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The University of Southern Mississippi

The Relationship between Attitudes and Achievement in Mathematics among Fifth Grade Students

by

Madeleine Michelli

A Thesis

Submitted to the Honors College of

The University of Southern Mississippi

in Partial Fulfillment

of the Requirements for the Degree of

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the Department of Curriculum, Instruction, and Special Education

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Approved by

_____

Marlene Naquin

Instructor of Mathematics

_____

Kevin Walker

Instructor of Education and Psychology

_____

David Daves, Chair

Curriculum, Instruction, and Special Education

_____

David R. Davies, Dean

Honors College

Abstract

There have been a number of studies investigating how attitudes such as confidence and motivation affect students and their academic achievement. This study was conducted to identify specifically how fifth grade students' attitudes affect their achievement in mathematics. Gender was studied to determine its effect on attitude and achievement. Furthermore, various types of personality traits were studied including extroversion, conscientiousness, self-control, and intellectual efficiency to determine their effects on achievement. To gather the data a questionnaire including a Likert scale survey and a math test was administered. The results indicated that there is a significant relationship between attitudes toward and achievement in math. Concerning gender, males had a more positive attitude towards math compared to females, but both genders scored approximately the same on the achievement test. Finally, extroversion was the only trait to have a significant relationship with achievement, showing that students who were more extroverted scored higher on the test. These findings indicate that educators should be aware of students' attitudes and seek to improve them in order to positively influence students' academic achievement.

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CHAPTER I

INTRODUCTION

According to Douglas McLeod, "Recent research has made substantial progress in characterizing the cognitive processes that are important to success in mathematical problem solving. However, the relationship of affective factors to these cognitive processes has yet to be studied in detail" (1988). This study seeks to determine a relationship between affective factors and the achievement of students based on their cognitive ability.

Kate Christian, Frederick Morrison, and Fred Bryan determined that family education level and childcare environment could influence students' achievement in math (2002). While these factors can play into students' achievement, one aspect that is not frequently looked at is the students' attitudes concerning the subject. The question that will be studied is "Is there a relationship between attitudes toward and achievement in mathematics among fifth grade students?"

For the purposes of this study, the words attitude and math need be defined. According to Lewis Aiken, "Investigations concerned with the developing and influencing of attitude toward mathematics have dealt almost exclusively with enjoyment of the subject or anxiety in its presence" (1974). This study will examine both aspects in order to determine if students are fascinated with the subject or if they feel dread and nervousness when doing work. The study will also consider students' opinions of how they think they do in this subject area. In order to restrict the topic, attitudes towards whether or not the subject is beneficial or necessary for life will not be considered. For this study, math will be defined as numbers and operations, algebra, and geometry.

Because these are the only aspects that will be measured, achievement in other math content areas will not be addressed.

This study will examine one school to determine a correlation between attitudes and achievement. Students will be given a standardized assessment and survey to determine their attitudes and achievement. Demographic information will be gathered at the school level for the purpose of defining site characteristics. Other than gender, demographic information from students will not be collected.

This study is important so that there can be more clarity concerning what allows students to succeed in math or what is hindering their success. Some reasons for difficulty include extreme anxiety that exists or a refusal to give effort; however, self-confidence has rarely been a consideration. If attitudes indeed prove to be a significant factor in students' achievement, then teachers can adjust their instruction to include more motivating elements, especially for low-achieving students. By determining a correlation between self-confidence and attitudes towards math and achievement in this area, this study will help identify factors that influence student success.

CHAPTER II

REVIEW OF RELATED LITERATURE

This study seeks to further understand what helps students succeed in elementary school so that teachers can implement techniques that promote success. Relationships between academic achievement, motivation, and attitudes will be examined, and their findings analyzed. Correlations must be found between certain elements before a relationship can exist between all three. After understanding what motivates students and what affects academic achievement, strategies can be created. By implementing these new approaches, teachers will be instructing according to students' needs in the classroom.

Student Achievement: Socioeconomic Status

In 2005, Jennifer Barry conducted a study measuring the effect socioeconomic study has on academic achievement. She predicted that the higher a student's socioeconomic status, the higher his or her test scores will be. Academic achievement was measured by a standardized test administered by the National Center for Education Statistics (NCES) on the subjects of math and reading. Barry measured socioeconomic status by examining parents' education, occupational status, and income, and then she coded it so that it had a value between 0-100 (Barry, 2005). In her discussion Barry writes, "OLS [ordinary least squares] regression revealed that socioeconomic status had the greatest impact on test scores in relation to the other variables of this study" (2005). The researcher measured each family's resources and parental involvement as well. Factors such as if the family owned a computer or if parents were involved in their students' school were taken into account. Barry found that when parents are more

involved in the school, their children's test scores are higher. In addition, she found that when families do not own technology such as computers, students struggle due to not having that resource (Barry, 2005)

Another study concerning socioeconomic status was done by a group of researchers including Vonetta Dotson, Melissa Kitner-Triolo, Michele Evans, and Alan Zonderman. They examined test scores from low and high socioeconomic status African Americans and Whites in order to determine if socioeconomic status and/or race affect cognitive abilities. The researchers hypothesized that proficiency in literacy would be a better predictor of cognitive abilities than years of education, especially for people of low socioeconomic status and African Americans (Dotson, Kitner-Triolo, Evans, & Zonderman, 2009). In order to measure the theory, cognitive tests from participants were examined and demographic questions were asked to determine incomes and race. Participants were placed in one of four categories: low socioeconomic status Whites, low socioeconomic status African Americans, higher socioeconomic status Whites, or higher socioeconomic status African Americans. Ages ranged from 30 to 64 years old, years of education 1 to 21, and 747 women participated while only 598 men did so. The data supported the hypothesis, finding that, "literacy appears to be a stronger predictor of cognitive functioning than education regardless of SES in African Americans" (Dotson, Kitner-Triolo, Evans, & Zonderman, 2009). Low socioeconomic status Whites reported the same results as African Americans, but high socioeconomic status Whites varied, sometimes following the trend, but other times reporting literacy and years of education as significant factors towards cognitive development.

Socioeconomic status and performance are readily researched, but school size is not often also considered. School size is not found in research as regularly due to methodological problems and the assumption that school size is not directly related to school quality (Slate & Jones, n.d.). In 2006 Trevor Cobbold studied the way these three factors relate to one another. He found that socioeconomic status is the governing factor as to whether or not school size affects performance. He wrote, "Small school size is unambiguously good for students from low SES backgrounds and communities with relatively high levels of disadvantage. Large schools do academic harm to students from low SES backgrounds" (Cobbold, 2006; Eggleton, n.d.). In Cobbold's study, the students were affected by their lower socioeconomic status, but if lower income or disadvantaged areas had smaller schools then their students are more likely to succeed.

Student Attitudes: Confidence and Socioeconomic Status

According to Kathleen Manzo, teachers should motivate students that do not receive necessary support from home; furthermore, this motivation is most easily incorporated into elementary classrooms because by middle and high school, students have more solidified attitudes (Manzo, 2008). A lack of motivation could mean an apathetic attitude or a lack of self-confidence in school. These attitudes could spring from home due to a number of reasons such as stress caused by finances. Lower socioeconomic status homes generally have more stress placed on the family as a whole. The National Center for Education Statistics states that, "In 2007, the high school dropout rate among persons 16- 24 years old was highest in low-income families (16.7%) as compared to high-income families (3.2%) (National Center for Education Statistics, 2008). This statistic supports Manzo's argument that by high school, students have their

minds made up concerning their goals in education: If students do not have the motivation to continue schooling, they will simply drop out. Motivating students from dropping out to being successful is a significant change, therefore, needing a strong amount of motivation.

Student Attitudes: Motivation

In Patrick Eggleton's article, *Motivation: A Key to Effective Teaching*, he writes, "Since motivation seems to play an important role in teaching, it is important for teachers to become familiar with various aspects of motivation" (Eggleton, n.d.). Teachers can improve students' motivation simply by smiling, giving extra help on an assignment, or by commending a student on a job well done. While these actions are great motivators, the best motivation lies in a teacher's personality towards her students (Eggleton, n.d.). In the article, he writes about Jaime Escalante, an extraordinary teacher. In an interview, Escalante said that, "a teacher has to possess love and knowledge and then has to be able to use this combined passion to be able to accomplish something" (Meek, 1989). According to Escalante, it is important to teach students the knowledge they need to know, but love must also be involved. This theory was evident in an interview with a first grade teacher, Nina Puckett. She stated that although she is strict with her students so that lessons stay on track, sometimes she has to say that she loves them and is here to help. She also stated that some of her students do not receive necessary support or motivation from home, and so she has to fill that gap (Puckett, 2012). Although these studies and interview are qualitative in nature, they still have importance in this quantitative research due to the fact that they suggest motivation has an effect on students' attitudes. According to these studies and Mrs. Puckett's interview, motivation

is an important aspect to include in a classroom; therefore, it supports the theory that students who have a low level of motivation are less likely to succeed.

As mentioned earlier, students must feel a sense of worth; therefore, teachers should not lower standards for certain students, making them feel less capable than other students. According to Vasquez, "Students who perceived that, while teachers would not lower their standards for them, teachers were willing to reach out to them and provide needed assistance in practical ways, were the highest achievers" (1988). If teachers have confidence in lower- achieving students and give them the support and the opportunities to succeed, they likely will. A study conducted in New York took various middle school math classes and combined them into one advanced math course. Students that were low-achievers, high-achievers and a variety of socioeconomic status and racial backgrounds were all placed in an advanced mathematics course (Burris, Heubert, & Levin, 2004). The research found positive results for the students and the writer concluded that, "We must not reserve accelerated courses in math and other subjects only for the most fortunate, but rather make these courses accessible and available to all" (Burris, Heubert, & Levin, 2004). By giving low-achieving students the opportunity to learn at a fast pace, it challenges them and possibly gives them more confidence in their abilities. In accordance with Vasquez, these students in New York were more motivated and scored higher once they knew standards were not being lowered for them.

As previously mentioned, confidence has a major impact on students' abilities in school. In the book, *Research Ideas for the Classroom: Middle Grades Mathematics*, the author discusses the affective domain of learning and how confidence affects performance (Hart & Walker, 1993). The author writes, "There is also evidence of

theoretical or empirical connections between confidence in learning mathematics and students' achievement motivation, intrinsic motivation, self-concept, and self-esteem" (Hart & Walker, 1993). Confidence is important in math because it makes students more sure of themselves when solving nonroutine problems and learning new concepts. It also affects students' enjoyment and interest in math; therefore, getting them more involved in the subject (Hart & Walker, 1993).

Student Achievement and Attitudes

Maria Tinio (2009) conducted a study measuring academic achievement by administering a test called the Academic Engagement Scale for Grade School Students (AES-GS) to 250 sixth and seventh graders in the Philippines. The test was made up of 102 questions, with three categories: behavioral engagement, emotional engagement, and cognitive engagement. The students answered using a Likert scale with options ranging from always to never (Tinio, 2009). Based on her results, Tinio concluded that,

> All three subscales (behavioral, emotional, and cognitive) are necessary to measure academic engagement…It is essential to construct such a scale because it could be an avenue of improving the education of a student. With this, it would also help teachers determine what aspects the student is not able to respond to well (Tinio, 2009).

Normally, levels of academic achievement are based on cognitive abilities; however, Tinio's study takes into account behavioral and emotional as well. All three levels are equally important to implement in a classroom, but schools often focus on the cognitive aspect because of standardized tests or other requirements that must be met. While cognitive, behavioral, and emotional engagement should be present to increase academic

engagement, a factor that Tinio did not study is motivation and its effect on academic success.

In a study from 2009, Brittany Coleman studied the relationship between parental involvement, student motivation, and academic achievement of fifth graders. Student motivation and academic achievement had a positive correlation; therefore, "if a student is motivated to do well in school, then he/she would be more likely to make an effort and therefore achieve higher scores" (Coleman, 2009). This statement is expanded in the textbook, *Teaching and Learning Elementary Social Studies* when the author writes, "A student's most powerful motivation to learn a school subject comes from his or her prior success in that subject" (Ellis, 2010). According to these two researchers, the aspects of motivation and academic achievement are reciprocal. The more one increases, the more the other increases; therefore students who are successful and motivated will continue to be, whereas students who do not succeed are less likely to become motivated to succeed. According to Coleman and Ellis, motivation is a crucial factor in promoting students' academic success and should be implemented into classrooms to increase test scores, which in turn motivates students further.

Kusum Singh, Monique Granville, and Sandra Dika (2002) conducted a study comparing the effect of attitude, motivation, and academic engagement on academic performance among eighth graders in the areas of mathematics and science. They used 25 percent of the National Education Longitudinal Study's student sample from 1988, and analyzed two motivation factors, one academic engagement factor, and one attitude factor. In all cases, their predictions were correct finding that,

> The study of the total effects revealed the important influences of academic time, attitude, and motivation on achievement. Of primary importance is the evidence of the strong effects of motivation, positive attitude, and engagement in academic work for success in mathematics and science (Singh, Granville, & Dika, 2002).

In their study, the researchers found that it is important for students to be actively engaged in their learning for success. They also determined that motivation has a significant impact on academic achievement (Singh, Granville, & Dika, 2002).

Motivation has been found to affect attitudes by causing students to have more positive attitudes and confidence in themselves (Burris, Heubert, & Levin, 2004). According to Ellis, motivation positively affects achievement with the two existing in a cycle so that as one increases the other increases (2010). This study seeks to further examine the effects attitudes and achievement have on one another. The information found would benefit teachers by allowing them to further understand what helps students succeed.

Gender and Mathematics

While there are conflicting views concerning success in mathematics based on gender, females are closing the gap in math scores (Cech, 2012) possibly making it more accepted for females to succeed in mathematics. Although gender is not the primary factor determining students' success in math, it can affect how students are treated in the classroom, as well as their self-confidence.

According to Art Markman in Psychology Today, girls and boys get different reactions from teachers in math from an early age. When boys have difficulty, teachers are more likely to encourage them to keep trying and tell them that math is simply a skill

that must be acquired. Alternatively, when girls have trouble teachers often express how math is difficult and do not necessarily exude confidence in the girls' capacity to understand the problem. As a result of these differing views, girls see math as a talent, which they can only be successful in for a limited amount of time. Boys are more likely to be motivated to understand math concepts because they see it as a skill, which can be understood only through practice (Markman, 2008).

Supporting Markman's stance, Erin Cech writes, "Gender researchers have shown that the root of this girl problem is not differences in innate math skills, but rather the contexts in which students learn math-contexts that give girls less encouragement and less confidence in their math abilities" (2012). Cech expands by saying that many people have the wrong idea believing that gender gaps in math achievement are because of the girls and not because of teachers', parents', and/or peers' influence on the girls. Cech writes about Jo Boaler's philosophy on math education based on studies she did in England. Boaler says educators believe "that math is a rite of passage of sorts, which builds character and perseverance in young people" (Boaler, 2008). If teachers struggled with math as students, then they believe their students should struggle as well. School administrators and teachers are also resistant to changes in how math is taught; however, Boaler found that when boys and girls are able to collaborate with one another in order to learn math, they are all more successful overall. In addition to the opinion that math is a rite of passage, some teachers are uncomfortable using unfamiliar teaching techniques because they have anxiety in math (Boaler, 2008).

A 2010 study was done in which first and second grade students were given surveys determining their self-confidence and perspective of gender in math success.

Their elementary teachers were given math anxiety tests to determine their comfort with the subject. Researchers found that girls who had teachers with math anxiety also suffered from math anxiety. These girls were more likely to report that boys are successful in math and girls are successful in reading, due to teachers not instilling confidence in the girls. The students' attitudes not only affected their perception, but also their performance. The more stereotyped opinion girls had concerning math, the poorer they scored on assessments. While the researchers did not observe the teachers in the classroom, they speculated that only girls were affected by the teachers' math anxiety due to the fact that ninety percent of elementary school teachers are female; therefore, girls were more likely to relate to the teachers whereas boys more independently formed their perceptions (Cox, 2010).

CHAPTER III

METHODOLOGY

The purpose of this study is to examine the correlation between fifth grade students' attitudes towards mathematics and their achievement in the subject.

Research Design

Pursuant to the purpose of this study, the researcher implemented a survey design to collect the necessary data. The study seeks to investigate the relationship between student attitude and achievement in mathematics. It does not seek to influence or manipulate either variable. Therefore, an experimental design of any kind would have been inappropriate. The variables investigated include student attitude and student achievement. Because this is a correlational study, not an experimental one, the variables themselves are neither independent nor dependent.

Instrumentation

Because a single instrument appropriate for this study could not be located, the researcher devised an instrument combining two different ones. The quantitative data needed to investigate this study's research question was collected using this created instrument. The form of the created instrument is a questionnaire. According to Suphat Sukamolson, "Quantitative research is the numerical representation and manipulation of observations for the purpose of describing and explaining the phenomena that those observations reflect" (Sukamolson, n.d.). The first part of the constructed questionnaire consists of the Aiken Revised Math Attitude Scale. It consists of 20 questions with 5 possible answers for each using a Likert scale (Appendix A). The answers range from "Strongly Agree" to "Strongly Disagree." This survey has been revised, but the original

and new versions have been used in multiple studies to measure students' attitudes towards mathematics. The instrument measures four traits: extroversion, self-control, intellectual efficiency, and conscientiousness. Three of the traits are clusters, but intellectual efficiency is considered a theme because it is embedded in two of the clusters. This theme involves the effective performance of mind and the way the mind works. Students who answer questions favoring extroversion are more likely to participate in class and ask questions. Their extroverted nature makes these students outgoing. Self-control means restraining or having control over one's emotions and actions. Finally, conscientiousness means that the student is thorough and guided by one's sense of right and wrong. Various questions pertained to the different traits. The study was given to fifth grade students at one school. All students received the same survey and were given sufficient time to complete it.

The second part of the constructed questionnaire consists of a math assessment from EasyCBM (EasyCBM, 2011). It was used to collect data related to student achievement in mathematics. It is strictly multiple-choice, and there are a total of 48 questions. The assessment is designed for fifth graders and includes problems from geometry, number operations, and algebra. There is also a training test that each class' teacher was asked to complete so that they are officially trained to administer the test. In order to maintain anonymity, each student was assigned a number so that scores between the two can be correlated. Their classroom teachers assigned the numbers so that only they knew the results for specific students.

Participants

The research participants were fifth graders at a school in the southern part of Mississippi. There were a total of 266 participants. The only demographic information that was collected directly from participants is gender. Other demographic information was provided by the site at the school level only—not for individual participants. The socioeconomic status of the school was taken into account when analyzing results. There was no compensation for the students who participated so that their answers were not influenced by a reward; furthermore, participation was voluntary. Teachers signed consent forms granting their classes permission to participate, but students could elect not to participate. (Appendix B).

The school is located in a suburb and is considered midsize. There are a total of 404 students in the sole grade, fifth. The school is a Title I School, but does not have a Title I school-wide program. Out of the 404 students, 106 are eligible for free lunch and 42 for reduced-price lunch, making 26 percent of the population eligible for free and 10 percent eligible for reduced-price. Enrollment by gender is near equal with 208 males and 196 females (School Directory Information, 2011).

Procedures

The constructed questionnaire was administered in May 2012 so that the students had nearly finished their current year of schooling. Once permission was granted from teachers and the necessary online preparation was completed in order to administer the assessment, the questionnaires were given to the teachers for distribution. The researcher was not present during the actual administration of the questionnaire so that the students did not feel any unnecessary pressure. There was an administrative protocol for the

classroom teachers to read to the class before the questionnaire was disseminated. This protocol assured that administration procedures remained consistent across classrooms. The protocol document contained information for the students such as participation in this study would not affect their grades in school and was completely voluntary. In addition, the protocol contained specific directions for teachers on how to proceed with the administration of the questionnaire. For instance, before students began part one of the questionnaire, how to respond to questions using a Likert scale was explained. Also, because part one of the questionnaire is meant to measure attitudes and not reading comprehension, teachers were required to read each of the statements in part one. After the directions were read for part two of the questionnaire, students were allowed to work through the math problems at their own pace until they completed the document. The results of the questionnaire were made available to the school for the purpose of improving their teaching methods.

Data Analysis

The second part of the questionnaire was scored according to an answer key provided by the makers of the assessment. A retired elementary school teacher scored the questionnaires as an unbiased third party who was not related to or acquainted with the participants. After scores were determined, all data was coded and entered into SPSS by one of the researcher's advisers to avoid bias, and statistical analyses were conducted. A Pearson correlation was conducted to determine the type and strength of relationship present between attitude and achievement in the sampled population. A multiple regression was run to determine which cluster or theme had the greatest impact on

achievement. Finally, a t-test was conducted to conclude if gender affects attitude or achievement.

According to *Discovering Statistics Using SPSS*, it is important to collect a significant amount of data to create a reliable regression model. The second question was analyzed using a multiple regression model, and there was a sufficient amount of data for it to be a reliable model. There should be 10 to 15 cases of data for each predictor of the model. Four predictors were present in this model; therefore, there should be between 40 and 60 cases. Total responses equaled 266 students. Green (1991) has two rules for the minimum acceptable sample size, the first dealing with the overall fit of the regression model. He suggests that a minimum sample size of $50 + 8k$, with k being the number of predictors. When four predictors are placed into the equation it gives a minimum sample size of 82. Green suggests using the equation $104 + k$ to determine the minimum sample size when individual predictors are examined. When four is placed in as k, the number of predictors, the result is 109 participants. With an actual sample size of 266 participants, both of Green's requirements are satisfied (Green 1991).

Limitations

This questionnaire was only given to fifth graders at one school in the southern part of Mississippi. The results should not be generalized to all student populations because the geographic area and age of the students was limited; however, the research provides insight into the attitudes of students, and teachers could benefit from the findings. The researcher, due to limited time, placed these restrictions on the study. The school was also limited on time due to state standardized testing taking place and end of the year exams. In all, there were 266 responses analyzed.

CHAPTER IV

RESULTS

In this study, the researcher seeks to examine the correlation between attitudes toward and achievement in mathematics among fifth grade students. These students were given a questionnaire, which included a test from EasyCBM and Lewis Aiken's Revised Math Attitude Scale. The results were scored and analyzed using the Statistical Package for the Social Sciences (SPSS) computer program. The first question studied was, "Is there a relationship between attitudes toward and achievement in mathematics among fifth grade students?" The predictor measured on an interval scale was attitude. The criterion measured on an interval scale was achievement. The appropriate statistical analysis, a Pearson correlation, was conducted (Leeper, 2000). See Table 1.1.

Table 1.1

Correlation Between Attitudes Toward and Achievement in Math

		Attitude	Achievement
Attitude	Pearson Correlation	1	.276**
	Sig. (2-tailed)		.000
	N	266	266
Achievement	Pearson Correlation	.276**	1
	Sig. (2-tailed)	.000	
	N	266	266

**. Correlation is significant at the 0.01 level (2-tailed).

The above matrix shows that there was a positive relationship between math attitude and achievement, $r = .276$. The effect size, although small, is still statistically significant at the $.01$ level.

The next question examined was "Which cluster or theme had the greatest impact on achievement?" Lewis Aiken's Revised Math Attitude Scale asks twenty questions, each related to a certain trait. These traits include "extroversion," "conscientiousness," "intellectual efficiency," and "self control" (Aiken, 1974). These four traits serve as predictors measured on an interval scale. Three of predictors are clusters: extroversion, conscientiousness, and self-control. Intellectual efficiency is considered a theme because it is embedded in two of the clusters (Aiken, 1974). Achievement was the criterion measured on an interval scale. The appropriate statistical analysis, multiple regression, was conducted (Leeper, 2000) and summarized in Table 2.1.

Table 2.1

Coefficients[a]

		B	Std. Error	Beta	t	Sig.
1	(Constant)	29.386	1.637		17.949	.000
	Extroversion	.605	.167	.806	3.624	.000
	Conscientiousness	-.005	.163	-.006	-.029	.977
	Intellectual Efficiency	-.182	.264	-.128	-.689	.492
	Self Control	-.474	.175	-.418	-2.713	.007

a. Criterion: Overall Math Achievement

Two clusters were statistically significant. “Extroversion,” with a $.806$ correlation coefficient, had a large, positive effect on achievement while “Self-Control,” with a -.418 correlation coefficient, had a moderately negative impact on achievement. “Conscientiousness,” and “intellectual efficiency” both had negative correlations—though not statistically significant—with achievement with correlation coefficients of $-.006$, and $-.128$ respectively.

The final question studied was “Does gender affect attitude or achievement?” There was one categorical predictor, gender, with two exclusive levels, male and female. Attitude and achievement were the criteria measured on an interval scale. The appropriate statistical analysis, a two independent sample t-test, was conducted (Leeper, 2000). Table 3.1 summarizes the group statistics while Table 3.2 provides the results of the Independent Samples T-Test.

Table 3.1

Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Attitude	Male	91	5.5220	21.36065	2.23920
	Female	96	-2.2604	20.39737	2.08180
Achievement	Male	91	24.8681	4.30815	.45162
	Female	96	24.3958	5.12061	.52262

Table 3.2

Independent Samples Test

	t	df	Sig.	Mean Difference	Std. Error
Attitude	2.549	185	.012	7.78239	3.05365
Achievement	.681	185	.497	.47230	.69390

$p<.05$

Because the significance value for Levene's Test was greater than .05, equal variances were assumed. The above tables show that gender does have a significant impact on attitude, but not on achievement. On average, males had positive attitudes toward math ($M = 5.5220$) and females had negative attitudes towards math ($M = -2.2604$). This difference was significant $t(185) = 2.549$, but it represented a small-sized effect $r = .18$. On average, males and females had similar scores for achievement ($M = 24.8681$ and $M = 24.3958$ respectively). This difference was not significant $t(185) = .681$ and it represented a small-sized effect $r = .05$.

CHAPTER V

DISCUSSION

According to the data there is a correlation between attitude and achievement in mathematics among the fifth grade participants. The school's results were analyzed, and there were a total of 266 responses. These findings are indicative of what is upheld in current literature; therefore, it is important for students to have a positive attitude towards math because their achievement will improve as well.

Teachers, parents, and other mentors should be aware of this correlation so that students feel confident in their math abilities and have a positive outlook on math. Teachers should also be conscious of their attitudes toward math because they can negatively affect the students. Their attitudes can be contagious such as in the case of a female teacher having a negative outlook on math and that feeling spreading to the other females in the class (Cox, 2010). The various findings in this study conclude that math teachers, particularly in elementary school, should be aware of students' attitudes toward math as it could have an effect on their performance. Altering instruction to include more positive and motivating elements could have a positive impact on student achievement and higher self-confidence (Eggleton, n.d.).

In order to avoid bias, a retired elementary school teacher who was not related to or acquainted with the participants graded the students' completed questionnaires. She was not aware of the questions related to the study, so she was in no way swayed to grade with a desired outcome in mind. Once the questionnaires were graded, one of the researcher's advisers entered the data into the SPSS computer program. Again, this measure was done so that no bias from the researcher could influence the results. Once

the results were entered, the researcher analyzed them, and the findings were consistent with the hypothesis.

The first question in the study determined if attitude affects achievement, and this relationship was determined using a Pearson correlation. A Pearson correlation requires that data are interval so that an accurate measure of the relationship between concepts is determined, and this requirement was met. A correlation shows if a relationship exists between concepts, and if that relationship is positive or negative. In this study, the relationship between attitude and achievement had a positive correlation of .276, which indicates that as the predictor increases the criterion increases as well.

The second question considered clusters or themes within the attitude survey having an affect on achievement. The most significant trait affecting achievement was extroversion, most likely because extroverted students are more outgoing and confident. As discussed earlier, confidence has a positive influence on math achievement (Hart & Walker, 1993); therefore, extroverted students who have more confidence in their abilities will score higher, which is supported in the results from table 2.4. The beta coefficient for extroversion is .806, which is a significant positive correlation with achievement. The other traits: conscientiousness, intellectual efficiency, and self-control all had negative correlations with achievement, with self-control being the greatest. According to Samuel Green, there are an appropriate number of participants needed in order for a study to be reliable. Depending on which model was used, this number ranges from 40 to 109 participants for a study with four predictors. With 266 questionnaires analyzed, this study meets the appropriate requirements (Green, 1991).

The final question examined the effect gender has on attitude and achievement. A t-test was used to determine the results. This test is used in situations when there are different participants for two experimental conditions. The two experimental conditions in this case are male and female and they are exclusive because a student can only be classified according to one or the other gender. Thirty percent of the total population did not record their gender on the questionnaire; therefore, gender is a subgroup within the study and only consists of 70 percent of the total population. There were approximately equal numbers of both genders with 91 males and 96 females. According to the results in table 3.1, gender had a significant effect on attitudes, but not achievement. Males had a positive correlation of 5.5220, whereas females had a negative correlation of -2.2604 between attitude and gender. These results show that in general, males in the population have a positive attitude towards math and females have a negative attitude towards math.

Although gender was proven to affect attitudes, it did not affect achievement significantly as both genders scored approximately the same on the math test portion of the questionnaire. These findings conflict with other studies that claim students, particularly females, with negative attitudes score poorly (Cox, 2010). This difference could be attributed to the particular type of negative attitudes these students felt. In the study, Cox writes that females felt that they were not supposed to be good at math and their confidence in the subject was not high. While they did not expect to succeed, perhaps the females in this study's population have confidence in math, but simply do not like it. These feelings of negativity towards oneself rather than towards the subject probably have a greater impact on achievement, as evidenced by the results of Cox's study compared to this study.

While attitude and achievement in math had a significant relationship in this study with a positive correlation of 0.276, attitude is only a portion of what affects students' achievement in math. Other factors affecting their achievement could include their home life or the community students live in. The quality of the teachers, the school, and its resources also affect student success. Teachers have varying levels of training and class sizes are different from school to school as well. The number of days students are absent from school also affects their achievement because they are missing out on learning valuable information. These factors were not considered in this study, and they are not known to have had an influence on this group of students. They are merely considerations as to other influences affecting student achievement in math because they are common factors affecting success in schools (New Insights into School and Classroom Factors Affecting Student Achievement, 2003).

If this study was replicated there should be several procedural adjustments in order to increase sample size and allow the administration of the questionnaire to be more efficient. While there were scripts for teachers to use when administering the test, more in depth training could have been done with the teachers. They were asked to complete an online program in order to better prepare them for administration of the test, but it was never known which teachers completed it and which did not. One way to ensure proper administration of the test would be to have a premade video of the researcher played at the beginning of the questionnaire with directions so that teachers would not veer from the script. The researcher could also be present during administration to ensure it is done properly in each class. In this study, teachers were asked to administer the test so that students would not feel unnecessary stress. Finally, color coded questionnaires would

increase sample size by allowing students to pick a blue or pink packet based on their gender; therefore, all participants' questionnaires could be examined based on gender.

Based on this study, there are several research proposals to explore in the future. While it was determined that attitude does have a strong affect on achievement in math, the academic results of a class whose general attitude is high compared to a class whose general attitude is low have not been compared. Two classrooms could be compared to determine the effect of motivation and positive elements on students' academic success. Test scores could be taken from both classes prior to the start of the study. One teacher could then incorporate motivating elements and have a more positive attitude in class for the remainder of the semester. Another class would be the control group, and both classes would be tested again at the end of the semester. The academic progress made would show how much influence motivation and a positive teacher attitude affects students.

Another potential study would be to confirm or deny the hypothesis that girls are treated differently than boys in math class. Teachers could be surveyed to determine their attitudes toward the two genders and their abilities. Observations could be made in the classes to show how often boys are called on versus girls and what type of feedback various students receive. If a difference in how girls and boys are treated is found, then these actions could show an effect on achievement. A control group could be used so that boys and girls are called on the same amount of times in a class period, and all students receive the same level of positive feedback.

Appendix A

INSTITUTIONAL REVIEW BOARD
118 College Drive #5147 | Hattiesburg, MS 39406-0001
Phone: 601.266.6820 | Fax: 601.266.4377 | www.usm.edu/irb

NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months.

Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: **12050811**
PROJECT TITLE**: The Relationship Between Attitudes and Achievement in Mathematics among Fifth Grade Students**
PROJECT TYPE**: Thesis**
RESEARCHER/S**: Madeleine Michelli**
COLLEGE/DIVISION**: College of Education & Psychology**
DEPARTMENT: **Curriculum, Instruction, & Special Education**
FUNDING AGENCY: **N/A**
IRB COMMITTEE ACTION**: Expedited Review Approval**
PERIOD OF PROJECT APPROVAL: **05/16/2012 to 05/15/2013**

Lawrence A. Hosman, Ph.D.
Institutional Review Board Chair

Appendix B

THE UNIVERSITY OF SOUTHERN MISSISSIPPI
AUTHORIZATION TO PARTICIPATE IN RESEARCH PROJECT

Participant's Name _____

Consent is hereby given to participate in the research project entitled “The Relationship Between Attitudes and Achievement in Mathematics among Fifth Grade Students." All procedures and/or investigations to be followed and their purpose, including any experimental procedures, were explained by the classroom teacher. Information was given about all benefits, risks, inconveniences, or discomforts that might be expected. The opportunity to ask questions regarding the research and procedures was given. Participation in the project is completely voluntary, and participants may withdraw at any time without penalty, prejudice, or loss of benefits. All personal information is strictly confidential, and no names will be disclosed. Any new information that develops during the project will be provided if that information may affect the willingness to continue participation in the project.

Questions concerning the research, at any time during or after the project, should be directed to Maddie Michelli at (228) 547-2138. This project and this consent form have been reviewed by the Institutional Review Board, which ensures that research projects involving human subjects follow federal regulations. Any questions or concerns about rights as a research participant should be directed to the Chair of the Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS 39406-0001, (601) 266-6820.

_____
Signature of participant

_____
Date

_____
Signature of teacher

_____
Date

Appendix C

Instructions and Script for Teachers Administering Questionnaires:

Prior to testing:
If students do not already have an assigned school number, please assign them a number to write on their questionnaire. Once I have graded the documents, I will return with the results, organized according to their number.

Each teacher who will be administering the questionnaire, please fill out a quick test on Easy CBM at www.easycbm.com. If you do not already have an account, please create one by clicking 'Register Now'. Once you are logged in, please click 'Training'. Under 'Group Administered Measures' please complete the Mathematics training and proficiency.

Please have all students who agree to participate sign a consent form. Teachers, also sign consent forms for students granting permission.

During testing:
After passing out questionnaires, please read to students:
"Please record your (assigned number/ school identification number) on the line beside 'participant ID'. Next to your number please record your gender. Remember, do not write your name on the test, only your number".

"We are about to begin the questionnaire. It will not affect your grade and participation is voluntary. Please turn the page so that you are looking at the 'Aiken Revised Math Attitude Scale' page. There are twenty statements and each one has five choices to the side of it. As I read these statements, consider your thoughts on it. Once I read the first statement, mark SD if you strongly disagree with it, D if you disagree with it, U if you are undecided, A if you agree with it, or SA if you strongly agree with it. Please mark only one answer by circling your choice. There is a key at the top of the page for you to reference as you complete the survey. I am going to read each statement; after everyone has marked his or her answer I will move on to the next statement. Please do not work ahead. Only answer after I have read each statement".

Administer first section by reading statements and allowing students time to answer.

After that section is complete please say:

"You may now complete the multiple choice section at your own pace. Please circle the answer that you think is correct. If you have a question, raise your hand and I will come by and help you. I cannot answer the math problems for you, but I can help you understand if it is unclear. When you are finished you may turn it in".

Appendix D

Participant ID: **Aiken Revised Math Attitude Scale**

SD=Strongly Disagree	**D=Disagree**	**U=Undecided**	**A=Agree**	**SA=Strongly Agree**

1.	I am always under a terrible strain in a math class.	SD	D	U	A	SA
2.	I do not like mathematics, and it scares me to have to take it.	SD	D	U	A	SA
3.	Mathematics is very interesting to me, and I enjoy math courses.	SD	D	U	A	SA
4.	Mathematics is fascinating and fun.	SD	D	U	A	SA
5.	Mathematics makes me feel secure, and at the same time it is stimulating.	SD	D	U	A	SA
6.	My mind goes blank, and I am unable to think clearly when working math.	SD	D	U	A	SA
7.	I feel a sense of insecurity when attempting mathematics.	SD	D	U	A	SA
8.	Mathematics makes me feel uncomfortable, restless, irritable, and impatient.	SD	D	U	A	SA
9.	The feeling that I have toward mathematics is a good feeling.	SD	D	U	A	SA
10.	Mathematics makes me feel as though I'm lost in a jungle of numbers and can't find my way out.	SD	D	U	A	SA
11.	Mathematics is something which I enjoy a great deal.	SD	D	U	A	SA
12.	When I hear the word math, I have a feeling of dislike.	SD	D	U	A	SA
13.	I approach math with a feeling of hesitation, resulting from a fear of not being able to do math.	SD	D	U	A	SA
14.	I really like mathematics.	SD	D	U	A	SA
15.	Mathematics is a course in school which I have always enjoyed studying.	SD	D	U	A	SA
16.	It makes me nervous to even think about having to do a math problem.	SD	D	U	A	SA
17.	I have never liked math, and it is my most dreaded subject.	SD	D	U	A	SA
18.	I am happier in a math class than in any other class.	SD	D	U	A	SA
19.	I feel at ease in mathematics, and I like it very much.	SD	D	U	A	SA
20.	I feel a definite positive reaction to mathematics; it's enjoyable.	SD	D	U	A	SA

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