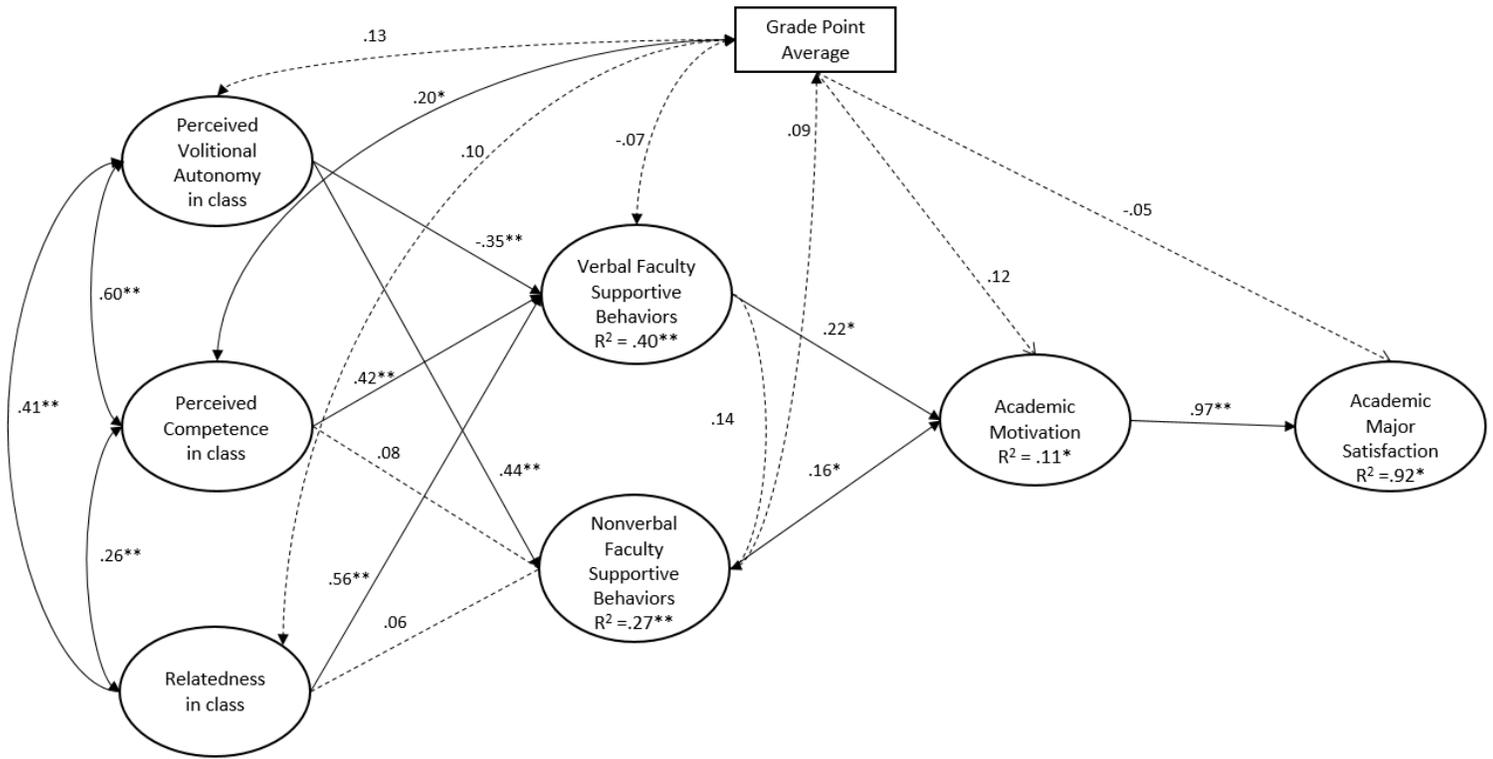


Figure 7: Fully mediated model with adjusted positions of faculty behaviors and psychological needs.

Note. $N = 332$, * $p < .05$, ** $p < .01$.

APPENDIX A. VERBAL IMMEDIACY BEHAVIORS SCALE

(Wilson & Locker, 2008)

Below are a series of questions. As you answer them, please think about the instructor in the class you were in most recently that is within your major.

Never		Sometimes		Very Often
0	1	2	3	4

Addresses students by name.

Addresses me by name.

Gets into conversations with individual students before or after class.

Has initiated conversations with me before, after, or during class.

Provides feedback on my individual work through comments on papers, oral discussions, etc.

Calls on students to answer questions even if they have not indicated that they want to talk.

Asks students how they felt about an assignment.

Praises students' work, actions, or comments.

Uses personal examples or talks about personal experiences.

Gets into discussions based on something a student brings up even when it doesn't seem to be part of the lecture plan.

Uses humor in class.

Asks questions to solicit viewpoints or opinions.

Will have discussions about things unrelated to class with individual students or with the class as a whole.

APPENDIX B. NONVERBAL IMMEDIACY SCALE
(Richmond, McCroskey, & Johnson, 2003)

Never	Rarely	Occasionally	Often	Very Often
1	2	3	4	5

DIRECTIONS: The following statements describe the ways some people behave while talking with or to others. Please indicate in the space at the left of each item the degree to which you believe the statement applies to the instructor in the class you were in most recently that is within your major.

1. They use hands and arms to gesture while talking to people.
2. They touch others on the shoulder or arm while talking to them.
3. They use a monotone or dull voice while talking to people.
4. They look over or away from others while talking to them.
5. They move away from others when they touch them while they are talking.
6. They have a relaxed body position when they talk to people.
7. They frown while talking to people.
8. They avoid eye contact while talking to people.
9. They have a tense body position while talking to people.
10. They sit close or stand close to people while talking with them.
11. Their voice is monotonous or dull when they talk to people.
12. They use a variety of vocal expressions when they talk to people.
13. They gesture when they talk to people.
14. They are animated when they talk to people.
15. They have a bland facial expression when they talk to people.
16. They move closer to people when they talk to them.
17. They look directly at people while talking to them.
18. They are stiff when they talk to people.
19. They have a lot of vocal variety when they talk to people.
20. They avoid gesturing while they are talking to people.
21. They lean toward people when they talk to them.
22. They maintain eye contact with people when they talk to them.
23. They try not to sit or stand close to people when they talk with them.
24. They lean away from people when they talk to them.
25. They smile when they talk to people.
26. They avoid touching people when they talk to them.

APPENDIX C. NEED FOR AUTONOMY SUBSCALE OF THE W-BNS

(Van den Broeck, Vansteenkiste, De Witte, Soens, & Lens, 2010)

Below are a series of questions. As you answer them, please think about the class you were in most recently that is within your major.

Totally Disagree		Some agreement		Totally Agree
1	2	3	4	5

I feel like I can be myself in that class

In that class, I often feel like I have to follow other people's commands (R)

If I could choose, I would do things in that class differently (R)

The tasks I have to do in that class are in line with what I really want to do

I feel free to do my classwork the way I think it could best be done

In that class, I feel forced to do things I do not want to do (R)

APPENDIX D. NEED FOR COMPETENCE SUBSCALE OF THE W-BNS

(Van den Broeck, Vansteenkiste, De Witte, Soens, & Lens, 2010)

Below are a series of questions. As you answer them, please think about the class you were in most recently that is within your major.

Totally Disagree		Some agreement		Totally Agree
1	2	3	4	5

I really master my tasks in that class

I feel competent in that class

I am good at the things I do in that class

I have the feeling that I can even accomplish the most difficult tasks in that class

APPENDIX E. NEED FOR RELATEDNESS SUBSCALE OF THE W-BNS

(Van den Broeck, Vansteenkiste, De Witte, Soens, & Lens, 2010)

Below are a series of questions. As you answer them, please think about the class you were in most recently that is within your major.

Totally Disagree	2	Some agreement	4	Totally Agree
1		3		5

I don't really feel connected with other people in that class (R)

In that class, I feel part of a group

I don't really mix with other people in that class (R)

In that class, I can talk with people about things that really matter to me

I often feel alone when I am with my classmates (R)

In that class, there are people who really understand me

Some people I am in class with are close friends of mine

APPENDIX F. COMPREHENSIVE-RELATIVE AUTONOMY INDEX
(Sheldon, Osin, Gordeeva, Suchkov, & Sychev, 2017)

Strongly Disagree		Some agreement		Strongly Agree
1	2	3	4	5

Why are you in the major you are in?

- ... I once had good reasons for being in this major, but now I don't
- ... Honestly, I don't know why I am in this major
- ... I'm not sure, I wonder whether I should continue doing this major
- ... I used to know why I do this major, but I don't anymore
- ... because important people (i.e., parents, professors) will like me better if I do this major
- ... because if I don't do this major, others will get mad
- ... because I'll get in trouble if I don't do this major
- ... because I don't have any choice but to do this major
- ... because I would feel guilty if I didn't do this major
- ... because I would feel ashamed if I didn't do this major
- ... because I would feel like a failure if I didn't do this major
- ... because I don't want to feel bad about myself
- ... because I want to feel proud of myself
- ... because I want to prove to myself that I am capable
- ... because this major boosts my self-esteem
- ... because I want to feel good about myself
- ... because I strongly value this major
- ... because this major is personally important to me
- ... because it is my personal choice to do this major
- ... because this major is meaningful to me
- ... because I enjoy this major
- ... because this major is fun
- ... because it is a pleasure to do this major
- ... because this major is interesting

APPENDIX G
ACADEMIC MAJOR SATISFACTION SCALE

(Nauta, 2007)

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	2	3	4	5

1. I often wish I hadn't gotten into this major.
2. I wish I was happier with my choice of an academic major.
3. I am strongly considering changing to another major.
4. Overall, I am happy with the major I've chosen.
5. I feel good about the major I've selected.
6. I would like to talk to someone about changing my major.

APPENDIX H
DEMOGRAPHICS QUESTIONNAIRE

Age: _____

Gender: Male
Female
Other

Ethnicity: African American
Asian American/Pacific Islander
Caucasian/White
Hispanic or Latino/a
Native American
Other: _____

Year in School: Freshman
Sophomore
Junior
Senior
Other: _____

Have you declared a major? __ yes __ no

If yes, what is your Academic Major? _____

If no, what major are you most strongly considering? _____

What is your current undergraduate GPA? _____

Academic Major Certainty

Strongly disagree	Disagree	Somewhat disagree	Somewhat agree	Agree	Strongly agree
1	2	3	4	5	6

1. I am completely certain about what major I want to graduate with.
2. I have some doubts about which major is right for me. (R)
3. I might be making a mistake with the major I'm considering. (R)
4. I definitely know which major is the best choice for me.

APPENDIX I INFORMED CONSENT

Title of Study: **Factors Influencing Academic Major Satisfaction**

Investigators: Mary Schenkenfelder, Principal Investigator

Lisa Larson, Ph.D., Study Supervisor

This is a research study. Please take your time in deciding if you would like to participate.

INTRODUCTION

The purpose of this study is to learn more about factors influencing undergraduate students' academic major satisfaction.

DESCRIPTION OF PROCEDURES

If you agree to participate, you will be asked to complete several surveys. First you will be asked to fill out some demographic information, you will then be asked to answer questions relating to your experience within classes and your major, and about your satisfaction with your major.

The whole survey will take about 20 minutes to complete. You will not be able to save your responses and finish at another time. If you intend to complete the survey you must finish it within a few hours of opening the survey.

RISKS

There are no foreseeable risks to participating in this survey. However, if you should feel uncomfortable or have concerns regarding the survey, please contact the primary investigator, Mary Schenkenfelder, (email: marysch@iastate.edu) or the study supervisor, Lisa Larson, Ph.D. (email: lm Larson@iastate.edu).

BENEFITS

If you decide to participate in this study, there may be no direct benefit to you. It is hoped that the information gained in this study will contribute to the understanding of factors contributing to academic major satisfaction in college students.

COSTS AND COMPENSATION

You will not have any costs from participating in this study. You will receive one (1) research credit for participating. There are alternatives to completing this particular study if you wish to receive research credit such as participating in other studies, writing a research paper, etc. Please consult with your course instructor to learn about the difference ways you can earn research credit.

PARTICIPANT RIGHTS

Your participation in this study is completely voluntary and you may refuse to participate or leave the study at any time. If you decide to not participate in the study or leave the study early,

it will not result in any penalty or loss of benefits to which you are otherwise entitled. You can skip any questions that you do not wish to answer.

CONFIDENTIALITY

Records identifying participants will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, federal government regulatory agencies, auditing departments of Iowa State University, and the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy your records for quality assurance and data analysis. These records may contain private information.

To ensure confidentiality to the extent permitted by law, the following measures will be taken:

- Once your survey responses are uploaded to our secure data file, your name will be replaced with an ID code.
- All data will be kept on a password-protected desktop computer within a locked room.
- If the results are published, your identity will remain confidential.

QUESTIONS OR PROBLEMS

You are encouraged to contact the principal investigator with questions at any time during this survey.

- For further information about the study, contact the primary investigator, Mary Schenkenfelder (email: marysch@iastate.edu) or the lab supervisor, Lisa Larson, Ph.D. (email: llarson@iastate.edu).
- If you have any questions about the rights of research subjects or research-related injury, please contact the IRB Administrator, (515) 294-4566, IRB@iastate.edu, or Director, (515) 294-3115, Office for Responsible Research, Iowa State University, Ames, Iowa 50011.

PARTICIPANT CONSENT

By clicking the icon next to “I understand this information” you are indicating that you voluntarily agree to participate in this study, that the study has been explained to you, that you have been given the time to read the document, and that your questions have been satisfactorily answered. After clicking “Consent” you will be led to a page with the study information and your consent information.

I understand this information.

Debriefing Information

Thank you for completing this survey. Your responses will be combined with the rest of the participants' responses in order to examine the relations between faculty behaviors, autonomy/competence/relatedness in the classroom, academic motivation, and academic major satisfaction. Specifically, we are interested in how students' perceptions of supportive faculty behaviors might impact major satisfaction. We are also interested in how academic motivation and perceptions of autonomy, competence, and relatedness might be involved in the relation between faculty behaviors and major satisfaction.

If you have questions about the survey items or the study as a whole, please contact the principal investigator, Mary Schenkenfelder (marysch@iastate.edu) or the study supervisor, Dr. Lisa Larson (lmlarson@iastate.edu).

APPENDIX J IRB APPROVAL

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Research
Vice President for Research
138 Pearson Hall
Ames, Iowa 50011-2207
515 294-4566
FAX 515 294 4267

Date: 6/21/2016

To: Mary Schenkenfelder
W112 Lagomarcino Hall

CC: Lisa Larson
W216 Lagomarcino Hall

From: Office for Responsible Research

Title: Predicting academic major satisfaction using environmental factors and Self-Determination Theory

IRB ID: 16-304

Study Review Date: 6/21/2016

The project referenced above has been declared exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b) because it meets the following federal requirements for exemption:

- (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey or interview procedures with adults or observation of public behavior where
 - Information obtained is recorded in such a manner that human subjects cannot be identified directly or through identifiers linked to the subjects; or
 - Any disclosure of the human subjects' responses outside the research could not reasonably place the subject at risk of criminal or civil liability or be damaging to their financial standing, employability, or reputation.

The determination of exemption means that:

- You do not need to submit an application for annual continuing review.
- You must carry out the research as described in the IRB application. Review by IRB staff is required prior to implementing modifications that may change the exempt status of the research. In general, review is required for any modifications to the research procedures (e.g., method of data collection, nature or scope of information to be collected, changes in confidentiality measures, etc.), modifications that result in the inclusion of participants from vulnerable populations, and/or any change that may increase the risk or discomfort to participants. Changes to key personnel must also be approved. The purpose of review is to determine if the project still meets the federal criteria for exemption.

Non-exempt research is subject to many regulatory requirements that must be addressed prior to implementation of the study. Conducting non-exempt research without IRB review and approval may constitute non-compliance with federal regulations and/or academic misconduct according to ISU policy.

Detailed information about requirements for submission of modifications can be found on the Exempt Study Modification Form. A Personnel Change Form may be submitted when the only modification involves changes in study staff. If it is determined that exemption is no longer warranted, then an Application for Approval of Research Involving Humans Form will need to be submitted and approved before proceeding with data collection.

Please note that you must submit all research involving human participants for review. Only the IRB or designees may make the determination of exemption, even if you conduct a study in the future that is exactly like this study.

Please be aware that approval from other entities may also be needed. For example, access to data from private records (e.g. student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), investigators must obtain permission from the institution(s) as required by their policies. An IRB determination of exemption in no way implies or guarantees that permission from these other entities will be granted.

Please don't hesitate to contact us if you have questions or concerns at 515-294-4566 or IRB@iastate.edu.