2009

Explaining Math Achievement;Personality, Motivation, and Trust

Ebru Kilic-Bebek
Cleveland State University

EXPLAINING MATH ACHIEVEMENT: PERSONALITY, MOTIVATION, AND TRUST

EBRU KILIÇ-BEBEK

Bachelor of Arts in Translation and Interpreting

Boğaziçi University

June, 2000

Master of Arts in Curriculum and Instruction

Yıldız Technical University

September, 2004

submitted in partial fulfillment of requirements for the degree

DOCTOR OF PHILOSOPHY IN URBAN EDUCATION: LEARNING AND DEVELOPMENT

at the

CLEVELAND STATE UNIVERSITY

December, 2009

This dissertation has been approved for

the Office of Doctoral Studies,

College of Education

and the College of Graduate Studies by

Rosemary Sutton, Chairperson 10/22/2009

Curriculum and Foundations

Joshua Bagaka's, Member 10/22/2009

Curriculum and Foundations

Brian Harper, Member 10/22/2009

Curriculum and Foundations

Xiongyi Liu, Member 10/22/2009

Curriculum and Foundations

Carol Phillips-Bey, Member 10/22/2009

Mathematics

DEDICATION

I dedicate this dissertation to my family. Their trust and support took me to higher levels of accomplishments in every stage of my life. I could not be where I am now without them. I would specifically like to express my deepest gratitude and appreciation to my beloved husband who has always made me a better and more accomplished person in life. I also wish to dedicate this work to my little baby whose existence has been very special and precious.

ACKNOWLEDGEMENTS

I will be forever grateful and indebted to my teacher, advisor, dissertation committee chair, mentor, and boss Dr. Rosemary E. Sutton for her invaluable support throughout my Ph.D. studies and research. She has always been concerned about my well-being as well as achievement. It is because of her that I felt like I belonged in this program, and that I knew I had someone to trust. She has played many significant roles in my life here but I am particularly grateful for all the support she has given me to pursue my own research. I hereby thank her with all my heart for all the things she has done for me. She is my absolute role model for the rest of my life.

I would also like to express my gratitude to my dissertation methodologist and previous boss Dr. Joshua G. Bagaka's. He has always been warm, patient, respectful, and flexible when dealing with my questions and concerns. I also thank him for the encouragement and support he has always given me to pursue research during my Ph.D. studies.

Much appreciation also goes to my other dissertation committee members, Dr. Brian Harper, Dr. Xiongyi Liu, and Dr. Carol Phillips-Bey, who are wonderful teachers who care about their students. Their insights, suggestions, feedback, and support have been invaluable for this research. I thank them for everything they have done.

I must also thank Dr. Barbara Modney, Dr. Ralph Gibson, Dr. Harry van Keulen, Ms. Alison Yassick, and Ms. Andrea Corbett from the biology department, and Mr. Robert Jones, Dr. Ivan Soprunov, Dr. Carol Phillips-Bey, Ms. Antoinette Marquard, Dr. Ieda Rodrigues, Dr. Sally Shao, Dr. Leah Gold, Dr. Chung-yi Suen, and Dr. Yuping Wu from the math department who welcomed me in their classes to announce my pilot study

on biology students and dissertation study on math students. I am also thankful for the kind support I received from Ms. Kathy Dobda and Theresa Nawalaniec from Cleveland State University Library, Ms. Paula Bloch from the Office of Vice Provost for Undergraduate Studies, and Mr. Michael Artbauer from the Office of Academic Affairs for their administrative support throughout the data collection process of this research. Finally, I would like to thank the Cleveland State University's Research Council, which provided financial support for this dissertation research through their Doctoral Dissertation Research Expense Award Program.

There have been many people who contributed to my academic and research interests, which eventually took the form of this research. Therefore, I would like to thank Dr. Rosemary E. Sutton for providing me with the tools and knowledge I needed for a solid theoretical and research foundation on human learning and development, which inspired me to pursue research on trust; Dr. Jeremy Genovese for opening to me the world of biological sciences and intellectual variability, which is and always will be integrated into my research; Dr. Jim Carl and Dr. Dwayne Wright for introducing me to the world of cultural foundations and social perspectives, which inspired me to look into the theory of social capital and helped me better understand the notion of cultural mistrust; Dr. Karl Wheatley whose dedication to the field of motivation inspired me to learn more about it; and finally Dr. Joshua G. Bagaka's and Dr. Mehmet Ozturk who taught me an extensive list of quantitative methods that enabled me to address any research question I wanted.

Finally, I would like to thank our dear “Aunt Wanda,” and my dear friends in the doctoral program who supported me in every way that they can. Their support, warmth, and friendship will always be cherished.

EXPLAINING MATH ACHIEVEMENT: PERSONALITY, MOTIVATION, AND TRUST

EBRU KILIÇ-BEBEK

ABSTRACT

This study investigated the statistical significance of student trust next to the well-tested constructs of personality and motivation to determine whether trust is a significant predictor of course achievement in college math courses. Participants were 175 students who were taking undergraduate math courses in an urban public university. The Mini-Markers (Saucier, 1994), an adapted Student Trust Survey (Barnes, Adams & Forsyth, 2004, April), and the Motivated Strategies for Learning Questionnaire (Pintrich, Smith, Garcia & McKeachie, 1991) were used to measure students' Big-Five personality factors, trust in their math instructor, and motivational beliefs and strategies for their learning and performance in one of the math courses they were taking during Spring 2009. Students reported their semester in college, gender and ethnicity; their final math grades and math class size information were collected from the university at the end of the semester; and their math course group was determined based on the categorization made by the university's math department. The data were analyzed using bivariate correlations, independent samples *t*-tests, and hierarchical multiple regression models. The Conscientiousness factor correlated significantly with students' final math grades, explaining 6% unique variance in students' grades. Students' trust in their math instructor also correlated significantly with their final math grades, contributing another 6% unique variance to the prediction of students' grades. Students' task value, self-efficacy beliefs, test anxiety, and effort regulation were all significantly correlated with their final math

grades, and when these were added in the final prediction model, the significant effects of the Conscientiousness factor and student trust on students' grades became non-significant. This showed that students' motivated strategies for learning completely mediated the relationship between students' Conscientiousness factor, trust, and their final math grades. The final prediction model explained 48% of the variance in students' grades, in which the significant predictors after controlling for students' gender, math course group, and math class size were students' self-efficacy beliefs, test anxiety, and effort regulation in their math course.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

College student achievement may be explained by many factors. Psychological research has shown that students' personality (e.g., Big-Five factors such as Intellect, Conscientiousness, and Agreeableness), their motivational beliefs (e.g., self-efficacy), and use of self-regulated learning strategies (e.g., effort regulation) affect success in college (e.g., Chamorro-Premuzic & Furnham, 2003a; Lynch, 2006). A recent study examined the relative predictive power of all these significant factors and found that effort regulation completely mediated the effects of personality factors (that of Agreeableness and Conscientiousness) on college students' academic achievement (Bidjerano & Yun Dai, 2007). This finding is promising as it points to a learning strategy rather than a personality factor in explaining student achievement. More studies are needed to determine the significant achievement factors that are more malleable in nature so that a truly supportive learning environment can be provided for students.

Students' trust in their instructors might prove to be a significant achievement factor. Trust is one's vulnerability to another in terms of the belief that the other will act in one's best interests (Hoy, Tarter & Hoy, 2006). As a key concept of social capital, the

significance of trust has been emphasized for decades (e.g., Bourdieu, 1986; Coleman, 1990; Putnam, 2000), specifically for creating and maintaining high organizational effectiveness (e.g., Nugent & Abolafia, 2006). In school settings it is believed that "students cannot learn from teachers whom they do not trust," and that they need reassurance in the classroom that they will not be harmed as learning involves opening up and becoming vulnerable (Willie, 2001, p. 255). Willingness to ask questions or to reveal areas of uncertainty and ignorance is known to facilitate student learning, and these revelations depend on how much a student trusts a teacher in that he or she will be treated with "respect and kindness rather than ridicule" (Rice, 2006, p. 75). Students are best served if they can feel certain that educators believe in their potential and care about their welfare (Cohen & Steele, 2002). Also, motivation and learning increases when there is trust between the student and the instructor (Buskist & Saville, 2001; Lee & Schallert, 2008). It might, for instance, influence students' willingness "to take cues and information from their instructors," and increase their "positive orientation to academic study" and the ability "to solve learning problems collectively" (John, 2005, p. 637). Motivation and performance might also decrease when there is a lack of trust between the student and the instructor, based on factors such as stigmatization experienced by the students (Cohen & Steele, 2002). Despite the educational significance of student trust, very few findings have been reported about its relationship to students' actual academic achievement (e.g., Lee, 2007). This study aims to test this presumed link between student trust and achievement.

Recent research on trust in educational settings has been based on Tschannen-Moran and Hoy's (2000) comprehensive review of literature, defining trust as "one

party's willingness to be vulnerable to another party based on the confidence that the latter party is (a) benevolent, (b) reliable, (c) competent, (d) honest, and (e) open" (p. 556). A summary of these "five facets of trust" is presented in Table 1.

Table 1

The Five Facets of Trust

Facets	Indicators
1. Benevolence	Goodwill Altruism Genuine care Protection Refraining from exploiting
2. Reliability	Dependability Consistency Predictability Coming through
3. Competence	Skill in handling difficult situations and meeting expectations
4. Honesty	Integrity (correspondence between words and deeds) Authenticity (telling the truth and accepting responsibility for one's actions) Keeping promises
5. Openness	Not withholding relevant information Sharing personal information Open, accurate and forthcoming communication

Note. This table is a summary of a section from Tschannen-Moran (2003, pp. 162-166).

This study is based on the belief that teachers should manifest these five facets of trust for their students to trust them. Therefore, these five dimensions serve as the basis for the definition of the term "student trust in instructor" in this study, and the relationship between this factor and student achievement is examined next to two other significant constructs: personality and motivation. Goldberg's (1981) lexical view of the Big-Five personality model, and Pintrich and Zusho's (2007) integrated model of student

academic motivation are the selected theoretical frameworks for personality and motivation in this study.

The five-factor structure of personality (i.e., Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Intellect) has been established by the research following the psychometric tradition, and this model is selected to be used in this study to represent the dispositional approaches to trust in the literature, which argue that some people are more likely to be trusting than others based on their disposition to trust (e.g., McKnight, Cummings & Chervany, 1998). The characteristics of some of these Big-Five personality dimensions include the propensity to trust others. Agreeableness, for instance, is conceptualized to cover trust and distrust (Goldberg, 1992, 1993) and specific tendencies and behaviors such as "being kind, considerate, likable, cooperative, and helpful" (Graziano & Eisenberg, 1997, p. 815); and the Extraversion dimension includes traits such as gregariousness (e.g., enjoying the company of others), and positive affectivity (e.g., feeling optimistic about future) (Watson & Clark, 1997, p. 776). Therefore, these trait-descriptions could be associated with students' trust in their instructors.

Pintrich and Zusho's (2007) integrated model of student academic motivation describes a dynamic and interacting system of three major components of college student motivation: (1) personal characteristics (age, gender, ethnicity) and the classroom contextual factors, (2) internal factors (motivational and self-regulatory processes), and (3) student outcomes (motivated behavior and achievement). This model was selected for this study because of its comprehensive view of student motivation; but more importantly because the concept of student trust in instructor seems to fit well into the classroom

contextual factors component of the model, which has not been sufficiently addressed in current studies.

All in all, this study seeks to establish the link between student trust and student achievement in undergraduate math courses, by testing this construct next to other well-tested concepts of personality and motivation. The following sections specify the problem of this study, and explain the purpose, research questions, and significance of this study. Then, the delimitations, limitations, term definitions, and assumptions are listed.

Statement of the Problem

In higher education, there is a need to understand the factors affecting student achievement because "the key to social justice and leveling the playing field for the disadvantaged (and all Americans) is not only access to college, but also degree completion" and "without more attention to college success we maintain a system that provides high probability for success only to the elite (just like K-12)" (Gardner, 2008, July 29, p. 2). Undergraduate math courses are in urgent need of instructional support due to their considerable drop-failure-withdrawal (DFW) rates particularly during the first year (e.g., Coley, Holliday, Lynch & Street, 2007, February; Gardner, 2008, July 29). Departmental math courses are also in need of instructional attention "to increase the likelihood that undergraduates, particularly those from underrepresented racial minority backgrounds, will persist in science, technology, engineering, and mathematical (STEM) majors, participate in the STEM workforce immediately after college, and/or pursue graduate or professional degrees in STEM fields" (Hurtado & Chang, 2008). Consequently, understanding the factors affecting student achievement in undergraduate math courses might help increase student success and degree completion of all students,

particularly those from underrepresented minority backgrounds. As, the personality and motivational models that have been shown to predict student achievement leave little room for instructional intervention or change, focusing more on the educational significance of students' trust in their instructors might provide a better leverage point for interventions to increase student achievement in college math courses.

Purpose of the Study

The purpose of this study is to examine the relationship between college students' trust in their math instructors and their math course achievement next to well-tested factors of personality and motivation. First, the relationships among the students' personality, trust, motivation, and math grades are explored. Then, the differences among these factors are examined with respect to student and classroom characteristics of gender, ethnicity, semester in college, math course group, and math class size. Finally, all these variables' relative contributions to explaining math course achievement are determined.

Research Questions

The findings of this study will reveal the educational significance of college students' trust in their math instructors next to student personal characteristics and motivation. Specifically, the following research questions are answered:

1. How are students' Big-Five personality factors, trust in their instructor, motivated strategies for learning, and math achievement related with one another across the three groups of undergraduate math courses in this university?

2. Do students' Big-Five personality factors, trust in their instructor, and motivated strategies for learning differ significantly by students' gender, ethnicity, semester in college, or class size across the three groups of undergraduate math courses in this university?
3. In what ways students' Big-Five personality factors, trust in their instructor, and motivated strategies for learning predict their math achievement next to their gender, ethnicity, semester in college, and class size across the three groups of undergraduate math courses in this university?

Significance of the Study

This study aims to explore the educational significance of college students' trust in their math instructors, which is important for two main reasons. First, the importance of students' trust in their course instructor has been acknowledged for better course achievement but this suggested link has not been statistically tested (e.g., Buskist & Saville, 2001; Cohen & Steele, 2002; Lee & Schallert, 2008; Rice, 2006; Willie, 2001). This study will test the statistical significance of this suggested link. There have been studies that measured student trust but the objects of trust in these studies were principals (e.g., Barnes et al., 2004, April), all adults in schools (e.g., John, 2005), or college institutions (e.g., Ghosh, Whipple & Bryan, 2001). The few studies that were interested in the link between student trust and achievement used standardized test scores as measures of academic performance (e.g., John, 2005). This study, however, focuses on students' trust in their instructors, and measures achievement by the course grades.

Secondly, the significance of students' trust in this study is tested in the context of undergraduate math classes, for which there has been concerns. For first year students,

institutional data show considerable drop-failure-withdrawal (DFW) rates (e.g., Coley et al., 2007, February; Gardner, 2008, July 29). For departmental math courses, there are efforts to increase the number of students receiving degrees in the fields of science, technology, engineering, and mathematics (STEM) (National Science Foundation, Division of Undergraduate Education, 2008), and to increase student persistence in STEM fields, particularly of minorities (Hurtado & Chang, 2008). Therefore the findings of this study might inform the efforts towards increasing student success in college math courses. This study specifically reports on the statistical significance of students' trust in their math instructors, which is assumed to be a malleable student factor that can be improved. A better understanding of the effects of college students' trust in their math instructors might also guide instructional practices to improve the quality of instruction, so that student achievement and persistence can be increased within the first year and beyond.

Delimitations of the Study

This study is conducted at an urban public university with a low retention rate. A comparison of the graduation rates of similar urban universities shows that this university's total graduation rate has been around 30% over the 2004-2006 period, while other urban universities' rates has ranged from 16% to 44% (The Integrated Postsecondary Education Data System, 2009). Therefore, understanding the factors affecting the achievement and retention of the students at this university might be useful for the other urban universities with similar characteristics and problems with student achievement and retention.

Limitations of the Study

1. This study is done in a Midwestern public university that is in an urban setting. The findings may not be generalized to other higher education institutions.
2. The participants of this study were not randomly selected. As a result this study might have a limited generalizability to this institution's student population.
3. For this study, data were collected online, which might be a limitation as some students might have encountered problems with their computers or internet connections while taking the survey, or simply might not have had access to computers or the internet during the data collection period.

Definition of Terms

Agreeableness: The definition of this personality dimension is based on Golberg's (1993) lexical approach to the Big-Five factors. The Agreeableness dimension "contrasts traits such as kindness, trust, and warmth with traits such as hostility, selfishness, and distrust" (Goldberg, 1993, p. 27).

Big-Five Factors: The five-factor structure of personality has been established by the research following the psychometric tradition, and have been numbered and labeled as follows: Factor I. Surgency (or Extraversion); Factor II. Agreeableness (or Pleasantness); Factor III. Conscientiousness (or Dependability); IV. Emotional Stability (vs. Neuroticism); and V. Culture, Intellect, or Openness to Experience" (Goldberg, 1990, p. 27; Goldberg, 1993, p. 27). In this study the Big-Five factors are referred to as: Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Intellect, respectively.

Conscientiousness: The definition of this personality dimension is based on Golberg's (1993) lexical approach to the Big-Five factors. The Conscientiousness dimension "contrasts such traits as organization, thoroughness, and reliability with traits such as carelessness, negligence, and unreliability" (Goldberg, 1993, p. 27).

Emotional Stability: The definition of this personality dimension is based on Golberg's (1993) lexical approach to the Big-Five factors. The Emotional Stability dimension "includes such traits as nervousness, moodiness, and temperamentality" (Goldberg, 1993, p. 27).

Extraversion: The definition of this personality dimension is based on Golberg's (1993) lexical approach to the Big-Five factors. The Extraversion dimension "contrasts such traits as talkativeness, assertiveness, and activity level with traits such as silence, passivity, and reserve" (Goldberg, 1993, p. 27).

Motivated Strategies for Learning: This study uses Pintrich's (1994) integrative model of student academic motivation in the college classroom. The phrase "motivated strategies for learning" is used simply for convenience of expression to refer to students' motivational beliefs and self-regulated learning strategies, as used in the name of the instrument developed for this model, which is the Motivated Strategies for Learning Questionnaire (MSLQ).

Intellect: The definition of this personality dimension is based on Golberg's (1993) lexical approach to the Big-Five factors. Intellect dimension "contrasts such traits as imagination, curiosity, and creativity with traits such as shallowness and imperceptiveness" (Goldberg, 1993, p. 27). There is not an agreement on its label but other preferred terms are Culture, and Openness to Experience (McCrae & Costa, 1997).

Student Trust in Instructor: The definition of trust in this study is based on Tschannen-Moran and Hoy's (2000) comprehensive review of literature, which defines trust as "one party's willingness to be vulnerable to another party based on the confidence that the latter party is (a) benevolent, (b) reliable, (c) competent, (d) honest, and (e) open" (p. 556). Based on this definition it is believed that students' trust in their course instructors include these five facets of trust.

Assumptions

This study is based on the following assumptions:

1. It is assumed that student trust can be assessed indirectly. This assumption is based on the premises of the Student Trust of Principal (STP) Scale developed by Barnes et al. (2004, April).
2. It is assumed that the undergraduate math classes in the selected university have different levels of content complexity for and instructional approaches to teaching math across these three groups of courses: (1) Preparatory courses; (2) Courses for humanities, business, education, and social sciences; and (3) Courses for mathematics, science, engineering, and computer science majors. This assumption is based on the way undergraduate math courses were grouped by the university's math department.
3. It is assumed that undergraduate math courses in this university are among the historically challenging undergraduate courses, which are likely to cause student anxiety and affect student achievement. This assumption is based on the information from other universities regarding historically challenging college courses (e.g., Coley et al., 2007, February; Gardner, 2008, July 29) as well as on

the institutional data from this institution (e.g., Cleveland State University, The Office of Undergraduate Studies, 2008, September).

CHAPTER II

REVIEW OF LITERATURE

This chapter deals with three important concepts of this study: trust, motivation and personality. As the main focus is trust, the chapter starts by a review of current approaches to the concept of trust, followed by a section on the importance of trust in diverse teaching and learning settings. Then, the selected motivation and personality models are explained with a particular focus on college student learning and achievement.

Current Approaches to the Concept of Trust

Trust is a broad concept that has been examined in a variety of fields. It has attracted the attention of sociologists, political scientists, and economists who were trying to explain social phenomena such as social capital (e.g., Bahry, Kosolapov, Kozyreva & Wilson, 2005; Coleman, 1990; Hoff & Pandey, 2005). Researchers in the field of business and public affairs have examined trust as a fundamental element of organizational behavior that is affected by various contextual factors (e.g., Perry & Mankin, 2007), and psychologists have examined it as an important process within

interpersonal relationships (e.g., Simpson, 2007). Trust also received a great deal of attention from the field of education, specifically from the school effectiveness research, which focuses mostly on teacher-principal trust or trust relations among teachers to build strong school communities (e.g., Bryk & Schneider, 2003). Recently, biological fields have developed an interest in explaining the nature of trust and its biological underpinnings (e.g., Damasio, 2005). The definition of trust across these fields inevitably varies because of their different approaches to trust as a concept. In this review, these various approaches to trust are grouped under three main categories: (a) dispositional, (b) situational, and (c) developmental (or interpersonal). The dispositional approaches regard trust as a personal tendency that applies across various situations, whereas situational approaches see it as a behavior determined by certain conditions; and finally developmental/interpersonal approaches see it as a process that goes through stages and evolves over time. These three main approaches to trust are explained below with current theoretical conceptualizations and research findings.

Dispositional Approaches to Trust

Some people are more trusting than others (Cook, 2005; McKnight et al., 1998), and certain biological and cognitive processes are found to explain the underpinnings of this difference. This section provides a brief review of the biological, cognitive, and personality-based approaches to the concept of trust.

Trust is considered to be essential for the normal operation of human societies, yet little was known about the biology of it until recently (Damasio, 2005). A line of biological research examines human's "innate" tendencies and inclinations to trust or be trustworthy from a hormonal and neurological activity standpoint across fields such as

behavioral neurology, cognitive neuroscience, neuroendocrinology, and the brain research field within psychology. Within this realm of studies, a neuroactive hormone called oxytocin is found to be an important factor for trust between individuals. This hormone has been known to promote social attachment and affiliation in nonhuman mammals, and in recent studies it is found to increase a person's level of trust in others (Kosfeld, Heinrichs, Zak, Fischbacher & Fehr, 2005) as well as their trustworthy behavior (Zak, Kurzban & Matzner, 2005). A relationship was found between the oxytocin levels and maternal bonding behaviors of new mothers as indicated by their gaze, vocalizations, positive affect, and frequent checking of their infant (Feldman, Weller, Zagoory-Sharon & Levine, 2007). The magnitude of oxytocin levels was also found related to the strength of perceived partner support among couples, for both men and women (Grewen, Girdler, Amico & Light, 2005). In the light of these findings, it can be concluded that, individuals' trust related behaviors might be a function of the levels of oxytocin in their systems; therefore biologically driven.

Another line of biological research focuses on the "brain trust," which is found to involve both emotional and cognitive processing that are uniquely needed for trust. For example, studies have shown that individuals with early dysfunction in the prefrontal region of their brains (the typical region for cognitive processing) due to developmental disabilities or early brain trauma, might have severe and chronic social maladjustment such as distrust of others, alienation, and disregard of societal norms, despite having cognitive abilities such as intellect, memory, language, and academic achievement within normal range (Anderson, Damasio, Tranel & Damasio, 2001). This shows that trust requires a different type of cognitive processing compared to the processing used in

memory or language. Indeed, the prefrontal regions of the healthy brain are found to be more active during cooperative behavior, which requires joint attention to mutual gains and inhibition of immediate reward indulgence (McCabe, Houser, Ryan, Smith & Trouard, 2001). The reward processing regions of the brain might also explain the innate tendency to trust. Reciprocal altruism, for instance, is a form of cooperation and it is associated with consistent activation in the brain areas that have been linked with reward processing (i.e., nucleus accumbens, the caudate nucleus, ventromedial frontal/orbitofrontal cortex, and rostral anterior cingulate cortex) (Rilling, Gutman, Zeh, Pagnoni, Berns, & Kilts, 2002). Therefore, it is believed that activation of these neural networks might positively reinforce reciprocal altruism and motivate individuals to resist the temptation to selfishly accept but not reciprocate favors (Rilling et al., 2002).

Detection of trustworthiness is essential for human survival (Cosmides & Tooby, 1992), and many studies have shown that trust among people is often affected by the trustworthiness judgments (Colquitt, Scott & LePine, 2007). Various studies investigated the biological and cognitive processes involved in these judgments and found, for instance, that trustworthiness judgments are automatic rather than regulated (Willis & Todorov, 2006), and that the amygdala is significantly involved during trust related judgments (Heberlein, Adolphs, Tranel & Damasio, 2004), particularly regarding untrustworthiness (Winston, Strange, O'Doherty, & Dolan, 2002). The amygdala of the brain is known to react to threatening conditions along with the fear response in the body (Phelps, O'Connor, Gatenby, Gore, Grillon & Davis, 2001). It also "participates in the coordination of appropriate behaviors to avoid the danger" (Amaral, 2002, p. 15), and is "critical in emotional memory" (Adolphs, Tranel, & Buchanan, 2005, p. 512). These

findings suggest that trustworthiness judgments, therefore the likelihood of trust, might be based on the automatic emotion related processes in the brain.

There also are some personality-based models explaining individuals' differential tendencies to trust. These models are based on the concept of "generalized trust" which is defined as "a generalized expectancy held by an individual that the word, promise, or statement of another individual can be relied on" (Rotter, 1980, p. 1). There are two types of generalized trust: faith in humanity, namely the belief that "others are typically well-meaning and reliable;" and trusting stance, namely the belief that "regardless of whether people are reliable or not, one will obtain better interpersonal outcomes by dealing with people as though they are well-meaning and reliable" (McKnight et al., 1998, p. 477).

There is some evidence supporting this personality-based view that some people are more trusting than others, regardless of the contextual factors. For instance, in some social dilemma experiments, high trusters were found to be more likely to cooperate than low trusters even when there is an element of fear regarding a lack of reciprocation (Parks & Hulbert, 1995). Some researchers associate high trust with high social intelligence:

> …people with high social intelligence–those who are skilled in understanding their own and other people's internal states and use that understanding in social relations–are able to maintain a high level of generalized trust, whereas those with low social intelligence are not. (Yamagishi, Kikuchi & Kosugi, 1999, p. 155)

To summarize, certain biological and cognitive processes are found to be related to trust among individuals, such as oxytocin levels (Kosfeld et al., 2005; Zak et al., 2005), collaboration related cognitive processing in the pre-frontal region of the brain (Anderson et al., 2001; McCabe et al., 2001), reward processing of the brain (Rilling et al., 2002), and emotional processing of the amygdala (Heberlein et al., 2004; Winston et

al., 2002). These show that the likelihood of trust might be based on the healthy or sufficient functioning of certain biological systems, and that trust might be automatic rather than regulated in most cases. In addition to these, the level of trust might also be a function of personality where individuals hold a generalized trust, faith in humanity, or trusting stance no matter what the situation might be (McKnight et al., 1998; Rotter, 1980).

In this study, the Big-Five model of personality (Goldberg, 1993) represents the arguments of dispositional approaches to trust, specifically the personality-based approach to trust, which simply argues that some people are more likely to be trusting than others (e.g., McKnight et al., 1998). Specifically, the Agreeableness dimension of the Big-Five covers individuals' tendency to trust or distrust others (Goldberg, 1992, 1993). Therefore, the college students participating in this study who are high in Agreeableness might also report higher levels of trust in their math instructors.

Other personal and classroom characteristics such as gender, ethnicity, semester in college, math course type, and math class size are also considered to be important in the context of this study. Female students, more experienced students, or students in large classes might indicate significantly different levels of trust in their math instructors. These might be due to some contextual rather than dispositional factors. Therefore, this study also adopts a situational approach to trust which is explained in the following section.

Situational Approaches to Trust

Contextual factors such as norms and stereotypes influence individuals' trust (Cook, 2005). This section provides a brief review of the situational factors that are found to explain differences in trust.

Trust as a component of cooperative behavior, decision making, and strategy use has been examined across fields such as cognitive science, economic psychology, and social psychology using experimental designs with high ambiguity situations where certain risks and dilemmas are involved, having individuals to choose between cooperation versus selfish act. One factor that is associated with violations of trust is the situational conflict of interest between parties (Komorita & Mechling, 1967).

Situational conflicts involve a temptation to defect rather than cooperate, which have been investigated using games such as Prisoner's Dilemma (PD) (Komorita & Mechling, 1967). The magnitude of temptation in such situations is found to influence trust as it is shown that trust and cooperation are maintained longer when temptations are equal for both parties rather than unequal (Kershenbaum & Komorita, 1970). Group size is found to affect cooperative choices as examined in *N*-person dilemma (NPD) or "the tragedy of the commons" situations in which a group of three or more people is faced with a dilemma having to choose between maximizing individual interest versus maximizing collective interest, where everyone is worse off if they choose to maximize individual interests (Komorita & Lapworth, 1982). In these situations, the group size was found to negatively affect the cooperative choice, as larger groups increased the likelihood of selfish behavior (Komorita & Lapworth, 1982). Finally, the nature of the situation is found to affect trust as one study showed that the greatest amount of

cooperative behavior occurred in the benevolent condition rather than the malevolent one (Komorita, Sheposh & Braver, 1968). These findings suggest that trust in others might be based on contextual factors such as the temptation to defect, group size, and the benevolence of the situation.

Sociological trust models emphasize that both rational and emotional reasons affect people's trust. One reason might be a strong positive affect for the object of trust, which is known as emotional trust, affect-based trust, or identification-based trust; or the reason might be "good rational reasons" why the object of trust deserves to be trusted, which is known as cognitive trust, cognition-based trust, or calculation-based trust (Lewis & Weigert, 1985; McAllister, 1995; Nguyen, 2005). For example, trusting another person who is a member of one's own group is easier because the commonalities that arise from being members of the same social group, and the past experience provided by that membership can be reinforcing factors to trust (Child, 2001). Findings of an experimental study support this view, as it shows that group membership affects trusting behavior when personal information is not available (Tanis & Postmes, 2005).

These types of situational trust are essentially based on certain categorization processes, in which individuals are put into groups. It might be one's own group, or a group of people with similar attributions or reputations, or a general group of persons that is stereotypical (McKnight et al., 1998, p. 480). It is argued that "any process that categorizes another person into a positive group will lead to higher levels of trust beliefs about that person" (McKnight et al., 1998, p. 481). Social identity theory (Tajfel & Turner, 2007) and the similarity-attraction hypothesis (Byrne, 1971) also state that

individuals hold stronger trust beliefs about similar, in-group members than dissimilar, out-group members.

To summarize, situational approaches to trust have highlighted some contextual factors that are likely to affect people's trust related decisions, such as the magnitude of temptation to defect (Kershenbaum & Komorita, 1970), the nature of the situation (benevolent vs. malevolent) (Komorita et al., 1968), and the number of people involved (group size) (Komorita & Lapworth, 1982). The decision to trust others is also possibly affected by a strong positive affect or good rational reasons (Child, 2001; Lewis & Weigert, 1985; McAllister, 1995; Nguyen, 2005), social identities (Tajfel & Turner, 2007), and social categorization processes, such as reputation categorization or stereotyping (McKnight et al., 1998).

Students' math course type (or group) and math class size are the only contextual factors measured directly in this study. However, some indirect measures were also included, namely the students' gender, ethnicity and semester in college, which are considered to be important factors representing the arguments of situational approaches to trust. Even though contextual factors such as the instructor characteristics or the perceived atmosphere of the class are not directly measured in this study, it is believed that students' personal characteristics, which indicate their social groups, can be informative of such contextual factors. A female student, for instance, might perceive the nature of a situation differently than a male student within the context of a math class; the same thing might be true for an African American student compared to a White student.

The type of math class the students are taking and students' semester in college can also show a considerable difference in students' trust in their instructors, as students

in the math department, or more experienced students might have a better understanding of the norms and structures of a college math class than students who are in the communications department, or those who are in their first year, still in the process of adapting to a college life. Trust development over time is a widely examined issue in the literature by the developmental approaches to trust, particularly within the framework of interpersonal trust. These approaches and their theoretical assumptions are summarized in the following section.

Developmental Approaches: Interpersonal Trust

Trust is a key element in building and maintaining a sound interpersonal communication (Hoy, Smith & Sweetland, 2002). However, when the focus becomes long term interactions or relationships, the conceptualization of trust inevitably changes, and it becomes a dynamic process that evolves over time based on actions of interacting parties (Serva, Fuller & Mayer, 2005). In the context of interpersonal relationships trust is defined as "the level of confidence people have that another person will consistently respond to their needs and desires" (Miller & Rempel, 2004, p. 695).

The developmental approaches to trust examine it as a dynamic process that goes through certain stages and develops over time by being influenced by a variety of factors such as motives, attributions, emotions, expectancies, and decisions (e.g., Simpson, 2007). These approaches are specifically interested in explaining the ways trust is built and maintained over time; therefore trust is examined in natural contexts rather than laboratory settings.

In the developmental trust models, trust stages have generally been operationalized to be hierarchical. One such model states that trust goes through the

predictability, dependability, and faith stages (Rempel, Holmes & Zanna, 1985). In the predictability stage trust is established based on specific behavioral evidence, and if the individuals repeatedly behave in expected ways their relationship progresses to the dependability level. At the dependability level trust becomes a personal attribute of the individuals involved, and it is extended because of the trustworthiness of the other. Through continuous interaction, faith stage of trust might be reached, in which individuals experience emotional security, and no longer base their trust on behavioral evidence or dispositional attributes. At this final stage, individuals feel certain that the other party will follow through, despite any uncertainty (Rempel et al., 1985).

In business settings trust relations between parties begin by explicitly talking about the intentions to have an on-going relationship; then these relations develop into an understanding of each other through small deals; and if these interactions are successful, the relations turn into a strong interpersonal bond, and parties begin to rely on each other's networks and resources to function better (Nguyen, 2005). In dyadic relationships trust goes through six psychological stages: (a) entering trust (dispositions of the parties), (b) test situations (trust-diagnostic situations in the relationship), (c) joint decisions (motivation transformations of parties), (d) patterns of attributions, emotions, and future expectancies, (e) perceptions of trust (at least temporarily), and (f) perceived security (Simpson, 2007).

In the long run, trust might also decline, especially when distrust starts to emerge within this dynamic process:

> If solid evidence of untrustworthiness emerges, trust is destroyed quickly and distrust emerges. The speed with which trust can be destroyed depends on the magnitude of damage from untrustworthiness, plus the perceived intentionality of the untrustworthiness. In cases when the loss is

> particularly great, trust can evaporate almost immediately. If untrustworthiness is seen as intentional, the destruction of trust is particularly severe, because intentional untrustworthiness reveals malevolent intentions, which are seen as highly probable of predicting future untrustworthiness. (Currall & Epstein, 2003, pp. 197-198)

In some cases parties must choose or decide to trust in order to move from distrust to trust, so that the parties can coexist in peace and harmony, particularly in diverse social settings:

> … in the most difficult cases of building trust, between age-old ethnic enemies or longtime warring factions, the key ingredient isn't some magical transformation of attitude so much as it is the possibly drawn-out tedium of bringing the sides together and making some mutual commitments, perhaps starting with small and seemingly insignificant promises. In Vietnam, in Korea, in Palestine, in Bosnia, in Kosovo, the narrative in any attempt at reconciliation has always been the articulation of distrust, the airing of grievances and aspirations, the swapping of accusations and threats, the slow coming together of mutual acknowledgment and, eventually, shared identity and mutual respect. (Solomon & Flores, 2001, p. 94)

These cases are examples of the problems that developmental approaches deal with and are based on.

To summarize, developmental approaches to trust focus on explaining the facilitating and inhibiting factors in the dynamic process of trust development, which involves its initiation and maintenance over time. In the initial stages, parties actively develop an understanding of each other, and if their interactions are successful, they enter into a more secure stage where their trust is based on mutual faith and identification (Nguyen, 2005; Rempel et al., 1985). Therefore, the progression of trust is primarily based on an uncertainty reduction between individuals over time (Rempel et al., 1985).

This study does not examine trust from a developmental perspective, as the parties involved, namely the college students and their math instructors, do not enter into a long-term relationship throughout consecutive semesters and years. Therefore, this

study uses a cross-sectional design in which students' trust in their instructors can be compared across different semesters of study in college (e.g., more experienced students' trust in their instructors vs. newer students' trust in their instructors). This comparison will reveal differences, if any, between experienced students' trust and new students' trust in their instructors. Among all students, the senior might exhibit higher levels of trust in their instructors based on their previous successful interactions and identification within their departments, or the university as a whole.

The next section of this review deals with the educational significance of trust, particularly in diverse teaching and learning settings. There is extensive research showing the significance of trust within school communities particularly among teachers, parents, and principals. The following review, however, focuses solely on the significance of students' trust.

Importance of Trust in Diverse Teaching and Learning Settings

This study aims to test the educational significance of student trust in the instructor across all undergraduate math courses at an urban public university. It is believed that college students' personal characteristics such as gender and ethnicity might play a significant role in their trust and motivated strategies for learning math. There are research findings, for instance, showing how minority students' cultural mistrust might have negative effects on their motivation and academic performance (e.g., Albertini, 2004; Irving & Hudley, 2005). Based on these findings, identifying teacher characteristics that inspire student trust gains importance. Therefore, this section starts with a brief review of the research findings showing the negative effects of student mistrust and the positive effects of student trust in diverse teaching and learning settings,

and then continues with a summary of specific teacher characteristics that might be related to student trust in college settings.

Generalized trust, or the willingness to trust strangers, is more common in ethnically homogeneous societies (Knack & Keefer, 1997). Ethnic differences within societies are believed to strengthen in-group ties and undermine both generalized and cross-ethnic trust (Bahry et al., 2005). Based on these trends of trust at the society level, one can expect ethnic identities to influence trust among people in educational settings. One study, for instance, shows that the ethnic identity of the African American high school students moderates their initial trust beliefs about their adult mentors (Linnehan, Weer & Uhl, 2005).

Numerous studies have examined the effects of racial and cultural mistrust held by students, and their potential negative effects on academics, which point to the significance of a racial and cultural match between the student and the teacher. Perceived bias, for instance, is believed to prompt minority students to discount the validity of the feedback they receive from their European-American teachers (Akiba, 2001). Male African American high school students' cultural mistrust, namely their mistrust toward the intentions and actions of Whites and the dominant culture, is found to be significantly and negatively related to their academic outcome expectations and values (Irving & Hudley, 2005). More importantly, African American students' cultural mistrust, ethnic identity, and racial identity factors were found to explain 37% of the variance in their self-esteem scores (Phelps, Taylor & Gerard, 2001). One study showed that first generation Chinese-American adolescents did not trust their teachers and peers who were not Chinese-American (Zhou, Peverly, Xin, Huang & Wang, 2003). West Indian and

Haitian students in urban middle and alternative schools were found to hold moderate to high levels of racial mistrust towards White teachers, while their low academic achievement remained a concern (Albertini, 2004). These findings indicate how students' ethnic identity interacts with their trust in their teachers, which is also very likely to influence their achievement.

A sense of trust in relevant authority figures in schools is particularly important for immigrant students. Their trust in their English as a Second Language (ESL) teacher, for instance, is associated with their willingness to participate in ESL programs (Roessingh, 2006). As seen in this example, students are best served if they can feel certain that educators believe in their potential and care about their welfare (Cohen & Steele, 2002). One detrimental factor for the establishment of trust between teachers and students is the stigmatization as experienced by the students. In such classroom contexts stigmatized students mistrust their teachers, which can cause their motivation and performance to suffer (Cohen & Steele, 2002). Therefore, teachers are recommended to allay the threat of stigmatization to inspire trust in their students, hence improve their motivation (Cohen & Steele, 2002).

Students' trust might contribute to "a more positive orientation to academic study" (John, 2005, p. 637). It might also affect their academic performance. One study has shown that students' generalized trust in the adults in their schools is positively linked to their performance in standardized achievement tests (John, 2005). More importantly, a recent study done in middle schools has shown that "the student-teacher trust relationship uniquely contributed to students' performance through school adjustment and academic motivation" (Lee, 2007, p. 209).

The research on teacher characteristics might inform the research on student trust. Certain teacher behaviors like building rapport, and characteristics such as being caring and credible have been considered important for students' trust in their teachers, as well as their enjoyment of the subject matter and motivation to engage in proacademic behaviors (Benson, Cohen & Buskist, 2005). Also, teachers are strongly recommended to maintain high immediacy with their students, or to verbally communicate their caring in their classrooms, in order to maintain their trustworthiness and credibility in terms of competence (nonimmediacy was found to significantly reduce students' perception of teacher credibility and caring) (Teven & Hanson, 2004; Thweatt & McCroskey, 1998). Another trust related recommendation is for the mentors of the disadvantaged youth, to first focus on building trust and becoming friends instead of being overly goal-oriented and immediately trying to change their mentees (Sipe, 2002). For developing trust with the marginalized students, teachers are recommended to facilitate their trust by creating a curriculum and class environment that permits many opportunities for engagement, enables positive interactions, and fosters student ownership (Ennis & McCauley, 2002).

The trust between professors and college students contributes to building rapport, which is believed to enhance motivation, and stimulate learning (Buskist & Saville, 2001). Therefore, professors are recommended to demonstrate to their students that they can be trusted (Buskist & Saville, 2001). In one study, professor's out-of-class communications with their students was positively associated with student trust and motivation (Jaasma & Koper, 1999). Regarding classroom communications, college students reported that their ideal professors (in terms of personal characteristics, course design and policies, and classroom behavior) are more lenient, accessible, personable,

open to variation, and clear about course policies (Epting, Zinn, Buskist & Buskist, 2004).

There have also been suggestions for specific college subjects, and colleges as a whole. The English as a Foreign Language (EFL) instructors, for instance, are recommended to develop trust with their students through feedback and revision cycles in their writing classes, as the revision of drafts are found to play a significant role in the development of a caring relationship between the student and the instructor, which might affect students' writing as well as attitudes toward writing (Lee & Schallert, 2008). Instructors of undergraduate calculus classes, are recommended to set high standards for their students by gaining a good understanding of where they find their students regarding "their background, their ability, their desire to learn, their willingness to work hard, and their appreciation of what the teacher has a right to expect of them" (Lewis, 1994, p. 270). Other suggestions for calculus instructors are to be warm and caring, to "convince their students that their policies are fair and their expectations are reasonable," to avoid test questions that are out of reach of the students which leave students emotionally beat up and soured on mathematics (Lewis, 1994, p. 269). All these suggestions to college instructors require a certain level of skill and competence, not to mention the benevolence, fairness, and openness toward their students, which are among the five facets of trust (Tschannen-Moran, 2003).

Finally, students' trust in their colleges, namely their confidence that their colleges will take appropriate steps that will help them achieve their learning and career objectives (Ghosh et al., 2001, p. 325), is regarded to be an important component of student retention and recruitment. Therefore, the colleges are advised to pay attention to

their qualities regarding expertise, congeniality, openness, sincerity and integrity, which are believed to be the five antecedents of students' trust in their colleges.

To summarize, students with ethnic minority backgrounds, whose academic performance is lower than their White counterparts, typically have a lack of trust in their teachers. As this lack of trust and lower academic performance might be related, it becomes important to pay attention to teacher characteristics that inspire student trust. Several suggestions in this sense have been the following: allaying the threat of stigmatization (Cohen & Steele, 2002), building rapport, being caring and credible (Benson et al., 2005), maintaining high immediacy with students (Teven & Hanson, 2004; Thweatt & McCroskey, 1998), creating a curriculum and class environment that permits many opportunities for engagement, positive interactions, and student ownership (Ennis & McCauley, 2002). Suggestions specifically for college instructors and professors have been the following: having out-of-class communications with the students (Jaasma & Koper, 1999), being more lenient, accessible, personable, open to variation, and clear about course policies (Epting et al., 2004), developing trust through feedback and revision cycles in ESL writing classes (Lee & Schallert, 2008), and convincing the students about the fairness of the class policies and expectations in undergraduate calculus classes (Lewis, 1994). All in all, it seems important for both professors and colleges as a whole to make efforts to develop trust with their students to create an appealing learning environment, which could increase their academic motivation and achievement in their courses, and increase their satisfaction with the college experience.

The findings presented in this section suggest a link between student trust and their achievement that is mediated by their academic motivation, hence the interest for motivation in this study. Various researchers have investigated student motivation. However, for the purposes of this study, the integrated model of student academic motivation (Pintrich & Zusho, 2007) is selected as the theoretical framework because of its comprehensive view of motivation and specific focus on college students. The next section briefly explains this motivational model and then summarizes its components that are relevant to this study.

Motivation and Self-Regulated Learning in College Classroom

Student motivation is a common concern for college level courses. "Students often blame the instructor for not motivating them, and instructors often attribute poor academic performance in the classroom to the students' lack of motivation" (Pintrich, 1994, p. 23). Rather than assigning the whole responsibility to either students or instructors, Pintrich's (1994) integrative model of student academic motivation in the college classroom, emphasizes "the interactive and reciprocal nature of the relations between students and the classroom context, including the instructor's behavior, in describing and explaining motivation" (p. 23). The revised version of the model by Pintrich and Zusho (2007) incorporates students personal characteristics and self-regulated learning processes into the model and uses three main factors as general organizers: (1) personal characteristics (student age, gender and ethnicity) and classroom context (factors, such as nature of the tasks or instructor's behavior), (2) internal factors (students' motivational processes such as self-efficacy beliefs and task value, and self-regulatory processes such as effort regulation and help seeking), and (3) student

outcomes (such as the academic achievement measured through course grades). A representation of this model is displayed in Table 2 below with its three main organizers and their relevant elements.

Table 2

An Integrative Model for Conceptualizing Student Motivation in the College Classroom

Personal Characteristics & Classroom Context	→	**Internal Factors**	→	**Student Outcomes**
Students' personal characteristics and classroom factors that can influence student motivation		Student motivational beliefs, emotions and self-regulatory processes that are assumed to mediate between the context and behavior		Actual observable behaviors that can be used as indicators of motivation and student achievement
Personal Characteristics ➢ Age ➢ Gender ➢ Ethnicity		**Motivational Processes** ➢ Expectancy component • Self-efficacy ➢ Value component • Task value ➢ Affective component • Test anxiety		**Achievement** ➢ Course grades
Classroom Contextual Factors ➢ Nature of the tasks ➢ Reward and goal structures ➢ Instructional methods ➢ Instructor behavior		**Self-Regulatory Processes** ➢ Regulation of behavior • Effort regulation • Help seeking		

Note. This table is adapted and merged from Pintrich (1994, p. 25), and Pintrich and Zusho (2007, p. 735).

The model presented in Table 2 is given in a linear format only for ease of presentation as these three major components are linked in reciprocal ways as it is based on a social cognitive perspective (Pintrich & Zusho, 2007). For instance, it is assumed that student outcomes (e.g., the grades they receive) will also influence their motivational processes (e.g., beliefs about their self-efficacy). Students' background characteristics and prior motivational beliefs regarding themselves and the course subject may also influence their perceptions of the contextual factors as well as their subsequent beliefs and behaviors in the class (Pintrich & Zusho, 2007). However it is important to note that

this model does not assume a direct path from personal characteristics or classroom contextual factors to student outcomes. Rather, students' motivational and self-regulatory processes are believed to mediate their effects on the outcomes (Pintrich, 1994; Pintrich & Zusho, 2007).

This general model attempts to describe a dynamic and interacting system of the three major components of student motivation in college classrooms, which are explained below in the following order to make conceptualizations easier to follow: achievement as the student outcome, self-regulatory processes, motivational processes, and personal characteristics and classroom context.

Achievement as the Student Outcome

When asked about student motivation, most people give examples about student behaviors such as "studying effectively" or "asking questions" which are not usually defined as "motivation" per se in current motivation models but rather seen as functions of the motivational beliefs (Pintrich, 1994). These types of student behaviors can also be regarded as student outcomes, as they are the products of their motivational and self-regulatory processes. In this study, however, the student outcome factor that is of interest is their achievement, specifically their course achievement, which can be observed through course grades (Pintrich & Zusho, 2007). Within the current motivational model, indicators of achievement are assumed to be partially a function of motivational and self-regulatory processes, which are explained in the following sections.

Self-Regulatory Processes

College students' motivation can be explained by the four general assumptions of self-regulated learning: (1) "active constructive assumption" (i.e., learners are active and constructive participants of the learning process, as opposed to being passive recipients of information), (2) "potential for control assumption" (i.e., it is possible for learners to monitor, control, and regulate some aspects of their cognition, motivation, behavior, and environment), (3) "criterion assumption" (i.e., learners use some type of criterion or standard to make their comparisons for self-evaluations), and (4) "mediation assumption" (i.e., learner's cultural, demographic, and personality characteristics, as well as the classroom contextual factors affect their learning and achievement through the mediation of the learners' motivational beliefs and self-regulatory activities) (Pintrich & Zusho, 2007, pp. 739-741). Self-regulatory processes are defined as the "internal strategies and processes that students might use to monitor, control, and regulate themselves" (Pintrich & Zusho, 2007, p. 735). These processes involve regulation of cognition (i.e., selective use of cognitive strategies, monitoring through metacognitive strategies), regulation of motivation and affect (i.e., monitoring and changing motivational beliefs, coping with negative emotions), regulation of behavior (i.e., time management, effort regulation, help seeking), and regulation of context (contextual planning and activation, contextual monitoring, contextual control and regulation, contextual reaction and reflection). The focus of this study is on the regulation of behavior component, specifically the effort regulation and help seeking strategies (Pintrich, 1994, p. 25; Pintrich & Zusho, 2007, p. 735).

Regulation of Behavior. This type of regulation by students implies their behavioral control. In a college math classroom, students' regulation of behavior would start with their planning regarding their time and effort allocation for working on assignments, studying, or preparing for exams. Following these, they would monitor their effectiveness and make adjustments to meet the demands of the tasks they are dealing with. If the task is harder than they expected, students might increase their efforts; however if the task is too difficult, they might decrease effort, procrastinate, or give up. Finally, students might regulate their behavior by help seeking, which involves social interactions with their environment, such as seeking help from other students or their professors (Pintrich & Zusho, 2007).

Research findings show significant associations between college students' effort regulation and academic achievement. For instance, a recent study showed that undergraduate students' effort regulation is significantly and positively related to their GPAs; more importantly, effort regulation was found to mediate the effects of the Big-Five personality factors of Conscientiousness and Agreeableness on GPA (Bidjerano & Yun Dai, 2007). Another study found effort regulation to be a strong predictor of course grades for freshman and upper level college students (Lynch, 2006).

No significant relationships were found to be reported for the help seeking strategy. In a validation study of the motivational measure used in this study, help seeking did not correlate significantly with students' final course grades (Pintrich, Smith, Garcia & McKeachie, 1993).

Motivational Processes

The expectancy-value approach to motivational processes provides a useful framework for a comprehensive view of motivational processes in the classroom (Pintrich, 1994). The three important components of this approach are: (1) expectancy component (i.e., "beliefs about one's ability or skill to perform a task"), (2) value component (i.e., "beliefs about the importance and value of a task"), and (3) affective component (i.e., "feelings about the self or emotional reactions to the task") (Pintrich, 1994, p. 28). In the current model of college student motivation, the expectancy component involves self-efficacy and control beliefs, value component involves goals and task value beliefs, and the affective component involves test anxiety, other emotions (e.g., anger, guilt) and self-worth beliefs (Pintrich, 1994, p. 25; Pintrich & Zusho, 2007, p. 735). In this study, the expectancy component is represented by students' self-efficacy beliefs, the value component is represented by students' task value beliefs, and the affective component is represented by their test anxiety, all of which are briefly explained below.

Expectancy Component: Self-Efficacy. The students who have confidence in their ability to perform in a task (e.g. "I can learn this material in linear algebra") are more likely to persist when faced with difficulty (Pintrich, 1994). Such beliefs of students are referred to as their self-efficacy beliefs, which imply situational or domain specific judgments of performance capabilities (e.g., in linear algebra) (Pintrich, 1994).

Research suggests that students' self-efficacy beliefs are positively related to adaptive cognitive and self-regulatory strategy use, and significantly predict actual college course achievement, next to previous knowledge and general ability as measured

by performance in earlier tests and SAT scores, respectively (Pintrich & Zusho, 2007). One study showed that music students with high self-efficacy beliefs were more likely to show cognitive and metacognitive engagement with the material to be learned (Nielsen, 2004). Another study showed a link between self-efficacy beliefs and metacognitive strategies among university students, in fact, self-efficacy beliefs were found to fully mediate the relationship between metacognition and performance (Coutinho, 2008). Self-efficacy beliefs of university students were also linked to their self-oriented perfectionism (rather than socially prescribed perfectionism), which is associated with adaptive metacognitive and cognitive learning strategies, and effective resource management (Mills & Blankstein, 2000). More importantly, in several studies students' self-efficacy beliefs significantly correlated with or predicted midterm exam grades and course grades of both freshman and upper level college students (Klomegah, 2007; Lynch, 2006; Thomas & Gadbois, 2007).

Based on the strength of the relationships found in the literature, it is suggested that self-efficacy should be included in the analyses as a significant mediator between personal and classroom factors and student outcomes such as achievement (Pintrich & Zusho, 2007).

Value Component: Task Value. College students' task value beliefs refer to the extent to which they see the task as important, have a general liking for it, or believe in the usefulness of it for their future goals (e.g., "Learning linear algebra is important for me to become a good statistician"). Task value beliefs can be informative about students' level of involvement because when students believe in the importance and utility of a task, they behave and persist accordingly (Pintrich, 1994). Students might have different

goal orientations for a college subject (e.g., linear algebra), yet they could all believe in the value of learning it, hence become actively engaged with it (Pintrich, 1994).

Higher levels of task value are associated with the higher use of adaptive cognitive and self-regulatory strategies, as well as course achievement in college classrooms (Pintrich & Zusho, 2007). Indeed, it is found to be related to self-oriented perfectionism among university students, which is associated with adaptive metacognitive and cognitive learning strategies as well as effective resource management (Mills & Blankstein, 2000). Among other motivational constructs, task value was found to be the best predictor of course grades among students in a teacher education program (McClendon, 1996). In studies with high school students, task value is found to significantly predict biology achievement scores (Yumusak, Sungur & Cakiroglu, 2007), and remain relatively stable within a school year compared to the self-efficacy beliefs, which fluctuated significantly around examinations (Bong, 2005).

It is important to consider expectancy and value components of student motivation (i.e., self-efficacy beliefs and task value) simultaneously because students might have high task value but if they believe that the task cannot be accomplished based on their self-efficacy beliefs, they will be less engaged with the task–or they could believe that the task could be accomplished but would not value the task, hence become less engaged (Pintrich, 1994).

Affective Component: Test Anxiety. Many emotional needs and responses of students might be relevant to academic performance, such as self-esteem, self-worth, affiliation, anxiety, pride, or shame besides many other affective reactions; yet the most frequently examined student affect has been their anxiety (Pintrich, 1994).

Test anxiety, in particular, is known to have detrimental effects on students' cognitive processing, self-regulatory strategy use, and academic performance–evidenced by consistent findings showing its negative relationship to all these constructs, particularly academic achievement (e.g., Hembree, 1988; Pintrich & De Groot, 1990; Pintrich & Zusho, 2007; Rodger, Murray & Cummings, 2007). When students worry during a test they probably engage in thoughts about failure (e.g., "These questions are too hard, I am going to fail this exam, what am I going to do then?") or have physical reactions as they worry (e.g., increased heart rate, upset stomach) both of which are likely to interfere with their ability to do well in the exam (Pintrich, 1994). More importantly, test anxiety is associated with students' self-handicapping behavior and lower self-efficacy beliefs, which affect academic achievement (Thomas & Gadbois, 2007). Based on these significant findings about the negative effects of test anxiety, it seems important to integrate it into the models that try to explain student motivation and achievement in challenging college courses.

To summarize, there are three important motivational beliefs of college students that are significantly related to their academic achievement: (1) self-efficacy beliefs, (2) task value, and (3) test anxiety (Pintrich, 1994). In this study, these motivational factors are examined in the context of undergraduate math courses next to other student and classroom characteristics, such as Big-Five personality factors, gender, ethnicity, semester in college, math course type (or group), math class size, and more importantly, student trust in instructor, to compare their predictive powers for math course grades.

Personal Characteristics and Classroom Context

Students bring various personal characteristics with them into the college classrooms, which can influence their motivational and self-regulatory processes. Pintrich and Zusho (2007) focus only on three general personal factors: age, gender, and ethnicity, which are likely to be moderators between student motivation and outcomes.

Age. Even though research on college students uses a relatively homogeneous sample with ages ranging from 17 to 25, one can find differences in motivational beliefs and use of self-regulatory strategies across different years of study in college (Pintrich & Zusho, 2007). Juniors and seniors, for instance, are probably more likely to be proficient in self-regulating their behavior compared to the freshmen who may not even be aware of various self-regulatory strategies that apply to their situations (Pintrich & Zusho, 2007). It is also important to consider the non-traditional college students over 25, who might have different motivational beliefs and use of self-regulatory strategies compared to traditional 17- to 25-year-old college students. Non-traditional students might, for instance, have higher task value for college related work and be more willing to engage in self-regulatory processes (Pintrich & Zusho, 2007).

Gender. Recent research on gender differences in abilities and academic achievement no longer indicates a consistent gender-related gap; however, differences in persistence have been found between female and male students in the fields of mathematics, science and engineering, which are often attributed to the lower self-efficacy beliefs female students have in these fields (Pintrich & Zusho, 2007). There is limited evidence in the literature showing gender-related differences in other motivational beliefs (e.g., goal orientations) or use of self-regulatory strategies (e.g., females showing

higher levels of self-regulated learning); however the results have been inconsistent across different settings, indicating a lack of systematic pattern (Pintrich & Zusho, 2007).

Ethnicity. Considering the increasing number of minority students in colleges, college instructors need to understand how to teach these students better, making it imperative that researchers take ethnic and cultural differences into account in their research (Pintrich & Zusho, 2007). Researchers recently started to focus on the different ways the motivational processes operate in different ethnic groups to influence academic achievement (Pintrich & Zusho, 2007). For instance, an inverse relationship is found between self-efficacy beliefs and actual achievement comparing African American students, who generally overestimate their ability to perform an academic task, and Asian American students, who often underestimate their ability (Pintrich & Zusho, 2007, p. 791). Students who believe that they are doing well may not sufficiently regulate their learning behavior, which in turn may result in lower levels of achievement. Therefore, ethnicity should not be overlooked as a student factor while examining differences in the motivational processes and academic achievement.

Various factors in the classroom can also influence student motivation. Pintrich (1994) focuses only on four general factors that not only can dramatically effect student motivation but also can be changed by the individual college instructor to facilitate student motivation. These factors are: (1) the nature of the task, (2) the reward and goal structure of the classroom, (3) the instructional methods, and (4) the instructor's behavior.

Nature of Academic Tasks. These can be examined by looking at the type of tasks an instructor asks students to complete, which have two important components to them:

content and product (Pintrich, 1994). An appealing content might foster student interest better and lead them to become more engaged (e.g., asking questions), and a difficult content might lead to lower self-efficacy beliefs regarding understanding the course material hence lead to less motivated behavior (e.g., not maintaining effort when fatigued) (Pintrich, 1994). Research papers and exams can be examples of products, and a research paper topic that is chosen by the student can foster higher control beliefs hence lead to more motivated behavior (e.g., working on research paper instead of leisure activity), and a difficult exam with limited time allowed to finish can increase test anxiety and have serious negative effects on motivated behavior (e.g., reduced effort) (Pintrich, 1994).

Reward and Goal Structures. The three reward structures (e.g., grading system) the instructors might adopt are: independent, cooperative, or competitive structures (Pintrich, 1994). Among these, competitive reward structures where the instructor grades student on some type of curve (limiting the number of higher grades) are found to increase anxiety and lower students' self-efficacy beliefs, which are detrimental to student motivation (Pintrich, 1994). The goal structures can also take the forms of being individualistic, cooperative, or competitive based on the way instructor organizes the students to accomplish tasks (Pintrich, 1994). Overwhelming evidence suggests that organizing students to work together cooperatively have positive motivational effects such as lower anxiety and increased interest (Pintrich, 1994). However, there are some concerns to this type of organization such as "free riders" (students who do not contribute). Therefore:

> …the most beneficial arrangement is to have students work together on a task (a cooperative goal structure) but to maintain an individualistic

> reward structure whereby individual students are held accountable for their own work….just putting the students into groups and saying "Discuss and work together" is not effective for student motivation or learning. (Pintrich, 1994, p. 38)

Instructional Methods. Instructional methods that are used in college classrooms such as lectures, discussions, or recitations can influence student motivation (Pintrich, 1994). It is important to understand relative contributions of each instructional method to facilitate student motivation: Discussion methods might foster a greater sense of control on student part regarding pace and content, hence facilitate motivation through increasing students' control beliefs; a stimulating lecture, on the other hand, might facilitate motivation through increasing students' interest in the subject (Pintrich, 1994).

Instructor Behavior. Research on instructor characteristics has shown relationships between instructor characteristics such as clarity, enthusiasm and rapport and student learning and motivation (Pintrich, 1994). For example, "instructor expressiveness" as indicated by their physical movement, eye contact, voice inflection, and humor is found to enhance students' learning and motivation (Perry & Penner, 1990). In their recent experimental study, Rodger et al. (2007) found that students in the high teacher clarity condition scored higher on an achievement test than students in the low clarity condition (a significant main effect was reported for teacher clarity). Student ratings of "teaching effectiveness" can also be informative regarding student motivation particularly regarding more favorable instructor behavior dimensions such as "skill and structure" (Cohen, 1981, p. 281); "clarity of goals and objectives, clarity of expectations, quality of feedback" (Hammoud, Haefner, Schigelone, & Gruppen, 2004, p. 1743); "verbal and nonverbal immediacy behaviors" (Moore, Masterson, Christophel & Shea, 1996, p. 30); and finally "showing enthusiasm for teaching, inspiring confidence in

knowledge and skills, providing feedback, and encouraging students to accept increasing responsibility" and "being available to students" (Elnicki & Cooper, 2005, p. 635).

To summarize, the motivational model used in this study focuses on three personal factors of the students, namely their age, gender, and ethnicity, which are likely to be moderators between student motivation and outcomes (Pintrich & Zusho, 2007). The model also focuses on four classroom contextual factors that can dramatically affect student motivation: (1) the nature of the task, (2) the reward and goal structure of the classroom, (3) the instructional methods, and (4) the instructor's behavior (Pintrich, 1994). These factors can be changed by the individual college instructor to facilitate student motivation, and this is why student trust seems to fit well into this section of the motivational model. In other words, student trust can be considered as a classroom contextual factor as it is basically dependent on the instructor's behavior (e.g., trustworthiness), and it can be facilitated by changes in these behaviors to facilitate student motivation.

Students' personality is considered to be another important factor that is associated with college students' motivation and academic achievement. The following section explains the reason for including student personality in this study.

Big-Five Personality Factors

Student personality factors are included in this study to represent the dispositional approaches to trust in the literature, which assume that some people are more trusting based on their disposition to trust (e.g., McKnight et al., 1998). It is believed that certain personality factors might be associated with differences in students' trust in their instructors. The Agreeableness factor of the Big-Five model, for instance, includes trait

descriptions such as trust and distrust (Goldberg, 1992, 1993), which could be related to students' reports of trust in their instructors.

The Big-Five model of personality has been established by the research following the psychometric tradition, specifically the psycholexical and the questionnaire traditions (De Raad & Perugini, 2002). For this study, Goldberg's (1981) lexical view is selected as the theoretical framework for the Big-Five as it offers a comprehensive account of trait description in personality research. The next section briefly explains the Big-Five factors, and Goldberg's lexical approach to the Big-Five.

Theoretical Perspective: Goldberg's Lexical Approach

Research in the personality psychology field examining trait-descriptive terms has consistently revealed five broad factors of personality adding to the momentum of the Big-Five model of personality (Goldberg, 1992). The Big-Five factors represent the five broad domains of personality that incorporates "hundreds, if not thousands, of traits," and "have traditionally been numbered and labeled as follows:" Factor I. Surgency (or Extraversion); Factor II. Agreeableness (or Pleasantness); Factor III. Conscientiousness (or Dependability); IV. Emotional Stability (vs. Neuroticism); and V. Culture, Intellect, or Openness to Experience" (Goldberg, 1990, p. 27; Goldberg, 1993, p. 27). (Hereafter, this study refers to Factor I as Extraversion, Factor II as Agreeableness, Factor III as Conscientiousness, Factor IV as Emotional Stability, and Factor V as Intellect).

Goldberg's (1981) research in these factors was driven by his quest for a universal taxonomic structure of personality. His factor analysis of adjective clusters provided "the first persuasive evidence that five large factors provided a comprehensive account of trait description in the English language," which integrated the commonalities of various

personality models such as the semantic, interpersonal, factor analytic, and psychodynamic (Wiggins & Trapnell, 1997, p. 757). The roots of his taxonomy lie in "the lexical hypothesis" which states that "the most important individual differences in human transactions will come to be encoded as single terms in some or all of the world's languages" (Goldberg, 1993, p. 26). One of the key premises of this lexical approach is that the language of personality is used for description rather than explanation; in other words "it makes no a priori assumption that the phenotypic attributes encoded in language are stable ones" (Saucier & Goldberg, 2001, p. 848).

Significance of the Big-Five for College Teaching and Learning

This study defines the Big-Five factors based on the lexical approach explained in the previous section. This section briefly explains how each factor is defined by this approach, and then summarizes some research findings primarily based on British and Australian university students showing significant associations between the Big-Five and student outcomes (e.g., motivation and achievement).

Extraversion. This higher-order personality factor "contrasts such traits as talkativeness, assertiveness, and activity level with traits such as silence, passivity, and reserve" (Goldberg, 1993, p. 27), and it "has been included as a higher-order factor in every major taxonomic scheme of personality traits that has been developed during the past 50 years" (Watson & Clark, 1997, p. 768). Among university students in the UK, Extraversion is associated moderately with divergent thinking (Chamorro-Premuzic & Reichenbacher, 2008), and weakly with creative thinking (Chamorro-Premuzic, 2006). In terms of assessment methods, Extraversion factor is weakly associated with preference for group work, and oral examinations (Chamorro-Premuzic, Furnham, Dissou &

Heaven, 2005). Studies have also shown that Extraversion is weakly but negatively related to undergraduate statistics exam grades (Furnham & Chamorro-Premuzic, 2004), and overall academic exam performance in a year (Chamorro-Premuzic & Furnham, 2003b). These findings associate Extraversion positively with creativity, and negatively with academic achievement.

Agreeableness. This factor "contrasts traits such as kindness, trust, and warmth with traits such as hostility, selfishness, and distrust" (Goldberg, 1993, p. 27); and represents the agentic versus communal orientation of individuals, which influences group goal attainment, group cohesion, and effective group functioning (Graziano & Eisenberg, 1997, pp. 799-803). Among university students, Agreeableness is associated weakly with the deep approach to learning, which is characterized by "intrinsic motivation, engagement with the subject matter, and the desire to know everything about a given topic" (Chamorro-Premuzic, Furnham & Lewis, 2007, p. 242). It is also associated weakly with undergraduate students' preferences for lab classes, discussion groups, and small groups as methods of teaching (Chamorro-Premuzic et al., 2007), as well as group work as the method of assessment (Chamorro-Premuzic et al., 2005). Regarding instructor personality, Agreeable students are found to prefer Agreeable instructors (Furnham & Chamorro-Premuzic, 2005). Finally, a recent study done in a large Northeastern university in the US has shown that Agreeableness explain 12% of the variance in GPAs through the mediation of students' effort regulation (Bidjerano & Yun Dai, 2007). These findings associate Agreeableness positively with adaptive learning strategies and motivational orientations as well as academic achievement.

Conscientiousness. This factor "contrasts such traits as organization, thoroughness, and reliability with traits such as carelessness, negligence, and unreliability" (Goldberg, 1993, p. 27). Conscientiousness is "the only dimension of personality to show consistent validities across organizations, jobs, and situations" (Hogan & Ones, 1997, p. 851). Among university students, Conscientiousness is associated weakly with the deep approach to learning (Chamorro-Premuzic et al., 2007), and a preference for Conscientious lecturers (Chamorro-Premuzic, Furnham, Christopher, Garwood & Neil Martin, 2008). One study shows that the more Conscientious the students are, the more likely they are to think that intelligence can be increased through life span (Furnham, Chamorro-Premuzic & McDougall, 2003). Regarding student outcomes, Conscientiousness is associated weakly with academic examination performance (Chamorro-Premuzic & Furnham, 2003b), and undergraduate students' statistics exam grades (Furnham & Chamorro-Premuzic, 2004). It is found to predict final exam scores of undergraduate students accounting for more than 10% of unique variance in these scores (Chamorro-Premuzic & Furnham, 2003a). Among students in the US, it is also found to significantly contribute to the variance in total exam scores over and above student high school GPA, undergraduate GPA, and SAT total score (Dwight, Cummings & Glenar, 1998). A recent study in the US has shown that Conscientiousness explains 11% of the variance in GPA through the mediation of students' effort regulation (Bidjerano & Yun Dai, 2007). These findings associate Contentiousness positively with adaptive learning strategies and motivational orientations as well as academic achievement in college.

Emotional Stability. This fourth factor "includes such traits as nervousness, moodiness, and temperamentality" (Goldberg, 1993, p. 27). Neuroticism (a similar Big-Five factor used in NEO-PI-R based measurements, which corresponds to low Emotional Stability) is associated with test anxiety among university students in British and American universities (Chamorro-Premuzic, Ahmetoglu & Furnham, 2008). Emotional Stability is associated weakly with the preference for the deep learning strategy, and weakly but negatively with the preference for the surface learning strategy (Chamorro-Premuzic et al., 2007). Neuroticism (low Emotional Stability), on the other hand, it is weakly but negatively correlated with the preference for oral exams and continuous assessment methods (Chamorro-Premuzic et al., 2005). Studies have also associated Neuroticism weakly but negatively with students' total exam scores (Dwight et al., 1998) and overall academic examination performance in a year (Chamorro-Premuzic & Furnham, 2003b). In addition, Neuroticism is found to predict final exam scores accounting for more than 10% of unique variance in these scores (Chamorro-Premuzic & Furnham, 2003a). These findings associate low Emotional Stability negatively with both adaptive learning strategies and academic achievement.

Intellect. This fifth factor of personality "contrasts such traits as imagination, curiosity, and creativity with traits such as shallowness and imperceptiveness" (Goldberg, 1993, p. 27). There is not an agreement on its label but other preferred terms are Culture, and Openness to Experience as it seems to cover the elements such as "polished" and "knowledgeable" as opposed to "clumsy, awkward" (McCrae & Costa, 1997, p. 830). This personality factor is associated moderately with divergent thinking (Chamorro-Premuzic & Reichenbacher, 2008), and weakly with acquisition of general knowledge

(Furnham, Christopher, Garwood & Neil Martin, 2007) and the deep approach to learning (Chamorro-Premuzic et al., 2007). It is also associated weakly with students' preferences for lab classes, discussion groups, and small groups as options regarding the teaching method (Chamorro-Premuzic et al., 2007). Regarding preferences for assessment methods, it is associated weakly but negatively with the preferences for multiple-choice exams, and positively with the preference for oral examinations (Chamorro-Premuzic et al., 2005). In a recent study Intellect is shown to independently explain 10% of the variance in undergraduate GPAs in a large American university (Bidjerano & Yun Dai, 2007). These findings associate the Intellect factor positively with creative thinking, adaptive learning strategies, and academic achievement.

To summarize, there are consistent findings in the literature showing that desirable student outcomes in college such as academic achievement, as measured by their exam scores and overall GPAs are related positively to the Big-Five factors of Conscientiousness, Agreeableness, and Intellect, and negatively to Extraversion and low Emotional Stability. The Big-Five personality model is selected to be used in this study to represent the dispositional approaches to trust in the literature. Particularly the Agreeableness factor could be associated with students' reports of trust in their instructors, as it involves trait-descriptions of trust and distrust (Goldberg, 1993), as well as specific tendencies and behaviors such as "being kind, considerate, likable, cooperative, and helpful" (Graziano & Eisenberg, 1997, p. 815).

All in all, this study seeks to establish the link between student trust and student achievement in challenging college courses, by testing this link next to other well-tested concepts of personality and motivation. The following chapter explains the methodology

of this study by giving specific details about the participants, selected instruments, data collection procedures, research design, and statistical analyses.

CHAPTER III

RESEARCH METHODOLOGY

The purpose of this study was to examine the relationship between college students' trust in their math instructors and their math course achievement next to other student factors of personality and motivation. The particular focus on undergraduate math courses was due to their reputation to be "historically challenging," and the venue for this research, namely the medium-sized American university, was determined partly based on the researcher's familiarity with this institution's interventions intended to increase undergraduate students' achievement and mostly because it is an urban public university struggling with student achievement and retention.

Participants

The participants of this study were the students enrolled in undergraduate math courses offered in Spring 2009 semester in the selected university. In Spring 2009 semester this university offered a total of 33 undergraduate math courses under three main groups with differing intended students and levels of math. The first group was preparatory math courses with three courses offered; the second group was made up of 12

courses that were offered for students in humanities, business, education, and social sciences majors; and the third group was made up of 18 courses that were intended for the students in mathematics, science, engineering, and computer science majors. Only nine students participated from the preparatory math courses, therefore this group had to be excluded from the study. Several other exclusions were due to cases in which the student did not provide identifiable information (i.e., the name or the student ID), or was just auditing the math class hence was not given a grade at the end of the semester, or was not enrolled in any of the math courses in Spring 2009 semester according to the university's database. After these exclusions, there were a total of 175 participants. The characteristics and demographics of these participants are presented in Table 3.

The participants were mostly female (58%), White (69%), in their first or second semester (60%), under 25 years of age (70%), and from the colleges of science (26%), liberal arts and social science (19%), and education (18%). There were two groups of students based on the math course they were taking: students in Group 1 (48%) were those who were taking math courses for humanities, business, education, and social sciences majors; and students in Group 2 (52%) were those who were taking math courses for mathematics, science, engineering, and computer science majors.

Even though these participants were volunteers for this study, their characteristics were somewhat reflective of all the students in this university. Based on this institution's 2008 Book of Trends (Chen, Geither, Moran & Radachy, 2008), general characteristics of its undergraduate students in Fall 2007 were as follows: Their median age was 23 and the majority was made up of White students with 62% enrollment (51% female), followed by 22% African American (70% female), and 3% Asian or Pacific Islander (49% female).

Table 3

Participant Characteristics and Demographics (N = 175)

Gender	Female	101 (58%)
	Male	72 (41%)
Ethnic Background	Caucasian/White	120 (69%)
	African American	22 (13%)
	Asian	12 (7%)
	International Student	5 (3%)
	Pacific Islander	1 (1%)
	Other	13 (8%)
Age	Under 25	123 (70%)
	Between 25 and 35	37 (21%)
	Over 35	15 (9%)
Semester	1 & 2	104 (60%)
	3 & 4	35 (20%)
	5 & 6	13 (8%)
	7 & 8	14 (8%)
	More than 8	3 (2%)
College	Science	44 (26%)
	Liberal Arts & Social Science	33 (19%)
	Education	31 (18%)
	Engineering	29 (16%)
	Business	16 (10%)
	Urban Affairs	4 (2%)
	Others	18 (10%)
Math Course Group	Group 1	84 (48%)
	Group 2	91 (52%)

Note. Data are expressed as *f* (%). Semester counts are grouped in pairs for a convenient presentation here. Group 1 = Math courses for humanities, business, education, and social sciences majors; Group 2 = Math courses for mathematics, science, engineering, and computer science majors.

Instruments

Student Trust Survey (STS)

In a recent study, the concept of social capital was applied to the context of public schools in the United States, and a theory-based measurement of social capital was proposed based on two dimensions: cognitive and structural (Forsyth & Adams, 2004a). The cognitive dimension–the dimension that is relevant for the purposes of this study–referred to "people's trust and attitudes towards others," which was proposed to be measured using one of the "trust measures that build on extensive trust theory and that are context specific" (p. 256), namely the Student Trust of Principal (STP) Scale developed by Barnes et al. (2004, April).

The STP is based on the assumption that trust can only be measured indirectly, and its definition of trust is drawn from Tschannen-Moran and Hoy's (2000) comprehensive review of literature defining trust as "one party's willingness to be vulnerable to another party based on the confidence that the latter party is (a) benevolent, (b) reliable, (c) competent, (d) honest, and (e) open" (p. 556). Based on these premises, the STP measures trust indirectly by asking the students to report how they view their principal using a 4-point Likert response set (1 = Strongly Disagree, 2 = Disagree, 3 = Agree, and 4 = Strongly Agree) across 12 items such as "The principal at my school treats students with respect," "The principal at my school makes me feel safe," and "The principal at my school is nice" (Barnes et al., 2004, April, p. 3). Reported alpha values for this scale are in the .90's indicating strong internal consistency; and the fact that it's results are positively associated with students' identification with school, parental trust of

principal, and school academic performance provides evidence for its construct validity (Barnes et al., 2004, April, p. 4; Forsyth & Adams, 2004a, p. 266, 270).

An adapted version of the STP was tested on students taking undergraduate biology courses in this institution at the beginning of the Spring 2009 semester. The adaptations to the STP included the following: The phrase "The principal at my school" was replaced by "The instructor of my biology class;" "likes students" was changed to "cares about students," and "makes me feel safe" was replaced by "is skillful in teaching" mainly due to the differences in roles of a principal and a college instructor. Then, several biology classes were visited and students were asked to volunteer for this study. A total of 102 students participated (a chance to win a bookstore gift card was used as an incentive).

This adapted version of the scale, which was referred to as the Student Trust Survey (STS), showed a robust internal consistency (Cronbach's alpha = .92), however the expression "is skillful in teaching" was found to change the factor structure of the scale as it represented a second factor by itself. Therefore, the STS was used in the current study by using the original item instead, which used the expression "makes me feel safe" (see Appendix B and D). A summary of the properties of the STS is provided in Table 4.

The results of the current study with students taking math courses in Spring 2009 semester supported the previous findings regarding the robust structure of the STS scale. An exploratory factor analysis was conducted using a principal component extraction method on the 12 items. The Kaiser-Meyer-Olkin measure of sampling adequacy for this group was .94, indicating that the present data were suitable for principal components

analysis (values over .70 are considered good for this measure of adequacy) (Meyers, Gamst & Guarino, 2006). Using the Kaiser-Guttman retention criterion of eigenvalues greater than 1.0, a one-factor solution provided the clearest extraction. This one factor accounted for 66% of the total variance. The Cronbach's alpha value for this scale was .95, indicating strong internal consistency.

The STS also showed predictive validity, based on the correlation between students' trust and their final math grades in the current study ($r = .23$, $p < .01$). Students' trust in their math instructor as measured by the STS also showed significant correlations with students' self-efficacy beliefs ($r = .53$, $p < .001$), task value ($r = .47$, $p < .001$), and effort regulation ($r = .19$, $p < .05$) in their math course, which provides evidence for its construct validity.

Motivated Strategies for Learning Questionnaire (MSLQ)

Developed by Pintrich, Smith, Garcia and McKeachie (1991), the Motivated Strategies for Learning Questionnaire (MSLQ) is a self-report measure designed to assess college students' motivational orientations and use of self-regulated learning strategies in a given college course. It is based on a general cognitive view of motivation and learning strategies which sees the student as "an active processor of information whose beliefs and cognitions are important mediators of instructional input" (Pintrich et al., 1993, p. 801). This study used the following motivational components and subscales of the MSLQ: (1) value component (one subscale: task value), (2) expectancy component (one subscale: self-efficacy), and (3) affective component (one subscale: test anxiety). Among the learning strategies, only the resource management component was used (two subscales: effort regulation and help seeking).

The task value was selected to be used instead of intrinsic or extrinsic goal orientations to represent the value component of this model because of its high reliability and predictive validity: the extrinsic goal orientation had a low reliability and insignificant correlation with the final grades, and the intrinsic goal orientation, despite having a better predictive validity, had a lower reliability and was highly correlated with task value (Pintrich et al., 1991).

The developers of the MSLQ report that the confirmatory factor analyses on the data from a validation sample of 380 Midwestern college students, mostly from a 4-year comprehensive university (n = 356) revealed a good fit for the theoretical model of the motivation items and subscales (Pintrich et al., 1993). The Goodness of fit indices for the motivation model were GFI = .77; AGFI = .73, and RMR = .07 (χ^2/df = 3.49). For the motivational scales the data showed robust coefficient alphas indicating good internal consistency (ranging from .62 to .93). The alpha values specifically for the self-efficacy, task value, and test anxiety subscales were .93, .90, and .80, respectively. The learning strategy items and scales also revealed a good fit of the theoretical model (χ^2/df = 2.26; GFI = .78; AGFI = .75, and RMR = .08). The alphas for the learning strategies scales were reasonable (ranging from .52 to .80). The alpha values specifically for the effort regulation and help seeking subscales were .69 and .52, respectively.

In addition, the correlations among the MSLQ scales showed that they are valid measures of the motivational and learning strategy constructs. All the correlations were in the expected directions: with regards to motivation, the value and expectancy subscales were all positively correlated with one another (correlations ranging from .14 to .68), and the affective component (i.e. test anxiety) was negatively correlated with the value and

expectancy subscales; the learning strategies were also positively correlated with one another with *r* values between .10 and .70 (Pintrich et al.,1993, p. 811).

The developers of the MSLQ also reported the predictive validity of the scales based on the correlations between student responses and the final course grades (Pintrich et al., 1993). The *r* values specifically for the task value, self-efficacy, and test anxiety subscales were .22, .41, and -.27 respectively ($p < .05$). Effort regulation also showed a significant correlation with the final grades ($r = .32$, $p < .05$), whereas help seeking did not. The results of this validation study showed that the MSLQ was a reliable and valid instrument for measuring college students' motivation and use of learning strategies. A summary of the properties of the selected MSLQ scales and subscales is provided in Table 4.

The results of the current study with students taking undergraduate math courses supported the previous reports regarding the five MSLQ subscales' internal consistency and predictive validity. The Cronbach's alpha values for the subscales were .95 for self-efficacy, .92 for task value, .80 for test anxiety, .77 for effort regulation, and .72 for help seeking subscale.

The MSLQ subscales also showed expected predictive validity with students' course grades in the current study. Students' responses to all MSLQ subscales showed significant correlations with their final math grade, except for the help seeking subscale. The *r* values were .63 for self-efficacy, -.48 for test anxiety, .39 for effort regulation, and .28 for the task value subscale ($p < .001$ for all values).

Table 4

Properties of the Instruments Used, Cronbach's Alpha Values, and Correlations with Final Course Grades

Instrument	Subscales (Items)	Sample Item	Original α	α in this study	Original *r*	*r* in this study
The Student Trust Scale (STS)	*No subscale* (12)	"The instructor of my math class cares about students."	.96	.95	-	.06
The Motivated Strategies for Learning Questionnaire (MSLQ)	Task value (6)	"I like the subject matter of this course."	.90	.92	.22*	.30***
	Self-efficacy (8)	"I expect to do well in this class."	.93	.95	.41*	.62***
	Test anxiety (5)	"I have an uneasy, upset feeling when I take an exam."	.80	.80	-.27*	-.45***
	Effort regulation (4)	"Even when course materials are dull and uninteresting, I manage to keep working until I finish."	.69	.77	.32*	.40***
	Help seeking (4)	"I try to identify students in this class whom I can ask for help if necessary."	.52	.72	.02	.12
Big-Five Mini-Markers	Extraversion (8)	Bold, Talkative, Shy(R)	.83	.83	-.06	.09
	Agreeableness (8)	Kind, Cooperative, Harsh(R)	.75	.86	-.01	.06
	Conscientiousness (8)	Efficient, Organized, Sloppy(R)	.81	.80	.16**	.22**
	Emotional Stability (8)	Unenvious, Relaxed, Jealous(R)	.75	.79	-.10*	.11
	Intellect (8)	Creative, Imaginative, Uncreative(R)	.74	.71	.02	.17*

Note. The original Cronbach's alpha and Pearson correlation coefficient values were taken from Barnes et al. (2004, April) for the STP, Pintrich et al. (1991, 1993) for the MSLQ, and from Dwight et al. (1998) and Saucier (1994) for the Big-Five Mini-Markers (all items and the score calculations can be seen in Appendix B, C, and D). (R) = Reverse. *$p < .05$; **$p < .01$; ***$p < .001$

Big-Five Mini-Markers

In 1992, Lewis Goldberg investigated new sets of Big-Five factor markers to develop "a factorially univocal measure of each of the 5 domains that subsume most English-language terms for personality traits" and found a set of 100 unipolar terms that are highly robust across various samples (Goldberg, 1992, p. 26). The performance of these 100 adjective markers was later examined by Saucier (1994) across 12 data sets to develop an optimally robust measure of 40 items selected from the original 100. This new set that was called the "Mini-Markers" suffered some loss of reliability, yet it increased Goldberg's (1992) markers' user-friendliness by reducing the number of root negation pairs (such as *kind-unkind*) and adjectives with the prefix *un-*, and reducing the number of items from 20 to eight for each Big-Five factor (i.e., Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Intellect) (Saucier, 1994, p. 509).

The 40-item Mini-Markers lists common human traits such as "Talkative," "Kind," and "Organized," and asks respondents to indicate how accurately each trait describes themselves using a 9-point Likert rating scale (1 = Extremely Inaccurate, 2 = Very Inaccurate, 3 = Moderately Inaccurate, 4 = Slightly Inaccurate, 5 = Neither Inaccurate nor Accurate, 6 = Slightly Accurate, 7 = Moderately Accurate, 8 = Very Accurate, and 9 = Extremely Accurate). Each set of factor markers consists of eight items with a roughly equal number of positive and negative pole items in each set. The Mini-Markers offers researchers a brief and robust set of inventory that can be used as an alternative to Goldberg's (1992) full measure with some confidence, in situations where researchers face time constrains, and brevity is a priority (Dwight et al., 1998; Saucier, 1994).

The developer of the Mini-Markers had reported the alpha coefficients to be .83 for Extraversion, .75 for Agreeableness, .81 for Conscientiousness, .75 for Emotional Stability, and .74 for Intellect, which indicate acceptable internal consistencies (Saucier, 1994, p. 513). Also, a predictive validity study using several academic criteria had shown that the estimates of the Mini-Markers were comparable to those by Goldberg's (1992) 100 Big-Five markers (Dwight et al., 1998). In this particular study, only the Conscientiousness and Emotional Stability factors were significantly correlated with the exam scores, with *r*s .16 ($p < .01$) and -.10 ($p < .05$), respectively (Dwight et al., 1998). Furthermore, the Conscientiousness factor was found to significantly contribute to the variance in total exam scores over and above high school GPA, undergraduate GPA, and SAT total score ($R^2 = .02$, $p < .05$) (Dwight et al., 1998). A summary of the properties of the Mini-Markers is provided in Table 4.

The results of the current study with students taking undergraduate math courses supported the previous reports regarding the Mini-Markers' internal consistency and predictive validity. The Cronbach's alpha values for the scales were .86 for the Agreeableness, .83 for the Extraversion, .80 for the Conscientiousness, .79 for the Emotional Stability, and .71 for the Intellect scale. The gender differences in personality in the current study also mirrored the previous findings regarding higher scores of females in the dimensions of Agreeableness (Costa, Terraciano & McCrae, 2001; Dwight et al., 1998; Feingold, 1994; Nettle & Liddle, 2008) and Extraversion (Feingold, 1994). Only the Conscientiousness factor showed predictive validity based on its correlation with students' course grades in this study ($r = .24$, $p < .01$).

Student Information

After completing the survey instruments, which were administered online, the participants were asked to provide information about their college status and demographics. Specifically, they were asked to provide their names, student ID numbers, majors, number of semesters they had been in this university including the current semester (Spring 2009), gender, ethnic background, and age. The information regarding names, ID numbers, and majors were collected through open-ended response boxes, and drop-down menus were used for collecting the semester (1 through 20, and More than 20) and age (Under 25, Between 25 and 35, and Over 35) information. The response choices for gender were Male and Female, and choices for ethnic background were Asian, African American, Caucasian/White, Pacific Islander, Native American, International Student, and Other (see Appendix B).

Students' responses were later grouped to form categories for statistical analyses. The gender data were coded as 0 = Male, 1 = Female. The ethnicity data had to be put into two groups mainly due to the insufficient number of participants from the minority groups. These data were coded as 0 = White and 1 = Others. The semester data were also put into two groups coding these as 0 = Semesters 1 and 2 (First Year), and 1 = Other (Semester 3 and beyond).

In addition to students' self reported data about themselves, information on their math class sizes, and final math grades were collected from their university after all the grades were announced for Spring 2009 semester. The class size data were put in two groups, and were coded as 0 = "Fewer than 50 students" (combining classes with 8 through 44 students), and 1 = "50 and more students" (combining classes with 51 through

106 students). This grouping was based on the fact that the largest class had 106 students, and the 67% of the classes had fewer than 50 students. In addition, this grouping left a sufficient number of students in the second group for a sound comparison between typical classes and large classes. Finally, students' math course groups were determined based on the math course they selected at the beginning of the survey instruments (see Appendix B). Using the categorization made by this university's math department, these data were coded as 0 = Group 1 (students taking math courses for humanities, business, education, and social sciences majors), and 1 = Group 2 (students taking math courses for mathematics, science, engineering, and computer science majors).

Data Collection Procedures

In this study, the survey instruments were administered online using an online survey tool (i.e., SurveyMonkey.com). Administering the surveys online was preferred considering its several advantages such as being able to efficiently and quickly recruit large and heterogeneous samples (including people with rare characteristics), which adds to the power of the statistical tests as well as its standardized procedures, making research studies easy to replicate (Birnbaum, 2004). More importantly, online data collection was preferred to minimize response bias that would be caused when only the students of those instructors who accepted to help with the research would make up the participants. Data collection solely dependent on the collaboration of the instructors could jeopardize the validity of this study, as its main focus was students' trust in their instructor, which involved evaluations of the instructor's niceness and helpfulness, among many other positive qualities.

The timing of the data collection was also important for this study. The researcher decided to give students a considerable time to have an opinion about their instructor, therefore to measure their trust sometime after their midterm exams. It was also important to collect data before the final exams, so that students' responses would reflect their perceptions prior to this final assessment by the instructors. Consequently, the online data collection period was planned to start sometime after March 23, 2009, which was both after the midterms and the Spring recess, and end on May 8, 2009, which was the last day of classes. Upon the approval from the Institutional Review Board (IRB) of the university on April 7, 2009, the announcements for this study began and students started taking the surveys on April 14, 2009.

The data collection period for this study was 31 days. During this time, all the math instructors teaching undergraduate math courses as well as the administrators in the math department, math tutoring center, and the university library were contacted and briefed regarding the purpose and the scope of this research. Fliers were posted to key areas in these places and handouts were left for students to pick up particularly in the general-purpose computer labs and math tutoring rooms. The fliers and handouts informed students about the link to the online survey, the prize they could win by entering the raffle, and the deadline for participation. In addition, all the instructors teaching undergraduate math courses were contacted through e-mail and asked for permission to make in-class announcements and to distribute handouts to the students at the beginning of their classes. Not every instructor allowed the announcement, yet the majority of the classes were visited and handouts were distributed. Also, towards the last week of classes the university administration posted an electronic message about this

study on their Web site, to their student announcements page. All the students were also sent an e-mail message about the announcements posted on this university's Web site, and this message included the announcement for this research.

The link to the online survey first took students to the message from the researcher, which served as the consent form for this study (see Appendix A). This message included all the information a standard consent form covers, except for the signature part. Students who wished to participate in the study indicated that by choosing the relevant option provided at the end of the message, and this was accepted as their signature. Participants were then asked to choose one of the math courses they were taking about which they would fill the surveys. A list of all math courses offered during Spring 2009 semester was provided for them to choose from. This also enabled the link between students' survey data and their final course grades.

Three groups of instruments were used through online survey pages (see Appendix B): (1) survey instruments for trust, motivation and personality (in this order) (2) the instrument for collecting student information (i.e., demographics), and (3) the instrument for collecting contact information (for those who wished to enter the raffle). Completion of all three parts took around 10-15 minutes of the students.

As previously mentioned, a prize (an 8 GB iPod nano) was used to encourage participation. Participants were able to enter a raffle to win the prize. To avoid multiple submissions, instructions told students to participate only once and that the prize would not be available for those who participated more than once. After the data collection ended, student names and contact information (e.g., e-mail addresses) were checked for repetitions to detect multiple submissions, and no repetitions were found. Then, those

participants who entered the raffle were assigned a number each, and the winner was determined though a drawing using the Research Randomizer program (Urbaniak, Plous & Lestik, 2003), which generated a random number in the given range. The winner, then, was awarded the prize.

At the end of the semester, the students' grade and class size information were retrieved from the university and these data were matched with each participant.

Research Design

Dependent Variables

The main focus of this study was math achievement in undergraduate courses with a specific interest in its prediction. Therefore, the outcome variable in this study was math achievement as measured by final course grades. However, this study also investigated mean differences in students' personality, trust, and motivated strategies for learning by students' gender, ethnicity, semester in college, math course group, and math class size. Therefore, the Big-Five personality factor scores (five different scores), the student trust score, and the motivated strategies for learning scores (five different scores) were the dependent variables in these analyses.

Independent Variables

The predictors in this study for math achievement as measured by final course grades were the Big-Five personality factor scores (five different scores), the student trust score, and the motivated strategies for learning scores (five different scores). The statistically significant student and classroom variables of gender, ethnicity, semester in college, math course group, and math class size were also included in the analyses as

control variables. These variables were also the independent variables in the analyses, which examined the mean differences in students' Big-Five factors, trust, and motivated strategies for learning.

Subscales

There were a total of 10 subscales in this study, and one trust scale with no subscales. Their score calculations were done as follows.

For the five subscales of the Mini-Markers, the items that have negative loadings (i.e., reverse coded items) were reflected, and the mean scores for each subscale were calculated–by summing up the responses and then dividing them by eight (Saucier, 2005). For the five subscales of the MSLQ, the scores were also calculated by taking the averages for each subscale after reflecting the reverse coded items (Pintrich et al., 1991). As for the STS, the response scores were calculated by simply taking the averages–summing up the responses and then dividing them by 12 (Forsyth & Adams, 2004b). The details on these score calculations are provided in Appendix C (all the corresponding items of the subscales are listed in Appendix D).

After the score calculations, the Cronbach's alpha coefficients were computed for the STS, and the subscales of the Mini-Markers and the MSLQ, to determine their internal consistencies. In addition, an exploratory factor analysis was conducted on the STS to see if it produced one factor structure. The construct validity of the STS was examined through the correlations of student trust with other constructs in the study. Finally, the predictive validity of each scale was determined through their correlations with the final course grades.

Data Analysis

In this study it is assumed that the undergraduate math classes in this university have different levels of content complexity and instructional approaches to teaching math for the three main groups of courses as grouped by its math department. Consequently, a "math course group" variable was created for statistical analyses. As previously explained, the group of students who take preparatory math courses were eliminated from the analyses due to a low participation rate, therefore only the remaining two groups of responses were analyzed, which were from (1) students taking courses for humanities, business, education, and social sciences majors (Group 1); and (2) students taking courses for mathematics, science, engineering, and computer science majors (Group 2). The statistical analyses for each research question were conducted as explained below.

Research Question 1

How are students' Big-Five personality factors, trust in their instructor, motivated strategies for learning, and math achievement related with one another across the three groups of undergraduate math courses in this university?

The interrelatedness of the personality factors, trust, motivated strategies for learning, and math achievement was examined by computing bivariate Pearson correlation coefficients.

Research Question 2

Do students' Big-Five personality factors, trust in their instructor, and motivated strategies for learning differ significantly by students' gender, ethnicity, semester in

college, or class size across the three groups of undergraduate math courses in this university?

Independent samples *t*-tests were performed to explore significant mean differences in students' personality factors, trust, and motivated strategies for learning by students' gender, ethnicity, semester in college, math course group, and math class size. The independent variables were students' gender (Male vs. Female), ethnicity (White vs. Others), semester in college (Semesters 1 and 2 vs. Other), math course group (Group 1 vs. Group 2), and math class size ("Fewer than 50 students" vs. "50 and more students"). The two groups of undergraduate math courses were the courses for humanities, business, education, and social sciences majors (Group 1), and the courses for mathematics, science, engineering, and computer science majors (Group 2). The dependent variables were the personality factors (i.e., Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Intellect), trust, and motivated strategies for learning (i.e., task value, self-efficacy, test anxiety, effort regulation, and help seeking).

Research Question 3

In what ways students' Big-Five personality factors, trust in their instructor, and motivated strategies for learning predict their math achievement next to their gender, ethnicity, semester in college, and class size across the three groups of undergraduate math courses in this university?

The variables that significantly correlated with math achievement were put into blocks and assessed through a hierarchical multiple regression analysis to detect mediator variables, if any. The variables were entered in the following order: (1) Control variables (i.e., demographic variables of gender, ethnicity, semester in college, math course group,

or math class size), (2) control variables and personality factors; (3) control variables, personality factors, and student trust; and (4) control variables, personality factors, student trust, and motivated strategies for learning. The order of the variables after the control variables reflected the relative stability of each concept as an individual difference based on empirical research findings and theoretical models, starting with the most stable, (i.e., personality factors) (Costa & McCrae, 1988; Digman, 1990; Goldberg, 1993) and ending with the less stable (i.e., self-regulated learning strategies) (Pintrich, 1994; Riding & Rayner, 1998).

CHAPTER IV

RESULTS

This chapter presents the results of the data analyses corresponding to each research question stated in Chapter I. First, the Pearson correlation results are presented regarding the relationships between students' Big-Five personality factors, trust in their math instructor, motivated strategies for learning in their math course, and final math grades. Then, the results of the independent samples *t*-tests are presented regarding the mean differences in students' Big-Five personality factors, trust in their math instructor, and motivated strategies for learning in their math course, by students' gender, ethnicity, semester in college, math course group, and math class size. Finally, the hierarchical multiple regression results are presented and examined to see how well the students' final math grades were predicted by the variables that were significantly correlated with students' final math grades.

Before any analyses were done, the data screening for univariate and multivariate outliers, and violations of normality were done through the SPSS Explore and SPSS Regression facilities, which resulted in the exclusion of nine cases who were univariate outliers that were causing unacceptable levels of skewness and kurtosis (above the +1.0

to -1.0 range) (Meyers et al., 2006). To check for multivariate outliers the Mahalanobis distance was calculated for each case. By using the criterion of Mahalanobis distance with $p < .001$, one case was identified as a multivariate outlier and excluded. The examination of univariate indices of skewness and kurtosis showed no values above the acceptable range of +1.0 to -1.0. Finally, the regression assumptions for linearity, and homoscedasticity were evaluated using the SPSS Regression facility. One case was found to have a residual outlier in excess of three standard deviation units below the mean, and excluded. The plot of the predicted values of final math grades against residuals showed that the multiple regression assumptions of linearity and homoscedasticity of residuals were met. In the end, the exclusion of the 11 outliers reduced the number of participants from 175 to 164.

This chapter presents the results of the data analyses for each research question and concludes with a summary of the results and findings.

Research Question 1

How are students' Big-Five personality factors, trust in their instructor, motivated strategies for learning, and math achievement related with one another across the three groups of undergraduate math courses in this university?

The results of the bivariate correlation analyses showed that students' several personality factors, trust in the instructor, motivated strategies for learning, and math achievement were significantly correlated. The results are presented in Table 5, and are explained in separate sections below for the Big-Five personality factors, student trust, and motivated strategies for learning.

Table 5

Pearson Correlation Results for Students' Personality Factors, Trust, Motivated Strategies for Learning, and Final Math Grades

Variable	*M* (SD)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Extraversion	5.5 (1.5)	(.83)	.32***	.21**	.16*	.22**	-.10	-.04	.06	-.13	.11	.35***	.10
(2) Agreeableness	7.2 (1.2)		(.86)	.46***	.35***	.22**	.05	.16*	.03	-.05	.23**	.25**	.04
(3) Conscientiousness	6.7 (1.3)			(.80)	.20*	.15	.03	.22**	.21**	-.18*	.51***	.19*	.24**
(4) Emotional Stability	5.8 (1.4)				(.79)	.15	.10	.04	.07	-.21**	.20*	.01	.13
(5) Intellect	6.9 (1.0)					(.71)	.08	.12	.07	-.02	.14	.12	.15
(6) Trust	3.4 (0.5)						(.95)	.47***	.53***	-.14	.19*	-.06	.23**
(7) Task Value	4.9 (1.5)							(.92)	.51***	-.06	.37***	.15	.28***
(8) Self-efficacy	5.2 (1.5)								(.95)	-.52***	.39***	.08	.63***
(9) Test Anxiety	3.5 (1.5)									(.80)	-.26**	.02	-.48***
(10) Effort Regulation	5.1 (1.4)										(.77)	.17*	.39***
(11) Help Seeking	3.9 (1.5)											(.72)	.12
(12) Final Math Grade	2.8 (1.3)												-

Note. N ranges from 163 to 164. The Cronbach's alpha values for the scales are given in parentheses in available spaces. Variables 1-5 are the personality factors, and 7-11 are the motivated strategies for learning.

*$p < .05$; **$p < .01$; ***$p < .001$

Big-Five Personality Factors

As seen in Table 5, the personality factors showed some significant correlations with students' motivated strategies for learning, and final math grades, but they showed no significant correlations with students' trust, which are explained in separate sections below.

Personality Factors and Trust. None of the Big-Five personality factors correlated significantly with students' trust. This showed that students' personality and trust in their instructor are independent of one another.

Personality Factors and Motivated Strategies for Learning. The Extraversion factor correlated positively with students' help seeking ($r = .35$, $p < .001$). The Agreeableness factor correlated positively with students' help seeking ($r = .25$, $p < .01$), effort regulation ($r = .23$, $p < .01$), and task value ($r = .16$, $p < .05$). The Conscientiousness factor correlated positively with students' effort regulation ($r = .51$, $p < .001$), task value ($r = .22$, $p < .01$), self-efficacy beliefs ($r = .21$, $p < .01$), and help seeking ($r = .19$ $p < .05$), and negatively with their test anxiety ($r = -.18$, $p < .05$). The Emotional Stability factor correlated negatively with students' test anxiety ($r = -.21$, $p < .01$), and positively with their effort regulation ($r = .20$, $p < .05$). The Intellect factor did not correlate significantly with any of the motivated strategies for learning.

Personality Factors and Math Grades. The results showed that only the Conscientiousness factor correlated significantly with students' final math grades ($r = .24$, $p < .01$). This showed that students who scored higher in the Conscientiousness factor were also the ones who received significantly higher grades in their math course.

Student Trust in Instructor

As presented in Table 5, students' trust in their instructor showed some significant correlations with students' motivated strategies for learning, and final math grades, but it showed no significant correlations with any of the personality factors, which are explained in separate sections below.

Trust and Personality Factors. Students' trust in their math instructor showed no significant correlations with any of the Big-Five personality factors. This result showed that students' trust and personality are independent of one another.

Trust and Motivated Strategies for Learning. Students' trust correlated positively with their self-efficacy beliefs ($r = .53$, $p < .001$), task value ($r = .47$, $p < .001$), and effort regulation ($r = .19$, $p < .05$). This showed that students who reported higher trust in their math instructor also reported significantly higher self-efficacy beliefs, task value, and effort regulation for their math course.

Trust and Math Grades. The results showed that students' trust in their math instructor correlated positively with students' final math grades ($r = .23$, $p < .01$). This showed that students who reported higher trust in their math instructor also received significantly higher grades in their math course.

Motivated Strategies for Learning

As seen in Table 5, the motivated strategies for learning showed some significant correlations with students' personality factors, trust, and final math grades, which are explained in separate sections below.

Motivated Strategies for Learning and Personality Factors. Students' task value correlated positively with their Conscientiousness factor ($r = .22$, $p < .01$), and

Agreeableness factor ($r = .16$, $p < .05$). Students' self-efficacy beliefs correlated positively with their Conscientiousness factor ($r = .21$, $p < .01$). Students' test anxiety correlated negatively with their Emotional Stability factor ($r = -.21$, $p < .01$), and Conscientiousness factor ($r = -.18$, $p < .05$). Students' responses for effort regulation correlated positively with their Conscientiousness factor ($r = .51$, $p < .001$), Agreeableness factor ($r = .23$, $p < .01$), and Emotional Stability factor ($r = .20$, $p < .05$). Finally, students' help seeking correlated positively with their Extraversion factor ($r = .35$, $p < .001$), Agreeableness factor ($r = .25$, $p < .01$), and Conscientiousness factor ($r = .19$, $p < .05$).

Motivated Strategies for Learning and Trust. Three of the motivated strategies for learning correlated significantly with students' trust in their math instructor: students' self-efficacy beliefs ($r = .53$, $p < .001$), task value ($r = .47$, $p < .001$), and effort regulation ($r = .19$, $p < .05$). This showed that students who reported higher self-efficacy beliefs, task value, and effort regulation for their math course also reported significantly higher trust in their math instructor.

Motivated Strategies for Learning and Math Grades. Four of the motivated strategies for learning correlated significantly and positively with students' final math grades: self-efficacy beliefs ($r = .63$, $p < .001$), test anxiety ($r = -.48$, $p < .001$), effort regulation ($r = .39$, $p < .001$), and task value ($r = .28$, $p < .001$). These results showed that students who reported higher self-efficacy beliefs, lower test anxiety, higher effort regulation, and higher task value were also the ones who received significantly higher grades in their math course.

Research Question 2

Do students' Big-Five personality factors, trust in their instructor, and motivated strategies for learning differ significantly by students' gender, ethnicity, semester in college, or class size across the three groups of undergraduate math courses in this university?

Significant mean differences in personality, trust, and motivated strategies for learning were explored by students' gender, ethnicity, semester in college, math course group, and math class size, using independent samples *t*-tests. The analyses were done for two groups of math courses instead of three, due to a low participation from the students taking the third group of courses (i.e., preparatory math courses). The results showed several significant differences in the means, which are labeled in Table 6 through Table 10, and are explained in separate sections below for the Big-Five personality factors, student trust, and motivated strategies for learning.

Big-Five Personality Factors

The results showed statistically significant differences in the means for some of the personality factors by students' gender, math course group, and math class size. The results and findings are presented in separate sections below for differences in students' personality factors by students' gender, ethnicity, semester in college, math course group, and math class size.

Personality Factors and Gender. The independent samples *t*-test comparing the mean scores of the male and female students showed a significant difference between the means for the Agreeableness factor [t (160) = -3.971, $p < .001$], Extraversion factor [t (160) = -3.396, $p < .01$], and the Conscientiousness factor [t (160) = -2.043, $p < .05$]. As

presented in Table 6, the mean of the female students for the Agreeableness factor was significantly higher (M = 7.5, SD = 1.0) than the mean of male students (M = 6.8, SD = 1.3). Female students' mean for the Extraversion factor was also significantly higher (M = 5.8, SD = 1.5) than the mean of male students (M = 5.1, SD = 1.5). Finally, the female's mean for the Conscientiousness factor was significantly higher (M = 6.9, SD = 1.2) than the male's mean (M = 6.5, SD = 1.3). These results showed that the female students' reports of Extraversion, Agreeableness, and Conscientiousness factors were significantly higher than the male students' reports.

Table 6

Mean Differences in Students' Personality Factors, Trust, and Motivated Strategies for Learning by Gender

	Male (n = 68)	Female (n = 94)
Extraversion	5.1 (1.5)**	5.8 (1.5)**
Agreeableness	6.8 (1.3)***	7.5 (1.0)***
Conscientiousness	6.5 (1.3)*	6.9 (1.2)*
Emotional Stability	6.0 (1.3)	5.7 (1.4)
Intellect	7.0 (1.0)	6.9 (1.1)
Trust	3.4 (0.5)	3.4 (0.5)
Task Value	5.1 (1.6)	4.8 (1.4)
Self-efficacy	5.2 (1.5)	5.2 (1.5)
Test Anxiety	3.5 (1.5)	3.6 (1.6)
Effort Regulation	5.1 (1.4)	5.1 (1.3)
Help Seeking	3.6 (1.5)*	4.2 (1.5)*

Note. Data are expressed as M (SD).
*p < .05; **p < .01; ***p < .001

Personality Factors and Ethnicity. As presented in Table 7, the independent samples t-test comparing the mean scores of the White students with other students showed no statistically significant differences in the means for any of the personality factors.

Table 7

Mean Differences in Students' Personality Factors, Trust, and Motivated Strategies for Learning by Ethnicity

	White (n = 114)	Others (n = 48)
Extraversion	5.6 (1.5)	5.4 (1.4)
Agreeableness	7.2 (1.2)	7.2 (1.2)
Conscientiousness	6.8 (1.2)	6.5 (1.4)
Emotional Stability	5.8 (1.3)	5.9 (1.4)
Intellect	7.0 (1.0)	6.8 (1.0)
Trust	3.4 (0.5)	3.4 (0.6)
Task Value	4.9 (1.5)	5.0 (1.4)
Self-efficacy	5.2 (1.5)	5.1 (1.4)
Test Anxiety	3.5 (1.5)	3.7 (1.6)
Effort Regulation	5.1 (1.4)	5.0 (1.4)
Help Seeking	4.0 (1.5)	3.8 (1.5)

Note. Data are expressed as *M* (SD).

Personality Factors and Semester in College. As presented in Table 8 below, the independent samples *t*-test comparing the mean scores of the students in their first or second semesters, namely the first year students, with other students showed no statistically significant differences in the means for any of the personality factors.

Table 8

Mean Differences in Students' Personality Factors, Trust, and Motivated Strategies for Learning by Semester in College

	1 & 2 (n = 96)	Other (n = 68)
Extraversion	5.6 (1.6)	5.4 (1.4)
Agreeableness	7.2 (1.3)	7.2 (1.2)
Conscientiousness	6.7 (1.2)	6.7 (1.4)
Emotional Stability	5.8 (1.3)	5.8 (1.4)
Intellect	7.0 (1.1)	6.8 (0.9)
Trust	3.4 (0.5)	3.4 (0.5)
Task Value	4.9 (1.6)	5.0 (1.3)
Self-efficacy	5.1 (1.5)	5.3 (1.4)
Test Anxiety	3.6 (1.6)	3.5 (1.4)
Effort Regulation	5.1 (1.4)	5.1 (1.3)
Help Seeking	3.8 (1.5)	4.0 (1.5)

Note. Data are expressed as M (SD). Semesters 1 and 2 are merged as a group to represent first year students.

Personality Factors and Math Course Group. The independent samples t-test comparing the mean scores of the students taking a math course among the first group of math courses as opposed to the second group of math courses showed a significant difference between the means for the Extraversion factor [t (162) = 3.386, $p < .01$]. As seen in Table 9, the Extraversion mean of the students taking a math course from the first group of math courses was significantly higher (M = 5.9, SD = 1.4) than the mean of students taking a math course from the second group of math courses (M = 5.2, SD = 1.5). This result showed that the students taking math courses for humanities, business, education, and social sciences majors (Group 1) reported significantly higher Extraversion than the students taking math courses for mathematics, science, engineering, and computer science majors (Group 2).

Table 9

Mean Differences in Students' Personality Factors, Trust, and Motivated Strategies for Learning by Math Course Group

	Group 1 (n = 75)	Group 2 (n = 89)
Extraversion	5.9 (1.4)**	5.2 (1.5)**
Agreeableness	7.3 (1.3)	7.1 (1.1)
Conscientiousness	6.7 (1.2)	6.7 (1.3)
Emotional Stability	6.0 (1.4)	5.6 (1.3)
Intellect	6.9 (1.0)	7.0 (1.1)
Trust	3.4 (0.6)	3.5 (0.5)
Task Value	4.5 (1.6)***	5.3 (1.3)***
Self-efficacy	5.2 (1.6)	5.2 (1.4)
Test Anxiety	3.4 (1.6)	3.7 (1.5)
Effort Regulation	5.2 (1.4)	5.0 (1.3)
Help Seeking	4.0 (1.5)	3.9 (1.5)

Note. Data are expressed as M (SD). Group 1 = Math courses for humanities, business, education, and social sciences majors. Group 2 = Math courses for mathematics, science, engineering, and computer science majors.
*$p < .05$; **$p < .01$; ***$p < .001$

Personality Factors and Math Class Size. The independent samples t-test comparing the mean scores of the students in math classes with fewer than 50 students as opposed to classes with 50 and more students showed a significant difference between the means for the Extraversion factor [t (162) = -2.190, $p < .05$]. As presented in Table 10, the Extraversion mean of the students in math classes with 50 and more students was significantly higher (M = 5.9, SD = 1.5) than the mean of students in math classes with fewer than 50 students (M = 5.4, SD = 1.5). This result showed that the students in math classes with 50 and more students reported significantly higher Extraversion than the students in math classes with fewer than 50 students.

Table 10

Mean Differences in Students' Personality Factors, Trust, and Motivated Strategies for Learning by Math Class Size

	Fewer than 50 (n = 115)	50 and More (n = 49)
Extraversion	5.4 (1.5)*	5.9 (1.5)*
Agreeableness	7.2 (1.2)	7.3 (1.2)
Conscientiousness	6.7 (1.3)	6.6 (1.2)
Emotional Stability	5.8 (1.3)	5.8 (1.5)
Intellect	6.9 (1.1)	6.9 (0.9)
Trust	3.5 (0.5)**	3.3 (0.6)**
Task Value	5.2 (1.4)**	4.3 (1.6)**
Self-efficacy	5.3 (1.4)	4.8 (1.7)
Test Anxiety	3.5 (1.5)	3.7 (1.6)
Effort Regulation	5.2 (1.3)	4.9 (1.5)
Help Seeking	3.9 (1.5)	3.9 (1.6)

Note. Data are expressed as M (SD).
*$p < .05$; **$p < .01$; ***$p < .001$

A descriptive analysis showed that larger classes (i.e., those with 50 and more students) were more likely to be Group 1 courses. Sixty percent of Group 1 courses had 50 and more students in the classes, whereas only 4% of Group 2 courses 50 and more students.

Student Trust in Instructor

The results showed statistically significant differences in the means for students' trust in the math instructor by the students' math class size only. All the results and findings are presented in separate sections below for differences in students' trust in the math instructor by students' gender, ethnicity, semester in college, math course group, and math class size.

Trust and Gender. As presented in Table 6, the independent samples *t*-test comparing the mean scores of the female students with male students showed no significant differences in the means for the trust in the math instructor.

Trust and Ethnicity. As presented in Table 7, the independent samples *t*-test comparing the mean scores of the White students with other students showed no significant differences in the means for the trust in the math instructor.

Trust and Semester in College. As presented in Table 8, the independent samples *t*-test comparing the mean scores of the students in their first or second semesters, namely the first year students, with other students showed no statistically significant differences in the means for the trust in the math instructor.

Trust and Math Course Group. As presented in Table 9, the independent samples *t*-test comparing the mean scores of the students taking a math course among the first group of math courses (i.e., courses for humanities, business, education, and social sciences majors) as opposed to the second group of math courses (i.e., courses for mathematics, science, engineering, and computer science majors) showed no statistically significant differences in the means for the trust in the math instructor.

Trust and Math Class Size. The independent samples *t*-test comparing the mean scores of the students in math classes with fewer than 50 students as opposed to classes with 50 and more students showed a statistically significant difference between the means for the trust in the math instructor [$t\ (162) = 2.666$, $p < .01$]. As presented in Table 10, the trust mean of the students in math classes with fewer than 50 students was significantly higher ($M = 3.5$, SD = 0.5) than the mean of students in math classes with 50 and more students ($M = 3.3$, SD = 0.6). This result showed that the students in math classes with

fewer than 50 students reported significantly higher trust in their math instructor than the students in math classes with 50 and more students.

A descriptive analysis showed that smaller classes (i.e., those with fewer than 50 students) were more likely to be Group 2 courses. The majority (96%) of Group 2 courses had fewer than 50 students in the classes, where as only 40% of Group 1 courses had fewer than 50 students.

Motivated Strategies for Learning

The results showed statistically significant differences in the means for students' motivated strategies for learning by students' gender, math course group, and math class size. All the results and findings are presented in separate sections below for differences in students' motivated strategies for learning by students' gender, ethnicity, semester in college, math course group, and math class size.

Motivated Strategies for Learning and Gender. The independent samples *t*-test comparing the mean scores of the male and female students showed a statistically significant difference between the means for help seeking [t (160) = -2.403, $p < .05$]. As presented in Table 6, the mean of the female students for help seeking was significantly higher (M = 4.2, SD = 1.5) than the mean of male students (M = 3.6, SD = 1.5). This result showed that female students reported significantly higher help seeking than the male students.

Motivated Strategies for Learning and Ethnicity. As presented in Table 7, the independent samples *t*-test comparing the mean scores of the White students with other students showed no statistically significant differences in the means for the motivated strategies for learning.

Motivated Strategies for Learning and Semester in College. As presented in Table 8, the independent samples *t*-test comparing the mean scores of the students in their first or second semesters, namely the first year students, with other students showed no statistically significant differences in the means for the motivated strategies for learning.

Motivated Strategies for Learning and Math Course Group. The independent samples *t*-test comparing the mean scores of the students taking a math course among the first group of math courses as opposed to the second group of math courses showed a statistically significant difference between the means for task value [t (162) = -3.723, $p <$ .001]. As seen in Table 9, the task value mean of the students taking a math course from the second group of math courses (i.e., courses for mathematics, science, engineering, and computer science majors) was significantly higher (M = 5.3, SD = 1.3) than the mean of students taking a math course from the first group of math courses (i.e., courses for humanities, business, education, and social sciences majors) (M = 4.5, SD = 1.6). This result showed that the students taking math courses for mathematics, science, engineering, and computer science majors reported significantly higher task value for their math course than the students taking math courses for humanities, business, education, and social sciences majors.

Motivated Strategies for Learning and Math Class Size. The independent samples *t*-test comparing the mean scores of the students in math classes with fewer than 50 students as opposed to classes with 50 and more students showed a statistically significant difference between the means for task value [t (162) = 3.550, $p < .01$]. As presented in Table 10, the task value mean of the students in math classes with fewer than 50 students was significantly higher (M = 5.2, SD = 1.4) than the mean of students in

math classes with 50 and more students (M = 4.3, SD = 1.6). This result showed that the students in math classes with fewer than 50 students reported significantly higher task value for their math course than the students in math classes with 50 and more students.

A descriptive analysis showed that smaller classes (i.e., those with fewer than 50 students) were more likely to be Group 2 courses. The majority (96%) of Group 2 courses had fewer than 50 students in the classes, where as only 40% of Group 1 courses had fewer than 50 students.

Research Question 3

In what ways students' Big-Five personality factors, trust in their instructor, and motivated strategies for learning predict their math achievement next to their gender, ethnicity, semester in college, and class size across the three groups of undergraduate math courses in this university?

In this study, students' final math grades did not differ significantly in terms of students' gender, ethnicity, semester in college, math course group, or math class size.

The variables that significantly correlated with students' final math grades were the Conscientiousness factor, trust, task value, self-efficacy beliefs, test anxiety, and effort regulation, which were assessed through a series of hierarchical multiple regression analyses. In the first model of the analyses, students' gender, math course group and math class size were entered as control variables, as only these three variables were found to make statistically significant differences in the predictor variables–students' mean scores for the Conscientiousness factor was significantly different according to their gender, so was their task value according to their math class size and math course group, and their trust according to their math class size.

The order of the models and the variables entered in each model were as follows. In Model 1, student demographic variables were entered, which were the control variables, namely students' gender, math course group, and math class size. In Model 2, the personality factor, Conscientiousness, was added. In Model 3, trust was added. Finally, in Model 4, all the variables for motivated strategies for learning were added together, namely students' task value, self-efficacy beliefs, test anxiety, and effort regulation. The order of the independent variables after the control variables reflected the relative stability of each concept as an individual difference; starting with the most stable (i.e., the personality factor) (Costa & McCrae, 1988; Digman, 1990; Goldberg, 1993) and ending with the less stable (i.e., effort regulation as the self-regulated learning strategy) (Pintrich, 1994; Riding & Rayner, 1998).

The results of this hierarchical regression analyses are presented in Table 11, and explained in separate sections below for the Big-Five personality factors, student trust, motivated strategies for learning, and demographics.

Big-Five Personality Factors

The only Big-Five personality factor that significantly correlated with students' final math grades were the Conscientiousness factor, therefore it was the variable entered in the second model of the hierarchical regression analysis. As presented in Table 11, the regression coefficient of the Conscientiousness factor was statistically significant in this model ($\beta = .26$, $p < .01$). This result showed that the Conscientiousness factor was a significant predictor of students' final math grades, explaining 6% unique variance in these grades.

After adding students' trust next to the Conscientiousness factor in the third model, the regression coefficient for the effect of Conscientiousness on final math grades remained statistically significant ($\beta = .26$, $p < .01$). The coefficient of student trust was also statistically significant in this model ($\beta = .24$, $p < .01$). This result showed that the Conscientiousness factor remained to be a significant predictor of students' final math grades when students' trust in their math instructor was also taken into account.

Table 11

Hierarchical Multiple Regression Results for Predicting Students' Final Math Grades

Model	Variables Entered	ΔR^2	R^2	*B (SE)*	β
1	Gender		.00	-.01 (.22)	.00
	Course Group			-.13 (.26)	-.05
	Class size			-.24 (.27)	-.09
2	Gender	.06	.07	-.13 (.21)	-.05
	Course Group			-.09 (.25)	-.04
	Class size			-.14 (.27)	-.05
	Conscientiousness			.26 (.08)	.26**
3	Gender	.06	.13	-.17 (.21)	-.07
	Course Group			-.06 (.25)	-.02
	Class size			.03 (.26)	.01
	Conscientiousness			.26 (.08)	.26**
	Trust			.59 (.19)	.24**
4	Gender	.35	.48	.02 (.16)	.01
	Course group			.21 (.20)	.08
	Class size			.22 (.21)	.08
	Conscientiousness			.04 (.07)	.04
	Trust			-.23 (.19)	-.09
	Task value			-.02 (.07)	-.02
	Self-efficacy			.46 (.08)	.54***
	Test anxiety			-.15 (.06)	-.18*
	Effort regulation			.14 (.07)	.15*

Note. Listwise $N = 161$.
*$p < .05$; **$p < .01$; *** $p < .001$

When students' motivated strategies for learning (i.e., task value, self-efficacy, test anxiety, and effort regulation) were added in the fourth and final model, the regression coefficient for the effect of Conscientiousness on final math grades became statistically non-significant. This showed that students' motivated strategies for learning completely mediated the relationship between students' Conscientiousness factor and their final math grades.

Student Trust in Instructor

Students' trust in the math instructor significantly correlated with students' final math grades; therefore it was entered in the third model of the hierarchical regression analysis. As presented in Table 11, the coefficient of student trust was statistically significant in this model ($\beta = .24$, $p < .01$), as was the regression coefficient of the Conscientiousness factor ($\beta = .25$, $p < .01$). This result showed that students' trust in their math instructor did not mediate the relationship between the Conscientiousness factor and students' grades, but it was a significant predictor of students' final math grades next to this significant predictor, contributing 6% unique variance to the prediction of students' final math grades.

When students' motivated strategies for learning (i.e., task value, self-efficacy, test anxiety, and effort regulation) were added in the next and final model, the regression coefficient for the effect of trust on final math grades became statistically non-significant. This showed that students' motivated strategies for learning completely mediated the relationship between students' trust and their final math grades.

Motivated Strategies for Learning

Students' task value, self-efficacy beliefs, test anxiety, and effort regulation were all significantly correlated with students' final math grades; therefore they were all entered together in the final model of the hierarchical regression analysis to represent the motivational factors.

As presented in Table 11, adding these motivational variables next to the Conscientiousness factor and trust in the final model resulted in the significant regression coefficients for the effects of both the Conscientiousness factor and trust on students' final math grades in Model 3 becoming statistically non-significant. This showed that students' motivated strategies for learning completely mediated the relationship between students' Conscientiousness factor, trust, and their final math grade. In the final model, the significant predictors of students' grades were students' self-efficacy beliefs ($\beta = .54$, $p < .001$), test anxiety ($\beta = -.18$, $p < .05$), and effort regulation ($\beta = .15$, $p < .05$). Overall, students' motivated strategies for learning contributed 35% unique variance to the prediction of students' final math grades, next to the Conscientiousness factor and student trust, after controlling for students' gender, math course group, and math class size. In this final model, the variance explained in students' final math grades was 48% [$R^2 = .48$, $F(9, 160) = 15.184$, $p < .001$].

Summary

The results and findings presented in this chapter give significant insights into explaining students' math achievement in this institution. The Pearson correlation analysis presented in this chapter showed that students' Conscientiousness factor, trust in

their math instructor, task value, self-efficacy beliefs, test anxiety, and effort regulation in their math course were significantly correlated with their final math grades.

Comparisons based on students' math course groups and math class sizes indicated significant differences. Students taking math courses for mathematics, science, engineering, and computer science majors (Group 2) reported significantly higher task value compared to the students taking math courses for humanities, business, education, and social sciences majors (Group 1); and, students in math classes with fewer than 50 students reported significantly higher task value in their math course, and significantly higher trust in their math instructor than the students in math classes with 50 and more students. A descriptive analysis showed that smaller classes (i.e., those with fewer than 50 students) were more likely to be Group 2 courses, which are the math courses for mathematics, science, engineering, and computer science majors.

Finally, the hierarchical multiple regression analyses showed that the Conscientiousness factor and students' trust in their math instructor were significant predictors of students' final math grades. However, these significant effects became non-significant once students' motivated strategies for learning, namely their task value, self-efficacy beliefs, test anxiety, and effort regulation were taken into account. Their introduction into the final model made the Conscientiousness factor and student trust non-significant predictors of students' grades, showing that their significant effects on students' final math grades were completely mediated by students' motivated strategies for learning. Controlling for students' gender, math course group, and math class size, the significant predictors of students' final math grades were students' self-efficacy beliefs, test anxiety, and effort regulation in their math course.

CHAPTER V

SUMMARY, DISCUSSION, AND RECOMMENDATIONS

The purpose of this study was to examine the relationship between college students' trust in their math instructors and their math course achievement next to well-tested factors of personality and motivation. This chapter starts with a summary of the major findings for each research question, followed by a section discussing the limitations. Then, the findings of this study are related to the current literature on trust. Finally, the implications for practice and recommendations for future research are presented.

Research Question 1

How are students' Big-Five personality factors, trust in their instructor, motivated strategies for learning, and math achievement related with one another across the three groups of undergraduate math courses in this university?

Students' Conscientiousness factor, trust in the math instructor, task value, self-efficacy beliefs, test anxiety, and effort regulation were all significantly correlated with their final math grades. Students' trust did not correlate significantly with any of the

personality factors, but correlated significantly with students' self-efficacy beliefs, task value, and effort regulation.

Research Question 2

Do students' Big-Five personality factors, trust in their instructor, and motivated strategies for learning differ significantly by students' gender, ethnicity, semester in college, or class size across the three groups of undergraduate math courses in this university?

Female students reported significantly higher Agreeableness, Extraversion, Conscientiousness, and help seeking. Students taking math courses for mathematics, science, engineering, and computer science majors (Group 2) reported significantly lower Extraversion, and significantly higher task value compared to the students taking math courses for humanities, business, education, and social sciences majors (Group 1). Also, students in math classes with fewer than 50 students reported significantly lower Extraversion, significantly higher task value in their math course, and significantly higher trust in their math instructor than the students in math classes with 50 and more students. Students' ethnicity or semester in college did not make any significant differences in students' personality, trust, or motivation.

Research Question 3

In what ways students' Big-Five personality factors, trust in their instructor, and motivated strategies for learning predict their math achievement next to their gender, ethnicity, semester in college, and class size across the three groups of undergraduate math courses in this university?

The Conscientiousness factor and students' trust in their math instructor were significant predictors of students' final math grades. However, these significant effects were completely mediated by students' motivated strategies for learning in their math course. The significant predictors of students' final math grades, after controlling for students' gender, math course group, and math class size, were students' self-efficacy beliefs, test anxiety, and effort regulation in their math course.

The following section discusses the limitations regarding the online survey method, participants, the student trust measure used, and the confounding variables in this study.

Limitations

Online Survey Method

In the current study, the survey instruments were administered online using an online survey tool (i.e., SurveyMonkey.com). One question that comes to mind about the methodology used in this study is whether or not the results would be any different if the study had used the traditional way of surveying students, namely using students' class time to administer paper-and-pencil surveys. No studies were found to show either the traditional method or the online method to produce more valid results. Even though there were certain conditions that made the use of online method more advantageous and necessary in this study, some limitations were encountered along the way.

There were two important reasons why the online survey method was used in this study. First, using a quick and efficient data collection method was crucial for this study as the timing of the data collection was important for its validity. When faced with time limitations, the researchers are advised to consider using online surveys compared to

other options, because of its advantages such as being low cost, fast, and efficient (Sue & Ritter, 2007). Secondly, the online data collection could minimize the response bias that could emerge from the responses of the students whose instructors accepted to help with this research. It would also considerably increase the possibility of reaching all potential participants (Sue & Ritter, 2007).

One issue that emerged as a hindrance to the effectiveness of using the online survey method was not being able to reach the targeted student population through direct e-mail messages. The responses to the online surveys are known to be greatest when respondents are first reached with e-mail (Sue & Ritter, 2007). Getting a hold of a student e-mail list proved to be impossible in this institution, and the institution had a policy of not sending out messages for studies such as this. The institution did, however, post an announcement message to their student announcements page on the university Web site. When announcements are posted, all students receive an e-mail message informing them about the new announcements. So, eventually all students received an e-mail about this study, however this happened towards the last week of classes, which gave them only a week to participate, if they had not heard about the study before.

Despite this issue with reaching the potential participants with e-mail, the data collection period for this study (i.e., one month) was sufficient to announce this research across the campus, and to direct potential participants to the online survey's Web site. This type of advertisement is recommended as an alternative to sending e-mails (Sue & Ritter, 2007).

Participants

Two main limitations emerged regarding the participants in this study. First, the total number of participants turned out to be small considering the total number of students taking undergraduate math courses in this institution at the time of data collection, which may be due to several factors including the time limitation, use of online method, or low volunteerism. Secondly, the responses of the students who take preparatory math courses are not included in this study, as their group was eliminated from the analyses due to their low participation, which is a limitation imposed by the data analysis method used. If their responses could be included in this study, the findings could be more informative regarding the students with the highest drop-failure-withdrawal rate among the students taking undergraduate math courses in this institution.

Confounding Variables

Two categorical variables used in this study turned out to be somewhat confounded, which were the variables of "math course group" and "math class size."

In this study the math course group variable was created based on the assumption that the undergraduate math courses in this university had different levels of content complexity and instructional approaches to teaching math for the three main groups of math courses as grouped by its math department. Excluding the preparatory math courses two groups were left for statistical analyses: the Group 1 courses, which were for students in humanities, business, education, and social sciences majors, and Group 2 courses, which were for students in mathematics, science, engineering, and computer science majors.

The math class size variable was created to test the statistical significance of mean differences in students' personality, motivation, and trust by class size. For this, the classes were put into two groups based on a somewhat arbitrary criterion. As 67% of the classes had fewer than 50 students, this size was considered to be "typical" or "small," and the remaining sizes was considered "large."

Descriptive statistical analyses showed that these two variables were somewhat confounded, as the small classes were more likely to be Group 2 courses, and large ones were mostly Group 1 courses. A different categorization for both variables could have yielded different information about the differences in students' personality, motivation, and trust, such as grouping math courses as "required vs. elective."

Student Trust and Math Achievement

In this section the findings are related to the current literature on trust, namely to the literature on the three main approaches about the nature of trust (i.e., dispositional, situational, and developmental/interpersonal approaches), and to the literature on the importance of student trust for teaching and learning.

Dispositional Approaches to Trust

The dispositional approaches to trust see it as a personal tendency that applies across various situations, and they attribute the differential levels of trust among individuals to certain biological and cognitive processes as well as their personalities.

In this study, the Big-Five model of personality (Goldberg, 1993) represented the personality-based dispositional approach to trust, which simply argues that some people are more likely to be trusting than others (e.g., McKnight et al., 1998). It was considered

possible that the Agreeableness dimension of the Big-Five, which covers individuals' tendency to trust or distrust others (Goldberg, 1992, 1993), would be related to students' trust in their instructor. The findings of this study, however, do not support such a link as the correlation between students' trust and their reports of Agreeableness were not significant. In fact, student trust did not correlate significantly with any of the Big-Five personality factors, indicating that the measures of trust and personality were independent from one another.

In conclusion, the findings of this study do not support the claims made by the dispositional approaches to trust. However, these findings need to be replicated among different groups of students, using different measures to further test these claims. Also, as this study did not investigate the biological underpinnings of students' trust based on the literature on neuroactive hormones, or brain research, these dispositional trust claims remain to be tested. Conducting these types of studies in educational contexts currently seem far-fetched, mainly because their measurements often necessitate the use of lab environments. However, a previous report showing that individual's trustworthiness judgments are automatic rather than regulated (Willis & Todorov, 2006), might be a worthwhile claim to test in a classroom context through a reaction time measurement.

Situational Approaches to Trust

The situational approaches to trust view it as a behavior determined by certain conditions and contextual factors.

In this study, students' personal and classroom characteristics such as gender, ethnicity, semester in college, math course group, and math class size were considered to be important contextual factors that could explain differences in students' trust levels. It

was considered possible, for instance, that female students, more experienced students, or students in large classes would report significantly different levels of trust in their math instructor. The findings of this study support only one of these links.

The results showed that students' trust did only significantly differ by their math class size. The comparison between two class sizes showed that students in math classes with fewer than 50 students reported significantly higher trust in their math instructor than the students in math classes with 50 and more students. This finding supports the notion regarding the negative effect of large group sizes on individual's cooperative choice and trust for one another (Komorina & Lapworth, 1982). The results also showed that students' trust did not significantly differ according to their gender, ethnicity, semester in college, or math course group.

It is possible that there were other contextual factors explaining the differences in students' trust in the current study. Instructor characteristics or qualities, for instance, might have been an important factor interacting with students' trust. Trusting another person who is a member of one's own group is easier because of the commonalities that arise from being members of the same social group, and also because the past experience provided by that membership can be reinforcing factors to trust (Child, 2001). Group membership also affects the trusting behavior of individual's when personal information is not available (Tanis & Postmes, 2005). These types of situational trust are essentially based on certain categorization processes, in which individuals are put into groups, and it is argued that "any process that categorizes another person into a positive group will lead to higher levels of trust beliefs about that person" (McKnight et al., 1998, p. 481). Social identity theory (Tajfel & Turner, 2007) and the similarity-attraction hypothesis (Byrne,

1971) also state that individuals hold stronger trust beliefs about similar, in-group members than dissimilar, out-group members. Therefore, measuring the significance of the "match" between the student's and the instructor's characteristics might have given more information about the differences in student trust due to contextual factors.

Developmental Approaches: Interpersonal Trust

The developmental (or interpersonal) approaches to trust see it as a process that goes through stages and evolves over time.

The current study did not examine trust from a developmental perspective, but used a cross-sectional design in which students' trust in their instructors could be compared across different semesters of study in college. It was considered that students' level of trust in their instructor could be different when more experienced students' trust was compared to the newer students' trust. However, the comparison between the students in their first or second semesters with other students showed no statistically significant differences in their trust. This finding challenges the idea of a link between students' time spent in college and their level of trust in their math instructors.

The claims made by the developmental approaches to trust regarding its stages and evolution over time are hard to test in a longitudinal design for the trust relations between the same college students and the same instructors throughout consecutive semesters or years. However, a "mini" longitudinal design could be used within a semester through several measurements of some general factors influencing interpersonal trust development, such as the parties' motives, attributions, emotions, expectancies, and decisions (Simpson, 2007).

In the next section, the importance of student trust for college math achievement is discussed by relating the findings of this study to the current literature on the educational significance of student trust.

Importance of Student Trust for Math Achievement

The results of this study showed that students' trust in their math instructors was a significant predictor of students' final course grades. Its predictive power was as strong as that of a personality factor (i.e., Conscientiousness), but not as strong as those of the motivated strategies for learning (i.e., self-efficacy beliefs, test anxiety, and effort regulation). In fact, students' motivated strategies for learning were found to mediate the significant effects of both personality and student trust on students' course grades. This finding supports the notions of the motivational model used in this study, which does not assume a direct path from students' personal characteristics or classroom contextual factors to student outcomes, but rather assumes mediation by students' motivational and self-regulatory processes (Pintrich & Zusho, 2007). Based on the mediated link between student trust and course achievement, the student trust as conceptualized and measured in this study seems to be more of a contextual factor than a motivational factor. Therefore, this finding seems to confirm the researcher's suspicion that student trust fits well into the "classroom contextual factors" category of the motivational model used in this study (Pintrich, 1994). Indeed, the STS might be accepted as an indirect measure of the "instructor trustworthiness," which categorically is a classroom contextual factor. However, additional research is needed to further test the finding about the indirect link between students' trust and their achievement.

The motivational model used in this study also implies potential differences in students' motivational beliefs and self-regulatory processes by gender, ethnicity, and different years of study in college (Pintrich & Zusho, 2007). The findings of this study did not support most of these assumptions, as the results indicated a significant gender difference regarding students' help seeking only (i.e., female students reported significantly higher help seeking). Students' ethnicity or semester in college did not make any significant differences in their motivated strategies for learning.

Another important finding of this study was that students' trust in their math instructor significantly correlated with students' self-efficacy beliefs, task value, and effort regulation in their math course, which links students' trust to their course achievement in various ways.

In the literature, effort regulation is reported to be a significant predictor of course grades for freshman and upper level college students (Lynch, 2006). It is also reported to mediate the effect of students' Conscientiousness factor on their GPAs (Bidjerano & Yun Dai, 2007). The results of the current study showed that students' effort regulation correlated significantly with their math grades and also significantly predicted them, which is consistent with previous research findings (Lynch, 2006). The fact that students' trust correlated significantly with their effort regulation in the current study shows that there is a link between how students' perceive their instructor and the level of their effort regulation in that course. In other words, the more students perceive their instructor to be benevolent, reliable, competent, honest, and open, the more they regulate their effort for their learning and performance in that course. However, a casual relationship should not be drawn here, as it was not statistically tested. Nevertheless, this is a significant finding

as it shows that students' perceptions of their instructor interact with their regulation of behavior, which in turn determines their level of achievement.

In the current study students' self-efficacy beliefs correlated significantly with their math grades and also significantly predicted them. These findings support the previous reports regarding the predictive power of self-efficacy beliefs on student outcomes (Klomegah, 2007; Lynch, 2006; Pintrich & Zusho, 2007; Thomas & Gadbois, 2007). The fact that students' trust correlated significantly with their self-efficacy beliefs in the current study shows that there is a link between how students' perceive their instructor and their own beliefs about their ability or skill to learn and perform in that course. In other words, the more students perceive their instructor to be benevolent, reliable, competent, honest, and open, the more they believe in their ability or skill for learning and performance in that course. It is important not to draw a causal relationship here, as the direction of this interaction was not determined in the current study. However, this is a significant finding as it shows that students' perceptions of their instructor interact with their expectancies about their learning and performance in a course, which is strongly linked to their actual achievement.

The previous reports about the significant correlation between students' task value and course achievement (e.g., Pintrich & Zusho, 2007) is supported by the results of the current study, which showed that students' task value correlated significantly with their math grades. Even though there are previous reports about the significant predictive power of task value on course grades (e.g., McClendon, 1996; Yumusak et al., 2007), the findings of the current study did not indicate such a power of task value in the presence of other motivational constructs (i.e., self-efficacy beliefs, test anxiety, and effort

regulation). The fact that students' trust correlated significantly with their task value in the current study shows that there is a link between how students' perceive their instructor, and their beliefs about the importance and value of that course, including all the tasks involved. In other words, the more students perceive their instructor to be benevolent, reliable, competent, honest, and open, the more they value that course and the tasks involved. Again, it is important not to draw a causal relationship here, as the direction of this interaction was not determined in the current study. However, this is a significant finding as it shows that students' perceptions of their instructor interacts with their value beliefs about the tasks involved in a course, which in turn influences their level of achievement.

The findings of the current study also support the previous reports regarding the detrimental effects of test anxiety on students' academic achievement (e.g., Hembree, 1988; Pintrich & De Groot, 1990; Pintrich & Zusho, 2007; Rodger et al., 2007). In the current study students' test anxiety correlated negatively with their math grades and also significantly predicted them. Interestingly, however it was not found to correlate significantly with students' trust in the instructor. Given the fact that both the expectancy and the value components of students' motivational processes correlated significantly with students' trust in the instructor in the current study, it might be possible that some other affective component of students' motivational processes, such as self-esteem, self-worth, pride, or shame, rather than their test anxiety, might be significantly linked to their trust in the instructor, which remains to be tested.

In the next section these discussions of the findings regarding the significance of student trust for math achievement is linked to relevant implications for practice.

Implications and Recommendations for Practice

The results of the current study showed that student trust was not significantly linked to their personality, but was significantly linked to their motivation. The results also showed that students' trust in their math instructor was a significant predictor of students' final course grades when tested next to a personality factor (i.e., Conscientiousness) but non-significant when tested next to motivated strategies for learning (i.e., self-efficacy beliefs, test anxiety, or effort regulation). Its significant effect on students' final course grades was completely mediated by these motivational factors.

The fact that students' trust correlated significantly with their effort regulation, self-efficacy beliefs, and task value in the current study shows that there is a link between how students' perceive their math instructor and their levels of behavior regulation, beliefs about their ability or skill to learn and perform in that class, as well as their beliefs about the importance and value of that course. Therefore, it seems college math instructors need their students to trust them, and for that they need to be perceived by their students as benevolent, reliable, competent, honest, and open. Based on the items of the student trust measure used in the current study it can be specifically concluded that in order for college students to trust their math instructors, the students need to see their instructor as a person who cares about students, who is there for them. They also need to see the instructor as a smart, fair, nice, and helpful person, who does his/her job well, treats students with respect, does the right thing, tells the truth to students, makes one feel safe, and can be trusted.

The results of this study also showed that students' trust in their math instructor differed significantly based on their math class size. Students in classes with fewer than

50 students reported significantly higher trust in their math instructor. It was also found that these smaller classes (i.e., those with fewer than 50 students) were more likely to be Group 2 courses, which are for students in mathematics, science, engineering, and computer science majors. Therefore, the administrators and instructors in this institution should evaluate their resources to accommodate math classes with a maximum number of 50 students in each so that all students can benefit from a smaller group size for their interactions.

In addition to these basic premises of increasing student trust as implied by the findings of the current study, there are also suggestions in the literature about the ways to establish student trust in the classroom, which might be useful for administrators and the instructors in this institution to know.

In one study, the professor's out-of-class communications with their students was positively associated with student trust and motivation (Jaasma & Koper, 1999). In another study, college students reported that their ideal professors (in terms of personal characteristics, course design and policies, and classroom behavior) are more lenient, accessible, personable, open to variation, and clear about course policies (Epting et al., 2004).

There are also some suggestions in the literature for the instructors of specific college math subjects. Instructors of undergraduate calculus classes, for instance, are recommended to set high standards for their students by gaining a good understanding of where they find their students regarding "their background, their ability, their desire to learn, their willingness to work hard, and their appreciation of what the teacher has a right to expect of them" (Lewis, 1994, p. 270). Other suggestions for calculus instructors

are to be warm and caring, to "convince their students that their policies are fair and their expectations are reasonable," and to avoid test questions that are out of reach of the students which leave students emotionally beat up and soured on mathematics (Lewis, 1994, p. 269).

The next section provides some recommendations for future research based on the discussions of the findings regarding the significance of student trust for math achievement.

Recommendations for Future Research

This is an early study on student trust. Therefore, it would be useful to replicate it using different measures of trust, personality, or motivation to see if the results are consistent.

This study could also be replicated using the same measures with a different student population, or subject matter. For instance, replicating this study in various universities would reveal the differences, if any, across different institutional populations; and if there were to be differences, the institutional characteristics of the universities would be considered as important variables to include in further analyses. Research designs for subject matters other than math would also provide a better understanding of the student trust.

In addition, measuring affective components other than test anxiety might provide a better insight into the affective links of student trust in the classrooms. Students' self-esteem, self-worth, or pride might be in a more meaningful interaction with students' trust, particularly of those with ethnic minority backgrounds. It could be useful to test whether there is a relationship between these students' trust and their actual academic

achievement through a mediation of such affective components that interact with their motivation.

Inquiring into the several claims made about the nature of trust can also yield valuable information for understanding student trust. Among these, the dispositional claims could be investigated using different measures. For instance, the previous reports about the automaticity of trustworthiness judgments (Willis & Todorov, 2006) might be a worthwhile claim to test in a classroom context through a reaction time measurement. This could show if students' trust in their instructor is automatic, rather than regulated; and if so, further studies could investigate the predictors of this automaticity.

It is also possible that there are several contextual factors explaining the differences in students' trust. For instance, instructor characteristics might be an important factor interacting with students' trust. It is argued in the literature that "any process that categorizes another person into a positive group will lead to higher levels of trust beliefs about that person" (McKnight et al., 1998, p. 481). Social identity theory (Tajfel & Turner, 2007) and the similarity-attraction hypothesis (Byrne, 1971) also state that individuals hold stronger trust beliefs about similar, in-group members than dissimilar, out-group members. Therefore, measuring the significance of the "match" between the student's and the instructor's characteristics might reveal more information about the nature of student trust. The measurements of instructor behaviors, or the instructional methods used in the classroom could also help find important links to students' trust.

Finally, the claims made by the developmental approaches could be tested through longitudinal measurements of both parties' motives, attributions, emotions,

expectancies, and decisions (Simpson, 2007). A qualitative research design could also be used to collect richer data to be able to identify distinct stages, if any, to students' trust development.

REFERENCES

Adolphs, R., Tranel, D., & Buchanan, T. (2005). Amygdala damage impairs emotional memory for gist but not details of complex stimuli. *Nature Neuroscience*, *8*(4), 512-518.

Akiba, D. (2001). Mistrust toward teachers: Implications for ethnic differences in affect, behavior and cognition in classrooms [Abstract]. *Dissertation Abstracts International*, *61*(9-B). (UMI No. 2001-95006-292).

Albertini, V. L. (2004). Racial mistrust among immigrant minority students. *Child and Adolescent Social Work Journal*, *21*(4), 311-331.

Amaral, D.G. (2002). The primate amygdala and the neurobiology of social behavior: Implications for understanding social anxiety. *Biological Psychiatry*, *51*, 11-17.

Anderson, S. W., Damasio, H., Tranel, D., & Damasio, A. R. (2001). Long-term sequelae of prefrontal cortex damage acquired in early childhood. *Developmental Neuropsychology*, *18*(3), 281-296.

Bahry, D., Kosolapov, M., Kozyreva, P., & Wilson, R. (2005). Ethnicity and trust: Evidence from Russia. *American Political Science Review*, *99*(4), 521-532.

Barnes, L. L. B., Adams, C. M., & Forsyth, P. B. (2004, April). *Student trust of principal: Instrument development.* Paper presented at the annual meeting of the American Educational Research Association, San Diego.

Benson, T. A., Cohen, A. L., & Buskist, W. (2005). Rapport: Its relation to student attitudes and behaviors toward teachers and classes. *Teaching of Psychology*, *32*(4), 237-239.

Bidjerano, T., & Yun Dai, D. (2007). The relationship between the big-five model of personality and self-regulated learning strategies. *Learning and Individual Differences*, *17*(1), 69-81.

Birnbaum, M. H. (2004). Human research and data collection via the Internet. *Annual Review of Psychology*, *55*, 803-832.

Bong, M. (2005). Within-grade changes in Korean girls' motivation and perceptions of the learning environment across domains and achievement levels. *Journal of Educational Psychology*, *97*(4), 656-672.

Bourdieu, P. (1986). Forms of capital. In J. G. Richardson (Ed.) *Handbook of theory and research for the sociology of education*, (pp. 241-258). New York: Greenwood Press.

Bryk, A. S., & Schneider, B. (2003). Trust in schools: A core resource for school reform. *Educational Leadership*, *60*(6), 40-44.

Buskist, W., & Saville, B. K. (2001) Rapport-building: Creating positive emotional contexts for enhancing teaching and learning. Retrieved February 28, 2008, from http://www.psychologicalscience.org/teaching/tips/tips_0301.html

Byrne, D. (1971). *The attraction paradigm*. New York: Academic Press.

Chamorro-Premuzic, T. (2006). Creativity versus conscientiousness: Which is a better predictor of student performance? *Applied Cognitive Psychology*, *20*(4), 521-531.

Chamorro-Premuzic, T., & Furnham, A. (2003a). Personality predicts academic performance: Evidence from two longitudinal university samples. *Journal of Research in Personality*, *37*(4), 319-338.

Chamorro-Premuzic, T., & Furnham, A. (2003b). Personality traits and academic examination performance. *European Journal of Personality*, *17*(3), 237-250.

Chamorro-Premuzic, T., & Reichenbacher, L. (2008). Effects of personality and threat of evaluation on divergent and convergent thinking. *Journal of Research in Personality*, *42*(4), 1095-1101.

Chamorro-Premuzic, T., Ahmetoglu, G., & Furnham, A. (2008). Little more than personality: Dispositional determinants of test anxiety (the Big Five, core self-evaluations, and self-assessed intelligence). *Learning and Individual Differences*, *18*(2), 258-263.

Chamorro-Premuzic, T., Furnham, A., & Lewis, M. (2007). Personality and approaches to learning predict preference for different teaching methods. *Learning and Individual Differences*, *17*(3), 241-250.

Chamorro-Premuzic, T., Furnham, A., Dissou, G., & Heaven, P. (2005). Personality and preference for academic assessment: A study with Australian University students. *Learning and Individual Differences*, *15*(4), 247-256.

Chamorro-Premuzic, T., Furnham, A., Christopher, A. N., Garwood, J., & Neil Martin, G. (2008). Birds of a feather: Students' preferences for lecturers' personalities as predicted by their own personality and learning approaches. *Personality and Individual Differences*, *44*(4), 965-976.

Chen, J., Geither, J. A., Moran, G., & Radachy, K. (2008). *Book of trends 2008*. Retrieved November 13, 2008, from Cleveland State University, The Office of Institutional Research and Analysis Web site: http://www.csuohio.edu/offices/iraa/bot/bookoftrends.html

Child, J. (2001). Trust–The fundamental bond in global collaboration. *Organizational Dynamics*, *29*(4), 274-288.

Cleveland State University, The Office of Undergraduate Studies. (2008, September). *Results of Freshman 2008 Survey*. Retrieved November 13, 2008, from the Office's Web site: http://www.csuohio.edu/offices/undergraduatestudies/

Cohen, P. A. (1981). Student ratings of instruction and student achievement: A meta analysis of multisection validity studies. *Review of Educational Research*, *51*(3), 281-309.

Cohen, G. L., & Steele, C. M. (2002). A barrier of mistrust: How negative stereotypes affect cross-race mentoring. In J. Aronson (Ed.), *Improving academic achievement: Impact of psychological factors on education*, (pp. 303-327). San Diego, CA: Academic Press.

Coleman, J. S. (1990). *Foundations of social theory*. Cambridge, MA: Harvard University Press.

Coley, C., Holliday, J., Lynch, K., & Street, A. (2007, February). *Promoting student success at the University of South Carolina.* Paper presented at the 2007 National Conference for the First Year Experience. PowerPoint presentation file retrieved November 30, 2008, from University of South Carolina's Web Site: http://www.sc.edu/fye/events/presentation/annual/2007/ppt/54-CA.ppt

Colquitt, J. A., Scott, B. A., & LePine, J. A. (2007). Trust, trustworthiness, and trust propensity: A meta-analytic test of their unique relationships with risk taking and job performance. *Journal of Applied Psychology*, *92*(4), 909-927.

Cook, K. S. (2005). The significance of trust. In K. S. Cook, R. Hardin & M. Levi (Eds.), *Cooperation without trust?* (pp. 1-19). New York: Russell Sage.

Cosmides, L., & Tooby, J. (1992). Cognitive adaptations for social exchange. In J.H. Barkow, L. Cosmides, & J. Tooby (Eds.), *The adapted mind: Evolutionary psychology and the generation of culture* (pp. 163–228). London: Oxford University Press.

Costa, P. T., & McCrae, R. (1988). Personality in adulthood: A six-year longitudinal study of self-reports and spouse ratings on the NEO Personality Inventory. *Journal of Personality and Social Psychology*, *54*(5), 853-863.

Costa, P., Terracciano, A., & McCrae, R. R. (2001). Gender differences in personality traits across cultures: Robust and surprising findings. *Journal of Personality and Social Psychology*, *81*(2), 322-331.

Coutinho, S. (2008). Self-efficacy, metacognition, and performance. *North American Journal of Psychology*, *10*(1), 165-172.

Currall, S. C., & Epstein, J. (2003). The fragility of organizational trust: Lessons from the rise and fall of Enron. *Organizational Dynamics*, *32*(2), 193-206.

Damasio, A. (2005). Brain trust. *Nature*, *435*(7042), 571-572.

De Raad, B., & Perugini, M. (2002). Big five factor assessment: Introduction. In B. De Raad & M. Perugini (Eds.), *Big five assessment* (pp. 1-26). Seattle: Hogrefe & Huber.

Digman, J. M. (1990). Personality structure: Emergence of the five-factor model. *Annual Review of Psychology*, *41*, 417-440.

Dwight, S. A., Cummings, K. M., & Glenar, J. L. (1998). Comparison of criterion-related validity coefficients for the Mini-Markers and Goldberg's Markers of the Big Five Personality Factors. *Journal of Personality Assessment*, *70*(3), 541-550.

Elnicki, D., & Cooper, A. (2005). Medical students' perceptions of the elements of effective inpatient teaching by attending physicians and housestaff. *Journal of General Internal Medicine*, *20*(7), 635-639.

Ennis, C. D., & McCauley, M. T. (2002). Creating urban classroom communities worthy of trust. *Journal of Curriculum Studies*, *34*(2), 149-172.

Epting, L. K., Zinn, T. E., Buskist, C., & Buskist, W. (2004). Student perspectives on the distinction between ideal arid typical teachers. *Teaching of Psychology*, *31*(3), 181-183.

Feingold, A. (1994). Gender differences in personality: A meta-analysis. *Psychological Bulletin*, *116*(3), 429-456.

Feldman, R., Weller, A., Zagoory-Sharon, O., & Levine, A. (2007). Evidence for a neuroendocrinological foundation of human affiliation: Plasma oxytocin levels across pregnancy and the postpartum period predict mother-infant bonding. *Psychological Science*, *18*(11), 965-970.

Forsyth, P. B, & Adams, C. M. (2004a). Social capital in education: Taking stock of concept and measure. In W. K. Hoy & C. G. Miskel (Eds.), *Educational administration, policy, and reform: Research and measurement* (pp. 251-278). Greenwich, CT: Information Age.

Forsyth, P. B, & Adams, C. M. (2004b). Student trust survey. In M. Tschannen-Moran's *Trust matters: Leadership for successful schools*, (pp. 205-207). San Francisco, CA: Jossey-Bass.

Furnham, A., & Chamorro-Premuzic, T. (2004). Personality and intelligence as predictors of statistics examination grades. *Personality and Individual Differences*, *37*(5), 943-955.

Furnham, A., & Chamorro-Premuzic, T. (2005). Individual differences in students' preferences for lecturers' personalities. *Journal of Individual Differences*, *26*(4), 176-184.

Furnham, A., Chamorro-Premuzic, T., & McDougall, F. (2003). Personality, cognitive ability, and beliefs about intelligence as predictors of academic performance. *Learning and Individual Differences*, *14*(1), 49-66.

Furnham, A., Christopher, A. N., Garwood, J., & Neil Martin, G. (2007). Approaches to learning and the acquisition of general knowledge. *Personality and Individual Differences*, *43*(6), 1563-1571.

Gardner, J. N. (2008, July 29). *Smoothing the transition from high school to higher education: Strategies to promote college success*. Retrieved November 30, 2008, from Grantmakers for Education's Web Site: http://www.edfunders.org/downloads/Member%20Briefing/Gardner_College_Success.pdf

Ghosh, A. K., Whipple, T. W., & Bryan, G. A. (2001). Student trust and its antecedents in higher education. *Journal of Higher Education*, *72*(3), 322-340.

Goldberg, L. R. (1981). Language and individual differences: The search for universals in personality lexicons. In L. Wheeler (Ed.), *Review of personality and social psychology: 2* (pp. 141-165). Beverly Hills, CA: Sage.

Goldberg, L. R. (1990). An alternative "description of personality": The Big-Five factor structure. *Journal of Personality and Social Psychology*, *59*(6), 1216-1229.

Goldberg, L. R. (1992). The development of markers for the Big-Five factor structure. *Psychological Assessment*, *4*(1), 26-42.

Goldberg, L. R. (1993). The structure of phenotypic personality traits. *American Psychologist*, *48*(1), 26-34.

Graziano, W. G., & Eisenberg, N. (1997). Agreeableness: A dimension of personality. In R. Hogan, J. Johnson & S. Briggs (Eds.), *Handbook of personality psychology* (pp. 795-824). San Diego, CA: Academic Press.

Grewen, K. M., Girdler, S. S., Amico, J., & Light, K. C. (2005). Effects of partner support on resting oxytocin, cortisol, norepinephrine, and blood pressure before and after warm partner contact. *Psychosomatic Medicine*, *67*(4), 531-538.

Hammoud, M. M., Haefner, H. K., Schigelone, A., & Gruppen, L. D. (2004). Teaching residents how to teach improves quality of clerkship. *American Journal of Obstetrics and Gynecology*, *191*(5), 1741-1745.

Heberlein, A. S., Adolphs, R., Tranel, D., & Damasio, H. (2004). Cortical regions for judgments of emotions and personality traits from point-light walkers. *Journal of Cognitive Neuroscience*, *16*(7), 1143-1158.

Hembree, R. (1988) Correlates, causes, effects and treatment of test anxiety. *Review of Educational Research*, *58*, 47-77.

Hoff, K., & Pandey, P. (2005). Opportunity is not everything: How belief systems and mistrust shape responses to economic incentives. *Economics of Transition*, *13*(3), 445-472.

Hogan, J., & Ones, D. S. (1997). Conscientiousness and integrity at work. In R. Hogan, J. Johnson & S. Briggs (Eds.), *Handbook of personality psychology* (pp. 849-870). San Diego, CA: Academic Press.

Hoy, W. K., Smith, P. A., & Sweetland, S. R. (2002). The development of the organizational climate index for high schools: Its measure and relationship to faculty trust. *The High School Journal*, *86*(2), 38-49.

Hoy, W. K., Tarter, C. J., & Hoy, A. W. (2006). Academic optimism of schools: A force for student achievement. *American Educational Research Journal*, *43*(3), 425-446.

Hurtado, S., & Chang, M. (2008). *Becoming Scientists: Practices in Undergraduate Education that Contribute to Degree Completion and Advanced Study in STEM Disciplines*. Retrieved January 12, 2009, from Higher Education Research Institute's research Web site: http://www.gseis.ucla.edu/heri/research.php

Irving, M. A., & Hudley, C. (2005). Cultural mistrust, academic outcome expectations, and outcome values among African American adolescent men. *Urban Education*, *40*(5), 476-496.

Jaasma, M. A., & Koper, J. (1999). The relationship of student-faculty out-of-class communication to instructor immediacy and trust and to student motivation. *Communication Education*, *48*(1), 41-47.

John, P. (2005). The contribution of volunteering, trust, and networks to educational performance. *Policy Studies Journal*, *33*(4), 635-656.

Kershenbaum, B. R., & Komorita, S. (1970). Temptation to defect in the Prisoner's Dilemma game. *Journal of Personality and Social Psychology*, *16*(1), 110-113.

Klomegah, R. Y. (2007). Predictors of academic performance of university students: An application of the goal efficacy model. *College Student Journal*, *41*(2), 407-415.

Knack, S., & Keefer, P. (1997). Does social capital have an economic payoff? A cross-country investigation. *Quarterly Journal of Economics*, *112*(4), 1251-1288.

Komorita, S. S., & Lapworth, C. W. (1982). Cooperative choice among individuals versus groups in an N-person dilemma situation. *Journal of Personality and Social Psychology*, *42*(3), 487-496.

Komorita, S. S., & Mechling, J. (1967). Betrayal and reconciliation in a two-person game. *Journal of Personality and Social Psychology*, *6*(3), 349-353.

Komorita, S. S., Sheposh, J. P., & Braver, S. L. (1968). Power, the use of power, and cooperative choice in a two-person game. *Journal of Personality and Social Psychology*, *8*(2, Pt.1), 134-142.

Kosfeld, M., Heinrichs, M., Zak, P. J., Fischbacher, U., & Fehr, E. (2005). Oxytocin increases trust in humans. *Nature*, *435*(7042), 673-676.

Lee, S. (2007). The relations between the student-teacher trust relationship and school success in the case of Korean middle schools. *Educational Studies*, *33*(2), 209-216.

Lee, G., & Schallert, L. (2008). Constructing trust between teacher and students through feedback and revision cycles in an EFL writing classroom. *Written Communication*, *25*(4), 506-537.

Lewis, W. J. (1994). Teaching mathematics in a state university. In K. W. Prichard & R. M. Sawyer (Eds.) *Handbook of college teaching: Theory and applications*, (pp. 267-279). Westport, CT: Greenwood Press.

Lewis, J. D., & Weigert, A. (1985). Trust as a social-reality. *Social Forces*, *63*(4), 967-985.

Linnehan, F., Weer, C., & Uhl, J. (2005). African-American students' early trust beliefs in work-based mentors. *Journal of Vocational Behavior*, *66*(3), 501-515.

Lynch, D. J. (2006). Motivational factors, learning strategies and resource management as predictors of course grades. *College Student Journal*, *40*(2), 423-428.

McAllister, D. J. (1995). Affect-based and cognition-based trust as foundations for interpersonal cooperation in organizations. *Academy of Management Journal*, *38*(1), 24-59.

McCabe, K., Houser, D., Ryan, L., Smith, V., & Trouard, T. (2001). A functional imaging study of cooperation in two-person reciprocal exchange. Retrieved April 10, 2006, from http://merlin.psych.arizona.edu/%7Edpat/Public/Pubs/McCabePNAS.pdf

McClendon, R. C. (1996). Motivation and cognition of preservice teachers: MSLQ. *Journal of Instructional Psychology*, *23*(3), 216-220.

McCrae, R. R., & Costa, P. T. (1997). Conceptions and correlates of openness to experience. In R. Hogan, J. Johnson & S. Briggs (Eds.), *Handbook of personality psychology* (pp. 825-847). San Diego, CA: Academic Press.

McKnight, D. H., Cummings, L. L., & Chervany, N. L. (1998). Initial trust formation in new organizational relationships. *Academy of Management Review*, *23*(3), 473-490.

Meyers, L. S., Gamst G., & Guarino, A. J. (2006). *Applied multivariate research: Design and interpretation*. Thousand Oaks, CA: Sage Publications.

Miller, P. J. E., & Rempel, K. (2004). Trust and partner-enhancing attributions in close relationships. *Personality and Social Psychology Bulletin*, *30*(6), 695-705.

Mills, J., & Blankstein, R. (2000). Perfectionism, intrinsic vs. extrinsic motivation, and motivated strategies for learning: A multidimensional analysis of university students. *Personality and Individual Differences*, *29*(6), 1191-1204.

Moore, A., Masterson, J. T., Christophel, D. M., & Shea, K. A. (1996). College teacher immediacy and student ratings of instruction. *Communication Education*, *45*(1), 29-39.

National Science Foundation, Division of Undergraduate Education (2008). *Science, technology, engineering, and mathematics talent expansion program (STEP)*. Retrieved January 12, 2009, from National Science Foundation's Division of Undergraduate Education Web site: http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5488

Nettle, D., & Liddle, B. (2008). Agreeableness is related to social-cognitive, but not social-perceptual, theory of mind. *European Journal of Personality*, *22*(4), 323-335.

Nielsen, S. G. (2004). Strategies and self-efficacy beliefs in instrumental and vocal individual practice: A study of students in higher music education. *Psychology of Music*, *32*(4), 418-431.

Nguyen, T. V. (2005). Learning to trust: A study of interfirm trust dynamics in Vietnam. *Journal of World Business*, *40*(2), 203-221.

Nugent, P. D., & Abolafia, Y. (2006). The creation of trust through interaction and exchange: The role of consideration in organizations. *Group & Organization Management*, *31*(6), 628-650.

Parks, C. D., & Hulbert, G. (1995). High and low trusters' responses to fear in a payoff matrix. *Journal of Conflict Resolution*, *39*(4), 718-730.

Perry, R. W., & Mankin, L. D. (2007). Organizational trust, trust in the chief executive and work satisfaction. *Public Personnel Management*, *36*(2), 165-179.

Perry, R. P., & Penner, S. (1990). Enhancing academic achievement in college students through attributional retraining and instruction. *Journal of Educational Psychology*, *82*(2), 262-271.

Phelps, E. A., O'Connor, K. J., Gatenby, J. C., Gore, J. C., Grillon, C., & Davis, M. (2001). Activation of the left amygdala to a cognitive representation of fear. *Nature Neuroscience*, *4*(4), 437-441.

Phelps, R. E., Taylor, J. D., & Gerard, P. A. (2001). Cultural mistrust, ethnic identity, racial identity, and self-esteem among ethnically diverse black students. *Journal of Counseling & Development*, *79*(2), 209-216.

Pintrich, P. R. (1994). Student motivation in the college classroom. In K. W. Prichard & R. M. Sawyer (Eds.), *Handbook of college teaching: Theory and applications*, (pp. 23-43). Westport, CT: Greenwood Press.

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

Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie, W. J. (1991). A manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ). Retrieved October 28, 2008, from ERIC Documents Web site: http://eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/23/3c/44.pdf

Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie, W. J. (1993). Reliability and predictive validity of the Motivated Strategies for Learning Questionnaire (MSLQ). *Educational and Psychological Measurement*, *53*(3), 801-813.

Pintrich, P. R., Zusho, A. (2007). Student motivation and self-regulated learning in the college classroom. In R. P. Perry & J. C. Smart (Eds.), *The scholarship of teaching and learning in higher education: An evidence based perspective*, (pp. 731-810). Dordrecht, The Netherlands: Springer.

Putnam, R. (2000). *Bowling alone: The collapse and revival of American community*. New York: Simon & Schuster.

Rempel, J. K., Holmes, J. G., & Zanna, M. P. (1985). Trust in close relationships. *Journal of Personality and Social Psychology*, *49*(1), 95-112.

Rice, S. (2006). The educational significance of trust. *Philosophy of Education Yearbook*, [No Volume/Issue], 71-78.

Riding, R. J., & Rayner, S. G. (1998). *Cognitive styles and learning strategies: Understanding style differences in learning and behaviour*. London: David Fulton Publishers.

Rilling, J. K., Gutman, D. A., Zeh, T. R., Pagnoni, G., Berns, G. S., & Kilts, C. D. (2002). A neural basis for social cooperation. *Neuron*, *35*(2), 395-405.

Rodger, S., Murray, H. G., & Cummings, A. L. (2007). Effects of teacher clarity and student anxiety on student outcomes. *Teaching in Higher Education*, *12*(1), 91-104.

Roessingh, H. (2006). The teacher is the key: Building trust in ESL high school programs. *Canadian Modern Language Review*, *62*(4), 563-590.

Rotter, J. B. (1980). Interpersonal trust, trustworthiness, and gullibility. *American Psychologist*, *35*(1), 1-7.

Saucier, G. (1994). Mini-Markers: A brief version of Goldberg's unipolar Big-Five markers. *Journal of Personality Assessment*, *63*, 506-516.

Saucier, G. (2005). Mini-Markers: 40-item adjective measure of Big Five. Retrieved November 16, 2008, from Gerard Saucier's Web site: http://www.uoregon.edu/~gsaucier/gsau41.htm

Saucier, G., & Goldberg, R. (2001). Lexical studies of indigenous personality factors: Premises, products, and prospects. *Journal of Personality*, *69*(6), 847-879.

Serva, M. A., Fuller, M. A., & Mayer, R. C. (2005). The reciprocal nature of trust: A longitudinal study of interacting teams. *Journal of Organizational Behavior*, *26*(6), 625-648.

Simpson, J. A. (2007). Psychological foundations of trust. *Current Directions in Psychological Science*, *16*(5), 264-268.

Sipe, C. (2002). Mentoring programs for adolescents: A research summary. *Journal of Adolescent Health*, *31*(6), 251-260.

Solomon, R. C., & Flores, F. (2001). *Building trust in business, politics, relationships, and life*. New York: Oxford University Press.

Sue, V. M., & Ritter, L. A. (2007). *Conducting online surveys*. Thousand Oaks, CA: Sage Publications.

Tajfel, H., & Turner, J. C. (2007). The social identity theory of intergroup behavior. In D. A. Stapel & H. Blanton (Eds.), *Social comparison theories: Key readings*, (pp. 355-374). New York: Psychology Press.

Tanis, M., & Postmes, T. (2005). Short communication: A social identity approach to trust: Interpersonal perception, group membership and trusting behaviour. *European Journal of Social Psychology*, *35*(3), 413-424.

Teven, J. J., & Hanson, T. L. (2004). The impact of teacher immediacy and perceived caring on teacher competence and trustworthiness. *Communication Quarterly*, *52*, 39-54.

The Integrated Postsecondary Education Data System. (2009). Peer Analysis System (PAS), Graduation rates (Aug 31, 2004-2006). Retrieved February, 24, 2009, from PAS's Web site: http://nces.ed.gov/IPEDS/find_data/peer_analysis_summary.asp

Thomas, C. R., & Gadbois, A. (2007). Academic self-handicapping: The role of self-clarity and students' learning strategies. *British Journal of Educational Psychology*, *77*(1), 101-119.

Thweatt, K. S., & McCroskey, C. (1998). The impact of teacher immediacy and misbehaviors on teacher credibility. *Communication Education*, *47*(4), 348-358.

Tschannen-Moran, M. (2003). Fostering organizational citizenship in schools: transformational leadership and trust. In W. Hoy & C. Miskel (Eds.), *Studies in leading and organizing schools* (pp. 157-179). Greenwich, CT: Information Age Publishing.

Tschannen-Moran, M., & Hoy, W. K. (2000). A multidisciplinary analysis of the nature, meaning, and measurement of trust. *Review of Educational Research*, *70*, 547-593.

Urbaniak, G. C., Plous, S., & Lestik, M. (2003). Research Randomizer [Computer program]. Retrieved November 9, 2008, from Social Psychology Network's Web site: http://www.randomizer.org/

Watson, D., & Clark, L. A. (1997). Extraversion and its positive emotional core. In R. Hogan, J. Johnson & S. Briggs (Eds.), *Handbook of personality psychology* (pp. 767-793). San Diego, CA: Academic Press.

Willie, C. V. (2001). Confidence, trust and respect: The preeminent goals of educational reform. *The Journal of Negro Education*, *69*(4), 255-262.

Willis, J., & Todorov, A. (2006). First impressions: Making up your mind after a 100-ms exposure to a face. *Psychological Science*, *17*(7), 592-598.

Wiggins, J. S., & Trapnell, P. D. (1997). Personality structure: The return of the big-five. In R. Hogan, J. Johnson & S. Briggs (Eds.), *Handbook of personality psychology* (pp. 737-765). San Diego, CA: Academic Press.

Winston, J., Strange, B., O'Doherty, J., & Dolan, R. (2002). Automatic and intentional brain responses during evaluation of trustworthiness of faces. *Nature Neuroscience*, *5*, 277-283.

Yamagishi, T., Kikuchi, M., & Kosugi, M. (1999). Trust, gullibility, and social intelligence. *Asian Journal of Social Psychology*, *2*(1), 145-161.

Yumusak, N., Sungur, S., & Cakiroglu, J. (2007). Turkish high school students' biology achievement in relation to academic self-regulation. *Educational Research and Evaluation*, *13*(1), 53-69.

Zak, P. J., Kurzban, R., & Matzner, W. T. (2005). Oxytocin is associated with human trustworthiness. *Hormones and Behavior*, *48*(5), 522-527.

Zhou, Z., Peverly, S. T., Xin, T., Huang, A. S., & Wang, W. (2003). School adjustment of first-generation Chinese-American adolescents. *Psychology in the Schools*, *40*(1), 71-84.

APPENDICES

APPENDIX A

Consent Form [Administered online]

SURVEY OF CSU STUDENTS TAKING MATH COURSES — Exit this survey

1. Consent

11%

Dear CSU Students

I am a doctoral student in the Urban Education Program of CSU. I am conducting a research regarding the classroom experiences of college students, and would like you to complete an online survey. You will be able to enter a raffle to win a prize if you participate. The deadline is May 8th. If you would like to participate, please read the information provided for you and continue accordingly. Students who are 17 or younger should not participate.

EXPLAINING MATH ACHIEVEMENT: PERSONALITY, MOTIVATION, AND TRUST

This research is titled "Explaining Math Achievement: Personality, Motivation, and Trust." I am mainly interested in examining college students' trust in their instructors in challenging college courses. Specifically, I aim to explore whether students' trust, motivation and personality influence their achievement in math. Your input will help educators better understand the dynamics between these concepts among undergraduate students like you; therefore I appreciate your help with this project. This study has been approved by Cleveland State University's Institutional Review Board (IRB).

Are you interested in learning more and helping me with this research? If yes, please click "Next" to continue.

Next

SURVEY OF CSU STUDENTS TAKING MATH COURSES — Exit this survey

2. Consent

22%

Will you take this online survey?

If you agree to participate in this research, you will be asked to answer some questions about your math instructor in one of the math courses you are currently taking in CSU (whichever course you choose). You will also be asked to answer some questions about yourself. This online survey has been created to gather this information, which should take around 15 minutes to complete. I am also requesting your permission to access your math course grade at the end of this semester (the grade for the course you will be completing the surveys about). Students' academic data is protected by the University's confidentiality policy, and the Federal Family Educational Right to Privacy Act of 1974 (FERPA) (Copies of these policies are available through the Office of the University Registrar and on CSU's Web site: http://www.csuohio.edu/enrollmentservices/registrar/privacy/ferpa.html). If you agree to participate in this study you will be authorizing CSU to disclose your math course grade to me at the end of this semester.

Your identity and personal information will be protected.

The information gathered on this survey is stored on a secure server. Only I will have access to this information. Your instructor will NOT know anything about your answers to this survey. All of your answers and your course grade will be kept strictly confidential. Your name will in no way be linked to your answers or course grade. I am interested in using the summary data and my subsequent findings from this study for academic conference presentations and journal publications.

If you are still interested in helping me, please click "Next" to find out about your chance to win an iPod nano.

Prev Next

SURVEY OF CSU STUDENTS TAKING MATH COURSES — Exit this survey

3. Consent

33%

If you participate in this study, you will be able to enter into a raffle to win an iPod nano (8 GB: 2000 songs/ 8 hours of video) in your favorite color. Please participate only once because the prize will not be available for those who participate more than once. Taking part in this study is entirely up to you. Refusal to participate will not involve any penalty. Your participation will have no impact on your relationship with your instructors, your grades, and/or your class standing. You may withdraw from this study at any time using the "Exit this survey" link at the top right hand corner of your screen. If you do not want to participate in this study, please exit using this link now.

What other questions and/or concerns do you have?

Please feel free to contact me at e.kilicbebek@csuohio.edu or (216) 523-7208, or my advisor, Dr. Rosemary Sutton at r.sutton@csuohio.edu or (216) 687-3924 should you have questions or any concerns about this study.

If you have any questions about your rights as a research subject, you can contact the CSU Institutional Review Board at (216) 687-3630.

I thank you in advance for your cooperation.

Ebru Kilic-Bebek

I UNDERSTAND THAT BY CLICKING THE "NEXT" BUTTON BELOW I AM AGREEING TO PARTICIPATE IN THIS STUDY.

Prev Next

APPENDIX B

Instruments

Introduction: Course Selection *[Administered online]*


SURVEY OF CSU STUDENTS TAKING MATH COURSES

Exit this survey

4. Introduction: Course Selection

44%

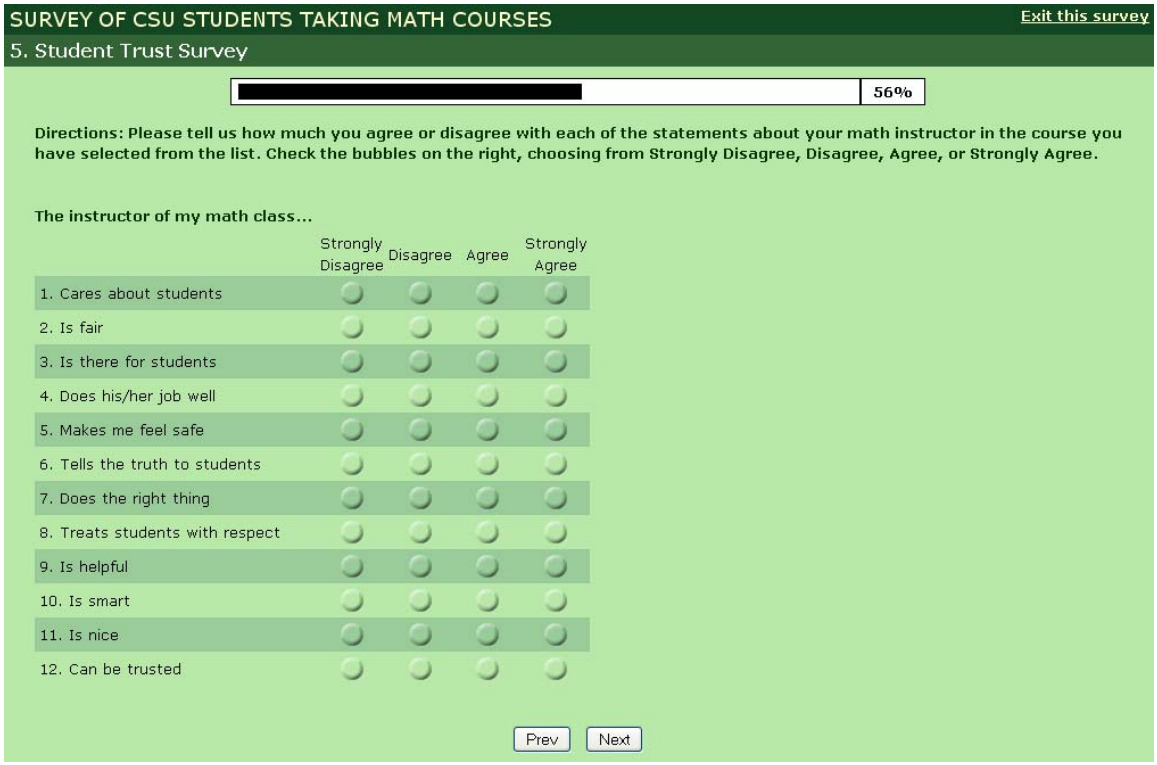
In order to fill out this survey you first need to select a math course you are taking this semester (Spring 2009) in Cleveland State University. Then, answer the survey questions based on your observations in that class.

Please select ONE of the math courses you are currently taking.

- MTH 087 Basic Math and Algebra for Liberal Arts Majors
- MTH 088 Basic Math and Algebra for Business and Science Majors
- MTH 115 Applied Algebra (or Intermediate Algebra)
- MTH 116 Foundations of Quantitative Literacy
- MTH 117 Mathematical Applications in the Real World
- MTH 127 Mathematics for Elementary and Middle School Teachers-I
- MTH 128 Mathematics for Elementary and Middle School Teachers-II
- MTH 129 Mathematics for Elementary and Middle School Teachers-III
- MTH 147 Statistical Concepts with Applications
- MTH 151 Mathematical Concepts-1a
- MTH 152 Mathematical Concepts-1b
- MTH 153 Mathematical Concepts-1c
- MTH 154 Mathematical Concepts-2a
- MTH 155 Mathematical Concepts-2b
- MTH 156 Mathematical Concepts-2c
- MTH 167 Precalculus Mathematics-I
- MTH 168 Precalculus Mathematics-II
- MTH 181 Calculus-I
- MTH 182 Calculus-II
- MTH 182H Honors Calculus-II
- MTH 220 Introduction to Discrete Mathematics
- MTH 247 Applied Statistics
- MTH 281 Multivariable Calculus
- MTH 283 Multivariable Calculus for Engineers
- MTH 284 Matrices for Engineers
- MTH 286 Introduction to Differential Equations
- MTH 288 Linear Algebra
- MTH 311 Numerical Analysis
- MTH 323 Statistical Methods
- MTH 327 Algebra and Functions for Middle School Teachers
- MTH 328 Geometry for Middle School Teachers
- MTH 358 Abstract Algebra
- MTH 424 Probability Theory and Applications
- MTH 434 Differential Geometry

Prev Next

The Student Trust Survey (STS) *[Administered online]*



SURVEY OF CSU STUDENTS TAKING MATH COURSES

Exit this survey

5. Student Trust Survey

56%

Directions: Please tell us how much you agree or disagree with each of the statements about your math instructor in the course you have selected from the list. Check the bubbles on the right, choosing from Strongly Disagree, Disagree, Agree, or Strongly Agree.

The instructor of my math class...

	Strongly Disagree	Disagree	Agree	Strongly Agree
1. Cares about students				
2. Is fair				
3. Is there for students				
4. Does his/her job well				
5. Makes me feel safe				
6. Tells the truth to students				
7. Does the right thing				
8. Treats students with respect				
9. Is helpful				
10. Is smart				
11. Is nice				
12. Can be trusted				

Prev Next

The Motivated Strategies for Learning Questionnaire (MSLQ) *[Administered online]*

SURVEY OF CSU STUDENTS TAKING MATH COURSES — Exit this survey

6. Motivated Strategies for Learning Questionnaire

67%

Directions: The following questions ask about your motivation and strategies for the math class you selected from the list. There are no right or wrong answers, just answer as accurately as possible. For each statement indicate your answer using the drop-down menus on the right using the scale below. If you think a statement is very true of you, choose 7; if a statement is not at all true of you, choose 1. If the statement is more or less true of you, find the number between 1 and 7 that best describes you.

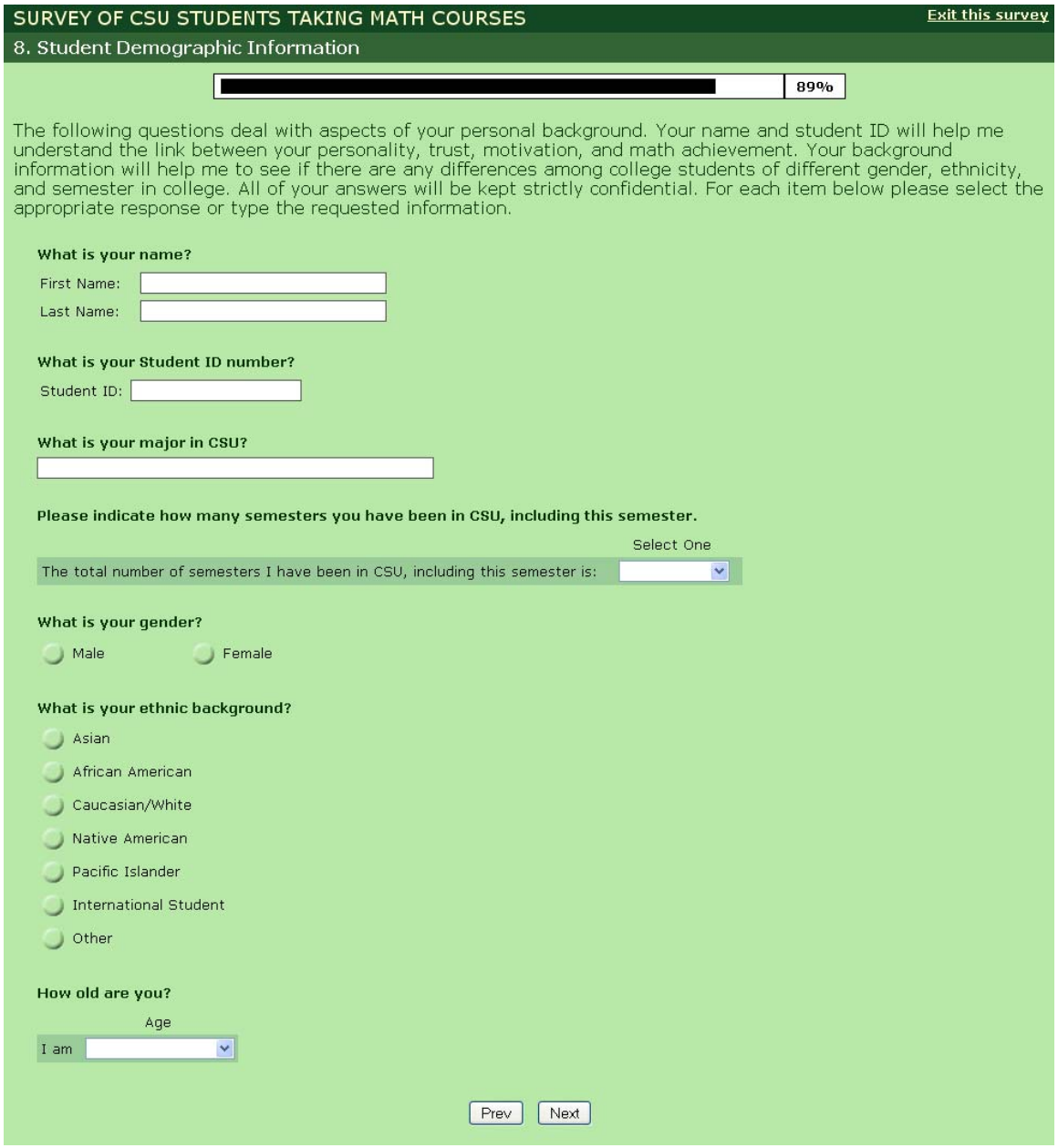
1 = Not at all true of me
2
3
4
5
6
7 = Very true of me

	Select Answer
1. I think the course material in this class is useful for me to learn.	
2. When I take a test I think about how poorly I am doing compared with other students.	
3. I think I will be able to use what I learn in this course in other courses.	
4. I believe I will receive an excellent grade in this class.	
5. I'm certain I can understand the most difficult material presented in the readings for this course.	
6. When I take a test I think about items on other parts of the test I can't answer.	
7. It is important for me to learn the course material in this class.	
8. I'm confident I can understand the basic concepts taught in this course.	
9. When I take tests I think of the consequences of failing.	
10. I'm confident I can understand the most complex material presented by the instructor in this course.	
11. I'm very interested in the content area of this course.	
12. I have an uneasy, upset feeling when I take an exam.	
13. I'm confident I can do an excellent job on the assignments and tests in this course.	
14. I expect to do well in this class.	
15. I like the subject matter of this course.	
16. Understanding the subject matter of this course is very important to me.	
17. I feel my heart beating fast when I take an exam.	
18. I'm certain I can master the skills being taught in this class.	
19. Considering the difficulty of this course, the teacher, and my skills, I think I will do well in this class.	
20. I often feel so lazy or bored when I study for this class that I quit before I finish what I planned to do.	
21. Even if I have trouble learning the material in this class, I try to do the work on my own, without help from anyone.	
22. I work hard to do well in this class even if I don't like what we are doing.	
23. I ask the instructor to clarify concepts I don't understand well.	
24. When course work is difficult, I give up or only study the easy parts.	
25. When I can't understand the material in this course, I ask another student in this class for help.	
26. Even when course materials are dull and uninteresting, I manage to keep working until I finish.	
27. I try to identify students in this classroom I can ask for help if necessary.	

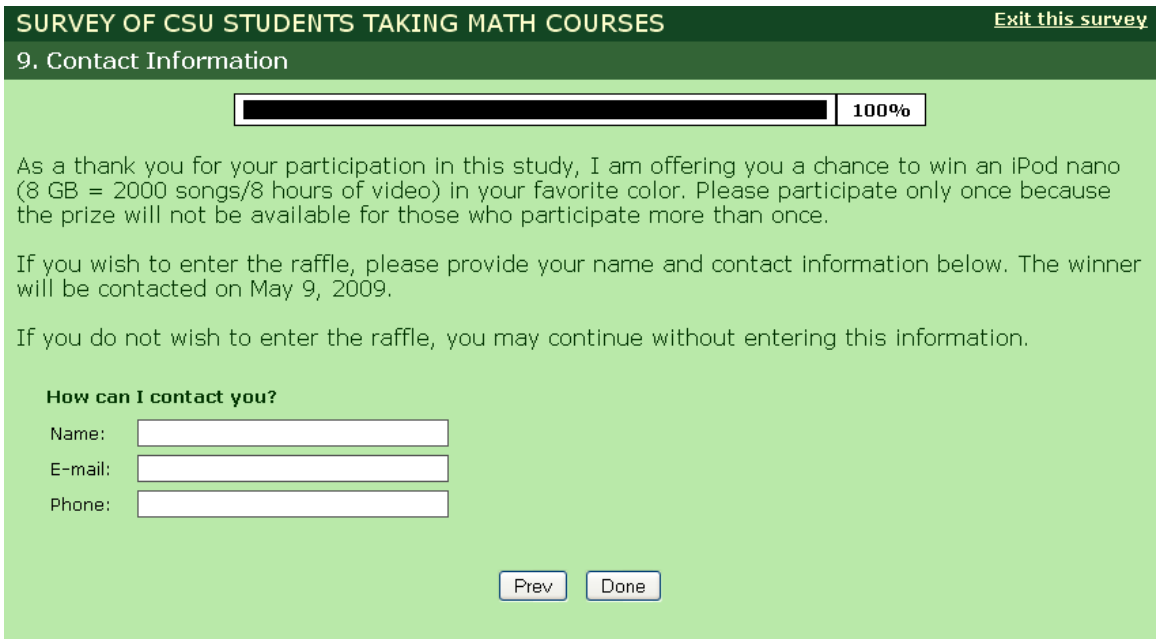
Prev Next

The Mini-Markers *[Administered online]*

Student Demographic Information *[Collected online]*



Contact Information *[Collected online]*



APPENDIX C

Score Calculations

The Student Trust Score

Student trust = (T1 + T2 + T3 + T4 + T5 + …+ T12) / 12

The Motivated Strategies for Learning Scores

Task value = (Q1 + Q3 + Q7 + Q11 + Q15 + Q16) / 6

Self-efficacy = (Q4 + Q5 + Q8 + Q10 + Q13 + Q14 + Q18 + Q19) / 8

Test anxiety = (Q2 + Q6 + Q9 + Q12 + Q17) / 5

Effort regulation = [Q20(R) + Q22 + Q24(R) + Q26] / 4

Help seeking = [Q21(R) + Q23 + Q25 + Q27] / 4

The Mini-Markers Scores

1. Extraversion = [Talkative + Extroverted + Bold + Energetic + Shy(R) + Quiet(R) + Bashful(R) + Withdrawn(R)] / 8
2. Agreeableness = [Sympathetic + Warm + Kind + Cooperative + Cold(R) + Unsympathetic(R) + Rude(R) + Harsh(R)] / 8
3. Conscientiousness = [Organized + Efficient + Systematic + Practical + Disorganized(R) + Sloppy(R), Inefficient(R), Careless(R)] / 8
4. Emotional Stability = [Unenvious + Relaxed + Moody(R) + Jealous(R) + Temperamental(R) + Envious(R) + Touchy(R) + Fretful(R)] / 8
5. Intellect = [Creative + Imaginative + Philosophical + Intellectual + Complex + Deep + Uncreative(R) + Unintellectual(R)] / 8

APPENDIX D

Scale Items

The Student Trust Survey (STS) Items

The instructor of my math class...

1. Cares about students

2. Is fair

3. Is there for students

4. Does his/her job well

5. Makes me feel safe

6. Tells the truth to students

7. Does the right thing

8. Treats students with respect

9. Is helpful

10. Is smart

11. Is nice

12. Can be trusted

The Motivated Strategies for Learning Questionnaire (MSLQ) Items

Task value

1. I think the course material in this class is useful for me to learn.

3. I think I will be able to use what I learn in this course in other courses.

7. It is important for me to learn the course material in this class.

11. I am very interested in the content area of this course.

15. I like the subject matter of this course.

16. Understanding the subject matter of this course is very important to me.

Self-efficacy

4. I believe I will receive an excellent grade in this class.

5. I'm certain I can understand the most difficult material presented in the readings for this course.

8. I'm confident I can understand the basic concepts taught in this course.

10. I'm confident I can understand the most complex material presented by the instructor in this course.

13. I'm confident I can do an excellent job on the assignments and tests in this course.

14. I expect to do well in this class.

18. I'm certain I can master the skills being taught in this class.

19. Considering the difficulty of this course, the teacher, and my skills, I think I will do well in this class.

Test anxiety

2. When I take a test I think about how poorly I am doing compared with other students.

6. When I take a test I think about items on other parts of the test I can't answer.

9. When I take tests I think of the consequences of failing.

12. I have an uneasy, upset feeling when I take an exam.

17. I feel my heart beating fast when I take an exam.

Effort regulation

20. I often feel so lazy or bored when I study for this class that I quit before I finish what I planned to do. (*Reverse item*)

22. I work hard to do well in this class even if I don't like what we are doing.

24. When course work is difficult, I give up or only study the easy parts. (*Reverse item*)

26. Even when course materials are dull and uninteresting, I manage to keep working until I finish.

Help seeking

21. Even if I have trouble learning the material in this class, I try to do the work on my own, without help from anyone. (*Reverse item*)

23. I ask the instructor to clarify concepts I don't understand well.

25. When I can't understand the material in this course, I ask another student in this class for help.

27. I try to identify students in this class whom I can ask for help if necessary.

The Mini-Markers Items

Extraversion

Bashful (*Reverse item*), Bold, Energetic, Extraverted, Quiet (*Reverse item*), Shy (*Reverse item*), Talkative, Withdrawn (*Reverse item*)

Agreeableness

Cold (*Reverse item*), Cooperative, Harsh (*Reverse item*), Kind, Rude (*Reverse item*), Sympathetic, Unsympathetic (*Reverse item*), Warm

Conscientiousness

Careless (*Reverse item*), Disorganized (*Reverse item*), Efficient, Inefficient (*Reverse item*), Organized, Practical, Systematic, Sloppy (*Reverse item*)

Emotional Stability

Envious (*Reverse item*), Fretful (*Reverse item*), Jealous (*Reverse item*), Moody (*Reverse item*), Relaxed, Temperamental (*Reverse item*), Touchy (*Reverse item*), Unenvious

Intellect

Complex, Creative, Deep, Imaginative, Intellectual, Philosophical, Uncreative (*Reverse item*), Unintellectual (*Reverse item*)