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STUDENTS' MATHEMATICAL BELIEFS AND ATTITUDES AS PREDICTORS TO STUDENTS' MATHEMATICAL ABILITY

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ABSTRACT

This study dealt with the students' mathematical beliefs and attitudes as predictors to students' mathematical ability of New Bataan District. The study's main goal is to determine the impact of mathematical beliefs and attitudes on students' mathematical ability in New Bataan District, using a research design that is quantitative and predictive-correlational with regression analysis and a total of 270 respondents among junior high school students from the district's eight secondary schools. The Mean, Pearson r, and Multiple Regression Analysis were the measurable instruments used in this study. The mathematical beliefs of students were discovered to be a strong predictor of their mathematical abilities in the New Bataan district in terms of teacher's role, relevance, difficulty, and high degree of competence. Furthermore, the results revealed that in terms of confidence, importance, and engagement, students' mathematical attitudes as a predictor of students' mathematical ability in the New Bataan district are quite high. Moreover, the students' mathematical beliefs and students' mathematical ability of New Bataan District have a significant relationship. Also, the students' mathematical attitudes and students' mathematical ability of New Bataan District have a significant relationship. Only teacher's role out of four domains of students' mathematical beliefs predicts students' mathematical ability. No domains of students' mathematical attitudes predicts students' mathematical ability. As a result, the higher a student's mathematical ability, the better his or her mathematical beliefs and attitudes about mathematics are.

KEYWORDS: MAED-Teaching Mathematics, students' mathematical beliefs, students' mathematical attitudes, students' mathematical ability, Philippines

INTRODUCTION

Rationale

Students' mathematical ability has become one of the most difficult problems which caught the attention of the education sector up until this generation. An individual's ability is defined as their ability to accomplish several tasks in a given activity. Students' ability here, however, relates to their mathematical abilities. Mathematical ability is a mental skill that is necessary to perform a variety of

mental tasks, such as thinking, analyzing, and solving arithmetic problems. While students are held responsible for poor performance, the focus is solely on their cognitive or intellectual abilities, when their mathematical abilities have an effect on their mathematics grades (Nizoloman, 2013).

Mathematics may be learned by anyone, yet some students learn and make connections more quickly than others. Everyone has some mathematical talent, but some students have significantly more potential than the majority of people believe. Mathematical abilities in students are frequently overlooked by both the children and his or her teachers. If this talent is not found and supported at the right time, it may be lost forever. Mathematics, like music, is a personality-building activity that changes how a student thinks and sees the world. (Borovik & Gardiner, 2007).

Mathematical learning is influenced by the beliefs and attitudes of the students regarding the subject, in addition to their ability to think and reason. The beliefs and attitudes of students in mathematics have long been a focus of study in mathematics education, both because of their ability to inspire and encourage students, as well as their potential impact on their mathematical thinking and behavior. Being effective in mathematics is linked to students' confidence in completing mathematics subject. Students may not succeed if they lack confidence in their mathematical abilities. Students become more engaged, confident, and connected to their studies when they realize the value of mathematics in everyday life (Attard, 2012).

The researcher did not find studies that talk about how students' mathematical beliefs and attitudes predict students' mathematical ability among the Grade 9 students especially in the local environment, therefore, the urgency to conduct the study. Most of the published studies only involved either mathematical beliefs or mathematical attitudes as the independent variable. Some studies also involved Grade 10, 11, 12, and Engineering students, not students in Grade 9. The purpose of this research is to find out and address which domain in the students' mathematical beliefs and attitudes predicts students' mathematical ability among the Grade 9 students. The outcomes of this study could be used to improve or construct relevant instructions and insights into how mathematics should be done to be learned and taught in a classroom of the twenty-first century.

Research Objectives

The research study's main objective is to determine which domain in mathematical beliefs and mathematical attitude significantly predicts to mathematical ability among the students. Furthermore, the following objectives will be answered by the study:

1. To describe the level of students' mathematical beliefs in terms of:
   a. teacher's role,
   b. competence,
   c. relevance, and
   d. difficulty

2. To describe the level of students' mathematical attitudes in terms of:
   a. confidence,
   b. importance, and
   c. engagement
3. To describe the level of students' mathematical ability in Trigonometry.
4. To determine the significant relationship between:

4.1 mathematical beliefs and mathematical ability; and

4.2 mathematical attitude and mathematical ability among the students

5. To determine which domain in mathematical beliefs predicts to mathematical ability among the students.
6. To determine which domain in mathematical attitude predicts to mathematical ability among the students.

Hypotheses

The following hypotheses were tested at 0.05 level of significance:

1. There is no significant relationship between students' mathematical beliefs and attitudes to students' mathematical ability.
2. Students' mathematical beliefs and attitudes do not significantly predict to students' mathematical ability in Grade 9 level of New Bataan District.
3. There is no domain in mathematical beliefs that significantly predicts to mathematical ability among the students.
4. There is no domain in mathematical attitudes that significantly predicts to mathematical ability among the students.

Review of Related Literature

This chapter discusses the theories, opinions, and concepts of various authors contributing to this study in order to provide a strong frame of reference for the variables being studied.

The first independent variable of this study is mathematical beliefs which is based in terms of teacher's role; competence; relevance; and difficulty (Mantecon, J.D., Andrews, P., Op't Eynde, P., 2007). The second independent variable is mathematical attitudes which is based in terms of confidence, importance, and engagement (Sanchal, A., Sharma, S., 2017). The dependent variable is mathematical ability which is based on certainty level of students in Trigonometry.

Students' Mathematical Beliefs

In mathematics learning and instruction, beliefs play a significant impact. Various researchers link motivation and conception to belief. Kloosterman (2002) argues that belief and effort are inevitably linked. A student's belief refers to any knowledge or idea that influences a student's effort – in this example, their effort to study mathematics. Furthermore, according to Kloosterman (2002), students'

decisions are influenced by their views and personal goals on the one hand. As a result, decisions are inevitably related to beliefs. However, there are situations when personal ambitions and ideals are at odds. The study of mathematics is a good example. Many students say mathematics is uninteresting and that learning it requires a lot of effort, yet they still believe it is vital in their lives. This is a paradox. Mathematics is important for a variety of reasons, including the desire to improve one's job and, to some extent, one's life.

Several math teachers have repeatedly emphasized the importance of beliefs in successful mathematics learning. The following arguments are offered as explanations for these effects: Beliefs may have a significant impact on how children learn and apply mathematics, and therefore they may also be a barrier to successful mathematics learning (Leder & Forgasz, 2003). Students who hold strong negative beliefs about mathematics and its learning are more prone to become passive learners who concentrate on memorization rather than comprehension during the learning process.

According to studies, some pupils place a high priority on memorizing facts, while others associate ability with mathematical success. Understanding and applying learned principles and methods for solving mathematical problems, according to students, is a crucial aspect of becoming a successful mathematics student (Presmeg, 2002).

Solving problems is a scientific procedure that begins with recognizing the problem and ends with evaluating the solution, and it is influenced by a number of factors. One of the most significant of these is beliefs. Problem solving is tough for pupils who feel it should be a quick procedure that they can solve by memorizing rules. Personal factors such as past experiences, as well as beliefs, influence the problem-solving process in this case (Ozturk & Guven, 2016).

The beliefs of learners are another contributor to their learning. The emotional domain includes beliefs, attitudes, and emotions. Beliefs, on the other hand, are predominantly cognitive in nature and thus fall between the domains of cognitive and affective (De Corte, Op't Eynde, & Verschaffel, 2002).

Individuals' opinions regarding knowledge of mathematics can be regarded of as domain-specific epistemic views. Students mistakenly believe that learning mathematics includes recalling the appropriate rule and that applying mathematics entails adhering to the rules. They believe that there is just one correct way for solving an issue, and that this method is employed to achieve the sole correct answer. Many students believe that memorizing facts is the most effective method of learning mathematics. Mathematical beliefs are assumed to have an impact on how pupils participate in mathematical behavior, and thus on their mathematics achievement.

Mathematical beliefs can be investigated using a variety of dimensions. Mathematical beliefs are divided into three categories by De Corte, Verschaffel, and Op't Eynde (2000): beliefs about mathematics, learning mathematics, and problem solving; individual's notions about himself/herself in

relation to mathematics; and beliefs about learning mathematics in a social setting. Researchers have been interested in knowing more about how mathematical beliefs are created, in addition to their dimensions. Previous experiences have a big influence on how one's belief system is formed.

Students' mathematical achievement has been predicted using beliefs about mathematics (House, 2009; Lay, Ng, & Chong, 2015). It's no surprise that factors like achievement in mathematics and connections with parents and instructors influence and influence students' mathematical beliefs. It's becoming a prominent topic in the international research community on mathematics education. Teachers' behavior has been shown to influence educational goals, cognitive capacity, mathematics accomplishment, learning in mathematics, beliefs in mathematics that are motivating, self-efficacy in mathematics, and other traits, according to research.

Beliefs are described in terms of a person's personal cognitions, hypotheses, and conceptions that he or she generates for personal reasons. They have a rational as well as an emotional component. They have an effect on how a person thinks about mathematics.

Students' Mathematical Attitude

A desire to react pleasantly or adversely to a specific attitude object, an idea, an item, a person, or a circumstance, is referred to as an attitude. An individual's attitude has an impact on their behavior choices as well as their responses to difficulties, opportunities, and rewards. According to Zelley,

Marianne, and Elaine (2005), attitudes are broad favorable or poor judgements of someone, somewhere, something, or an event known as the attitude object. The term "attitude" refers to a psychological orientation that develops resulting from someone experiences and has an impact on a way a person perceives events, things, or others, and the way he/she reacts correctly to them, according to numerous definitions. Depending on the situation, you can be pleasant or unpleasant, approve or disapprove, biased or unbiased.

There are three categories of attitudes, according to study. The cognitive, affective, and behavioral components are the three components (Maio & Haddock, 2010). This is what a person thinks or believes about the object of attitude on the cognitive side of attitude. The affective component of attitude refers to the person's emotions or feelings in relation to the attitude object. Seeing a snake, for example, can make a person feel uneasy. There is a desire to react to the attitude object in a particular way as part of the behavioral component. When a person, for example, sees a snake, he or she has the option of fleeing or screaming. As a result, the cognitive, affective, and behavioral aspects of attitude are all interconnected and linked.

Some authors define a positive or negative attitude toward mathematics as simply having a positive or negative attitude toward it, while others define it as a favorable or unfavorable opinion toward it as well as its capability, utility, and convictions. An attitude toward mathematics, according to Zan and

Martino (2007), is simply a good or bad emotional tendency toward mathematics. The predisposition to be afraid of and apprehensive about mathematics is part of one's attitude toward it.

According to studies, parents' educational degrees have an impact on the attitudes of children toward learning in addition to their mathematics achievement scores (Tadese, 2006). As a result, the attitude toward mathematics determines whether or not pupils succeed or fail in mathematics. In addition to their attitude toward mathematics, a lot of factors influence how students learn it.

In addition, because there is no such thing as a one-size-fits-all approach to mathematics instruction, a variety of factors might influence how effectively students learn mathematical ideas in elementary grade level. Mathematics is the most difficult subject for most high school pupils. Because mathematics is a cumulative topic, this is the case. New skills are built on the foundation of previously mastered math skills. If you don't comprehend some arithmetic skills today, you won't be able to grasp a new math ability tomorrow (Andualem, 2006).

Human identity is based on one's attitude. People love, despise, support, oppose, agree, disagree, dispute, persuade, and so on all the time. All of these are evaluative responses to an object. Attitudes are also characterized as mental and emotional tendencies or preferences toward something, someone, an idea or situation. A lot of people utilize self-reporting to evaluate their attitudes and activities (Rosetta et al, 2007). This combination method, according to (Desalegn, 2005), produces results that can be applied to large groups of people while also providing a more detailed view of the process of learning and understanding of the agreement level between personality and observable actions allows for a stronger interpretation of the results.

In truth, students' attitudes toward mathematics education in schools must be addressed as well. This is due to a variety of factors, including the fact that learning is still dull, repetitive, and oriented on the teacher. To truly involve children in the learning process, there isn't much that can be done. The lecture technique, which places a large focus on the teacher, is still used to teach mathematics. Students' views regarding mathematics learning are still largely negative, owing to the fact that many students are unconcerned and uninterested when learning occurs (Vionita & Purboningsih, 2017).

In mathematics education and learning, a student's attitude toward mathematics is extremely important. It affects how well students perform in mathematics. The teaching method, the school's structure, the family, and the students' attitudes toward school all influence students' attitudes toward mathematics. Even though teachers claim that they are teaching mathematics in a realistic and contextual manner, many students are alienated by the way it is commonly taught in the classroom and viewed by students (Barton, 2000; Furinghetti and Pekhonen, 2002). According to studies, pupils who have a good attitude toward mathematics are more likely to succeed in the subject. Attaining a positive attitude toward mathematics at a young age serves as a foundation for further mathematical education.

According to research, the process of forming an attitude is based on personal experience. People develop attitudes as a result of their life experiences. Classical conditioning, operant conditioning, and observational learning are three key learning theories used in social psychology to explain how attitudes are developed. Ivan Pavlov defined classic conditioning as "a strategy of modifying behavior in which a conditioned response is generated by repeatedly pairing a conditioned stimulus with an unconditioned stimulus" (Ntim, 2010; Lineros & Hinojosa, 2012). Neutral stimuli that naturally generate a response are used in classical conditioning. For example, children become fans of their fathers' football teams. They've been raised to believe that among all the clubs football clubs are the best in the world, and they all share that belief. As a result, we develop attitudes based on how our experiences have conditioned us.

B.F. Skinner established the Operant Conditioning theory. Skinner learning is a type of learning in which a response is elicited in anticipation of a stimuli. In operant training, reinforcement makes it more likely of a behavior being repeated (Ntim, 2010). Positive consequences reinforce positive behaviors and attitudes, which are more likely to be repeated than negative consequences reinforce negative behaviors and attitudes (Moris & Maisto, 2001). Reinforcement and punishment are both used in operant conditioning. When a mother smiles at her child when she picks something up for her, the child learns that helping others is pleasurable and will be more willing to do so in the future. When a mother yells at her child for blowing on a cigarette, the child is more likely to have a bad attitude toward smoking and, more significantly, other smokers. This is because her actions have a negative outcome.

Finally, people learn attitude from watching others, especially those they like, respect, or hold in high regard. As a result, children always learn a lot from their parents' and teachers' attitudes. Albert Bandura's observational learning theory states that one learns a behavior by seeing another or the model who executes it (Yara, 2009). The learner observes and strives to emulate the behavior that is displayed by the model. Invariably, teachers serve as role models for children, and their acts are easily emulated.

Students' Mathematical Ability

Psychologists, pedagogues, mathematicians, methodologists, and others investigate mathematical abilities from a variety of angles. In the teaching and learning process in mathematics, the NCTM lists six mathematical abilities: problem solving, reasoning and evidence, communication, connections, and representation. Furthermore, according to the National Council of Teachers of Mathematics (NCTM), the capacity to relate mathematical concepts is crucial to their comprehension. This standard has two parts, one for pre-kindergarten and the other for grade 12. To begin with, it aids in the integration of mathematical concepts within and between them. To create a web of related ideas, students learn to discover links between mathematical concepts.

Second, the standard is concerned with the interplay between the real world and other fields of study. As a result, students will comprehend the importance of mathematics in science, art, and social studies.

In a word, it proposes combining mathematics with other subjects and investigating real-world applications. By making the connection, previously learned mathematics topics can serve as a solid basis for understanding a new subject (Ndiung & Nendi, 2018).

When it comes to mathematical aptitude, children must be taught to think rationally while also practicing numerical problems; however, they must practice a problem and then repeat the process until it is engraved in their memory (Pearse & Walton, 2011).

A student's capacity to solve a mathematical problem can be characterized as the ability of a student to comprehend the challenges they are faced with, devise solutions, implement those solutions, and re-examine the problems they are faced with in order to find new ways to solve them (Kuzle, 2013).

Despite the fact that mathematics is an important topic in regular schooling and is inevitably linked to human existence, mathematics are uninterested in it. The ability of Indonesian students to answer mathematical issues is still lacking (Nidya et al., 2015). According to Simamora et al. (2017), the findings of teacher interviews indicated that students found problem solving in mathematics to be extremely challenging. Many students disliked mathematics because it was too tough for them to grasp. According to the findings of the school's interviews with teachers, the majority of children were not interested in arithmetic. One of the most significant aspects of higher order thinking is the ability to solve problems. The inability to answer mathematical problems is a critical issue that must be addressed.

Theoretical Framework

The theoretical framework behind this research study is based on the study by Eleftherios & Theodosios (2007), who believe that attitudes and beliefs have an impact on mathematical performance and abilities. He discussed the belief and attitude pattern of high school students toward mathematics, in addition to how these beliefs and attitudes influence mathematical ability and proof comprehension. Difficulty in mathematics is linked to a lack of conviction in the use of mathematics and proofs, in addition to a dislike for mathematics and a lack of mathematical talent. High performance and mathematical skill are linked to a love of mathematics.

Another supplemental theory that supports this study is of Yoseph's (1997), which states that concerns of the students about mathematics can have a considerable effect on their ability to study and comprehend the subject, as well as their beliefs and attitudes about their own mathematical competency. Students with a positive attitude toward mathematics are more likely to excel in the subject. Attaining a positive attitude toward mathematics at a young age serves as a foundation for further mathematical education.

Furthermore, Mc Leod (1992) categorizes beliefs into four groups: Beliefs about mathematics, oneself, mathematics teaching, and the circumstances in which mathematics is taught. Personal cognitions,

hypotheses, and conceptions are defined as a personal perceptions of individuals, hypotheses, and conceptions formed for personal reasons. Their personalities are both smart and passionate. They have an effect on how a person thinks about mathematics.

Attitudes are another key factor that influences students' mathematical competence in mathematics. According to Mc Leod (1992), attitudes are people's somewhat intense yet stable reactions to negative or positive emotions. A "repeated emotional reaction to mathematics" or "the assignment of an already existing attitude to a new but related task," he accepts, "may result in the automatization of an already existing emotional reaction to mathematics." Because beliefs are more cognitive than attitudes, Mc Leod claims that they are characterized by lower reaction intensity and higher stability in responses.

Conceptual Framework

Figure 1 shows the conceptual paradigm of the study. The first independent variable of this study is mathematical beliefs (Mantecon, J.D., Andrews, P., Op't Eynde, P., 2007), with the following indicators: teacher's role, competence, relevance, and difficulty. Teacher's role refers to in this study as the responsibility of a teacher as a facilitator of learning; competence refers to in this study as to someone's perceptions about someone's own mathematical abilities; relevance refers to in this study as the relevance of mathematics to someone's life; while difficulty refers to in this study as to student's perceptions of mathematics as a difficult and rote-learned topic.

The second independent variable, mathematical attitudes (Sanchal, A., Sharma, S., 2017) has the following indicators: confidence, importance, and engagement. Confidence refers to in this study as mathematical understanding, concerns, and satisfaction while learning mathematics; importance refers to in this study as to the perceptions of the students about mathematics as a worthwhile, necessary, and significant topic in their daily lives; and engagement in this study refers to dislike, like and enjoyment while learning mathematics.

The dependent variable, mathematical ability is a standardized test that has 50 questions all about Trigonometry.

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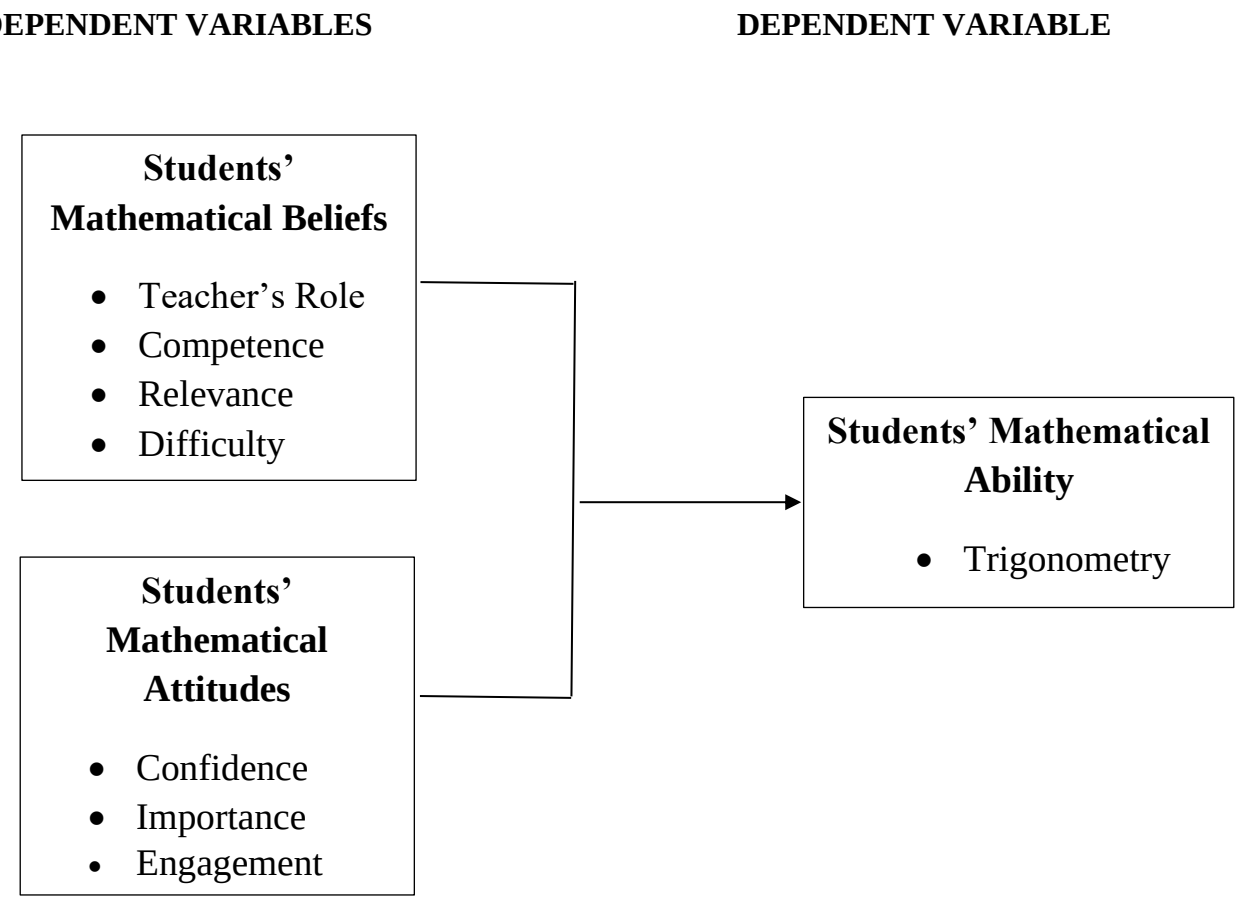

Figure 1. The Conceptual Model of the Study

Significance of the Study

Students' mathematical beliefs and attitudes can seriously impair a person's capacity to obtain the mathematical ability necessary for the 21st century class environment. Investigating the students' mathematical beliefs and attitudes towards students' mathematical ability is important for two reasons. First, this study will provide important information to mathematics teachers concerning students' beliefs and attitudes toward mathematics. Second, mathematics teachers will have a better understanding of how to improve their students' mathematical abilities.

Definition of Terms

Beliefs. It is defined in this study as the personal cognitions, theories and conceptions about the mathematics subjects of the students.

Attitude. It is defined in this study as the reactions to negative or positive emotions about the mathematics subjects of the students.

Ability. It is defined in this study as an ability that is required to accomplish a number of mental tasks, such as thinking, analyzing, and solving problems in mathematics.

CHAPTER 2

METHOD

The methodology utilized in this quantitative study is discussed in this chapter. The research design, research subject, research instrument, data gathering procedure, and statistical treatment of the data are all included.

Research Design

This is a quantitative predictive-correlational research strategy that employs the causal-effect method to characterize the possibility of a relationship between two variables, in addition to the direction and degree of that relationship if one exists. When the purpose of the study was to investigate the reasons of a specific phenomena, the descriptive correlation method was deemed appropriate. Correlational study aims to establish correlations between two or more variables in the same population and assess the statistical link between them without attempting to control minor variables. A correlational study seeks to determine if two or more variables are connected. According to Creswell (2002), correlation is a statistical test used to find patterns in two or more variables.

This descriptive study dealt with quantitative data about the said phenomenon. For the quantitative part, there must be a set time frame for gathering data that will allow the intended respondents to answer the questions. The process of gathering the data will be based on the use of questionnaires. The purpose of this research was to discover about New Bataan District of Division of Davao de Oro students' mathematical beliefs and attitudes towards their mathematical abilities.

Research Locale

The outcomes of the research are specifically relevant to the context of the private and public high schools of New Bataan, Davao de Oro. The scope and sample of the study limited the findings' general application to the general public. Accordingly, while there could be common features, the results may not have an overall applicability to another structures.

Figure 2 shows a map of the Philippines with a focus on the municipality of New Bataan in the Davao de Oro province. The respondents' neighborhood map, which shows where private and public high schools are located in New Bataan, is also shown in the figure.

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Figure 2. Map of the Philippines highlighting New Bataan in Davao de Oro

In the Philippines' Davao de Oro province, New Bataan is a first-class municipality. It has a population of 47,726 people. Compostela is 16 kilometers (9.9 miles) away, Nabunturan, the provincial capital, is 40 kilometers (25 miles) away, and Tagum City is 75 kilometers (47 miles) away. Republic Act No.

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4756 established the municipality on June 18, 1968. It is bordered by mountain ranges, and forest covers more than half of its land area, providing income for certain residents. The most forested barangays in New Bataan are Andap, Tandawan, Camanlangan, and Manurigao. Because to the lack of better roads and transportation, Manurigao is the most isolated of the barangays.

Population and Sample

Because all of the public high schools in New Bataan District were chosen by chance or random numbers, random sampling was utilized to choose the 270 respondents. Every sample of the population has an equal probability of getting chosen. The subjects of the study are all the Grade 9 - students of the school. Table 1 shows the study's respondents, who are Grade 9 – students for the school year 2021-2022. If the respondents feel intimidated during the survey, they can withdraw at any time. Learners who are not Grade 9 student of the eight schools of New Bataan District, learners who are mentally unstable, and learners who refuse to engage in the study will be excluded from the study.

Distribution of Respondents

School	Respondents
A	110
B	28
C	10
D	52
E	10
F	10
G	11
H	38
Total	270

Research Instrument

To fit the study's context, the researcher employed an adopted questionnaire for the independent variables and a standardized test for the dependent variable. The information gathered during the discussion was compared to the literature in order to assist in the development of the questionnaire, which will be validated by an internal and external panel of validators. A questionnaire containing demographic information about the students, as well as two sets of questionnaires for the independent variables and a standardized examination for the dependent variable, will be sent to the respondents.

The first set of questionnaires dealt with the students' mathematical beliefs with indicators of teacher's role, competence, relevance, and difficulty. The instrument to be used in this study will be adopted and modified from Mantecon, J.D., Andrews, P., Op't Eynde, P. (2007) entitled "Refining the Mathematics-Related Beliefs Questionnaire (MRBQ)".

The original questionnaire was modified to match the needs of the classroom. The items were simplified or paraphrased from the original items to help the participants comprehend them better. A panel of specialists reviewed and approved the content. It was also put through a validity and reliability test. Participants were asked to rate the level of mathematical beliefs of the students. For each item, a five-point Likert Scale with (5) Very High, (4) High, (3) Moderate, (2) Low, and (1) Very Low was used.

While analyzing the level of students' mathematical beliefs, the five orderable gradations were analyzed, along with their respective range of means and descriptions.

Range of Means	**Descriptive Equivalent**	**Interpretation**
4.20 – 5.00	Very High	This indicates that mathematical beliefs were very much felt among the students.
3.40 – 4.19	High	This indicates that mathematical beliefs were much felt among the students.
2.60 – 3.39	Moderate	This indicates that mathematical beliefs were moderately felt among the students.
1.80 – 2.59	Low	This indicates that mathematical beliefs were less felt among the students.
1.00 – 1.79	Very Low	This indicates that mathematical beliefs were not felt among the students.

The second set of the instrument embarks with mathematical attitudes among the students. It is composed of three indicators namely: confidence, importance, and engagement. The questionnaire for this variable will be adopted from a 44-item Students' Attitudes Towards Learning Mathematics: Impact of Teaching in a Sporting Context developed by Sanchal, A., Sharma, S. (2017).

The adopted questionnaire was further modified and simplified in order to perfectly fit the study. The content was approved by a panel of experts. It was also put through a reliability and validity test.

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Participants were asked to rate the level of mathematical attitudes of the students. For each item, a five-point Likert Scale with (5) Very High, (4) High, (3) Moderate, (2) Low, and (1) Very Low was used.

While analyzing the level of students' mathematical attitudes, the five orderable gradations were analyzed, along with their respective range of means and descriptions.

Range of Means	Descriptive Equivalent	Interpretation
4.20 – 5.00	Very High	This indicates that mathematical attitudes were very much felt among the students.
3.40 – 4.19	High	This indicates that mathematical attitudes were much felt among the students.
2.60 – 3.39	Moderate	This indicates that mathematical attitudes were moderately felt among the students.
1.80 – 2.59	Low	This indicates that mathematical attitudes were less felt among the students.
1.00 – 1.79	Very Low	This indicates that mathematical attitudes were not felt among the students.

The third set of the instrument deals with the mathematical abilities of the students. The questionnaire used in this study was a standardized test.

In order to suit the study's context, the standardized test was modified. The content was approved by a panel of experts. It was also put through a reliability and validity test. The respondents were asked to answer the problem for each item.

In evaluating the level of students' mathematical ability, the following parameter of limits was as follows.

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Range of Scores	Descriptive Equivalent	Interpretation
24 - 30	Very High	This indicates that mathematical ability is excellent.
18 - 23	High	This indicates that mathematical ability is very satisfactory.
12 - 17	Moderate	This indicates that mathematical ability is satisfactory.
6 – 11	Low	This indicates that mathematical ability is moderate.
0 – 5	Very Low	This indicates that mathematical ability is poor.

Remarkably, the instruments used in this study were validated by experts.

Data Collection

In order to acquire important data for the productivity of this research, the researcher was able to do the following methods.

Firstly, the researcher obtained consent from the Graduate School program head and their suggestion to recommend the study. The Superintendent of Public Schools and the concerned School Administrators were all asked to sign a letter to conduct the study.

Further, prior to distributing the survey questionnaires, the researcher sought validation from qualified internal and external evaluators. The researcher's manuscript was then examined by the University of Mindanao Ethics Review Center. It was then put through a pilot test to ensure its credibility.

Then, the questionnaires were handed out to the respondents via google forms, if and only if the students have an internet connection. For those who does not have, questionnaires were handed out to the advisers and given to students upon distributing modules. Schools followed a weekly release and retrieval of modules.

Finally, after the researcher retrieved the answered questionnaires, she immediately proceeded to the tallying and tabulating of collected data subjected to statistical analysis. After that, the data was evaluated and interpreted. Based on the findings, judgments and suggestions were made based on the data of the study.

Statistical Tools

The statistical tools listed below were used to analyze the responses to the questions at the 0.05 level of significance in this study. The responses to the questionnaire items were tailed, tabulated, and interpreted as needed. For data analysis and interpretation, the statistical tools listed below were used:

Mean. This statistical tool was utilized to determine how the level of mathematical beliefs, level of mathematical attitudes, and level of mathematical ability affected the students.

Pearson-r. The significant relationship between mathematical beliefs and mathematical ability, as well as the significant relationship between mathematical attitude and mathematical ability among the students, was determined using this statistical tool.

Multiple Regression Analysis. This statistical tool was used to determine if students' mathematical beliefs and attitudes predict their mathematical abilities.

Ethical Consideration

This quantitative study is affected by a number of ethical considerations and difficulties. Such problems and concerns could be caused solely by the study's approach. This study must handle ethical problems such as the right to conduct the study, as well as confidentiality and anonymity.

The researcher observed and thoroughly kept an eye on the complete ethical standards in conducting the research following the evaluations of the study protocol and standardized criteria, in particular, the population and data management such as, but not restricted to:

Voluntary participations. The Grade 9 students of the public high schools who are enrolled in the current school year 2021-2022 and are willing to participate in the study are given the freedom to participate without consequences, penalties, or loss of benefits. They will be described and presented to the participating schools after they have been informed of the study's purpose and advantages. The participants' rights to contribute to all knowledge will thereafter be carefully observed and agreed upon. Students who are not in Grade 9 at a public high school, who are mentally ill, and who refuse to engage in the study are excluded from the study. If a respondent decides not to participate in the study, he can withdraw at any time by not filling out the consent form provided by the researcher, or he can withdraw his consent at any time and stop participating without consequence. He waives no legal claims, rights, or remedies as a result of his involvement in this research study.

Privacy and confidentiality. The researcher personally administered the questionnaires to the advisers of Grade 9 level of public high schools. For clarity and to be transmitted to the students, the researcher presented the study's goal to the advisers and distributed it during the module release/retrieval. The questionnaires were retrieved after the students answered all the questions and

returned it during the module releasing/retrieval. The results were tallied and treated using statistical tools after the questionnaires were retrieved. After the calculations, the data analysis and interpretations were presented. The findings served as the foundation for the study's conclusions and recommendations. The researcher followed the Data Privacy Act in which the researcher secured the personal information of the respondents that could be bidden in the private study and with the maximum discretion.

Informed consent process. The research questionnaires did not comprise technical terminologies that would thwart in the facilitating of the conception of the respondents. It provides them with a clearer picture of the benefits they can expect as a result of the school principal's actions.

Recruitment. The distribution of respondents showed how respondents were dispersed. Additionally, the data collection measures were specified, as well as the way in which the questionnaire was managed and the form of the respondents implicated in this study.

Risks. To help the researcher gains the participants' willingness to participate, the researcher did the following: showed to the participants that the researcher acted in good faith and would only focused on the point of view of the participants, setting aside the researcher personal beliefs and; the researcher kept all the things that would be used during the course of the research. There were no high-risk situations in this study that the participants could face in terms of medical, psychological, or socioeconomic problems. The researcher and respondents adhered to the The Inter-Agency Task Force for the Management of Emerging Infectious Diseases (IATF) protocols. There is a guarantee of safety from the local authorities in the area. The researcher also asked the resident guidance counsellor to provide a briefing and debriefing to the students.

Benefits. The result of this study benefits the secondary schools and Grade 9 students of New Bataan District in terms of acquiring information about mathematical beliefs, mathematical attitude, and mathematical ability. The Grade 9 students who participated in the study received a certificate as a token for participating in the study.

Plagiarism. The study contains no hint or indication of untruthful claims of a different person's work as one's own possession. The study is based on researcher's own work, personal study and/or research and that the researcher also have acknowledged all material and sources used in its preparation, whether it's books, papers, reports, lecture notes, or any other type of content, whether it's electronic or personal contact. The study was subjected to a plagiarism checker, such as Grammarly or Turnitin.

Fabrication. The study has no hint or indication of deliberate untruthful statements of what has been done, without composing the data results or offering conclusions that are not precise. There is no deliberate misrepresentation of research findings, and the data presented was collected and verified. The data was not modified or misrepresented to achieve a particular result. Falsification. This study

has no hint or indication of deliberate falsification of the work to adapt to a theoretical model of expectation and has no sign of excessive assertions or overstatements. The researcher did not purposefully mislead or misrepresent something, nor did she manipulate study supplies, equipment, or processes, nor did she change or omit data or results.

Conflict of Interest (COI). The researcher is a professional teacher with a position as Teacher I in School A where conflict of interest may arise. However, it did not affect the researcher's professional judgment on the primary interest, such as the safety of the participants or the validity of the inquiry. The researcher did not tend to be prejudiced by a secondary interest, such as monetary or academic retributions or awards.

Deceit. The study does not comprise a trace of misleading contents that would lead the respondents to probable damage. It does not contain any deliberate misdirection of volunteers or the withholding of complete information regarding the experiment's nature. The researcher did not mislead or omit information about the purpose of the study, the researcher's role, or any procedures of the study.

Permission from Organization/Location. A letter was addressed to the Division Superintendent of the Division of Davao de Oro requesting permission for the researcher to perform the study in New Bataan District public high schools. A letter was also sent to the Principal/School Head of the public high schools of New Bataan District prior to the conduct of the study to allow the Grade 9 students to be the participants of this study. The letter contained the permission in conducting the study. As soon as the letter was approved, the researcher administered the questionnaires.

Authorship. The researcher holds a Bachelor's Degree in Secondary Education with a major on Mathematics. The researcher underwent a number of reviews due to the suggestions given by her adviser. The study also conformed to the University of Mindanao's Ethics Review Committee standards for ethical consideration procedures. Being done with the approval, the study was subjected to pilot tests and the collected data were interpreted for the constancy of the research questionnaire. This study can be presented and published by University of Mindanao (UM) and the researcher. Dr. Rey M. Regidor is the co-author of this study.

CHAPTER 3

RESULTS

Results, analysis, and intervention drawn out from the conduct of the study are introduced in this part. The data presented both tabular and textual forms. All inferential results were analyzed and interpreted at 0.05 level of significance. Chronologically, tables and its interpretations are arranged in the subsequent subheadings: level of students' mathematical beliefs, level of students' mathematical attitudes, level of students' mathematical ability, significance on the relationship between students' mathematical beliefs and students' mathematical ability, significance on the relationship between

students' mathematical attitudes and students' mathematical ability, the regression analysis on the influence of the domain of students' mathematical beliefs to the mathematical ability, and the regression analysis on the influence of the domain of students' mathematical attitudes to the mathematical ability. Level of Students' Mathematical Beliefs

The mean scores for the indicators of students' mathematical beliefs is shown in Table 1, which have an overall mean of 4.34 and are regarded as very high with 0.57 standard deviation. The very high level could be attributed to the very high rating given by the respondents in all indicators in terms of teacher's role, competence, relevance, and difficulty.

The cited total mean score was the outcome acquired from the subsequent computed mean scores from the highest to lowest indicators: 4.40 or very high for teacher's role with a standard deviation of 0.56; 4.40 or very high for relevance with a standard deviation of 0.61; 4.38 or very high for difficulty with a standard deviation of 0.63; and 4.18 or high for competence with its corresponding standard deviation of 0.72.

Table 1.
Level of Students' Mathematical Beliefs

Indicator	Mean	SD	Descriptive Level
Teacher's Role	4.40	0.56	Very High
Competence	4.18	0.72	High
Relevance	4.40	0.61	Very High
Difficulty	4.38	0.63	Very High
Overall	4.34	0.57	Very High

The teacher's role had the greatest mean score of 4.40 with a 0.56 standard deviation, defined as very high. The data shown in appended Table 1.1 bring to light that the respondents have observed the following order of importance: a score of 4.47 for mean and a 0.76 standard deviation, defined as very high for enjoys it when people strive hard even if their outcomes aren't great; a score of 4.44 for mean and a 0.69 standard deviation, defined as very high for they believe that making mistakes is fine as long as they learn from them; a score of 4.44 for mean and a 0.81 standard deviation, defined as very high for showing students how to solve a mathematical problems step by step before giving them tasks; a score of 4.42 for mean and a 0.68 standard deviation, defined as very high for they are quite concerned about how they feel in class; a score of 4.42 for mean and a 0.71 standard deviation, defined as very high for explains why mathematics is important; a score of 4.41 for mean and a 0.73 standard deviation, defined as very high for allowing them to thoroughly investigate new challenges and test various solutions techniques; a score of 4.40 for mean and a 0.73 standard deviation, defined as very high for making mathematics instructions entertaining; a score of 4.37 for mean and a 0.79 standard deviation, defined as very high for understanding the content of this mathematics subject; a score of

4.37 for mean and a 0.80 standard deviation, defined as very high for those who want them to like learning new things; a score of 4.33 for mean and a 0.85 standard deviation, defined as very high for understanding their mathematics problems and challenges; a score of 4.32 for mean and a 0.86 standard deviation, defined as very high for allowing pupils for this mathematics class to conduct a lot of group work.

Similarly, relevance received a score of 4.40 for mean with a 0.61 standard deviation, defined as very high. The data stipulated in appended Table 1.3 unveil the following order of importance observed by the respondents: a score of 4.47 for mean and a 0.70 standard deviation, defined as very high for a subject as important as mathematics; a score of 4.44 for and a 0.75 standard deviation, defined as very high for regular exercises are particularly significant in the learning of mathematics; a score of 4.44 for mean and a 0.77 standard deviation, defined as very high for people use mathematics all the time in their daily lives; a score of 4.43 for mean and a 0.73 standard deviation, defined as very high for anyone can learn mathematics; a score of 4.42 for mean and a 0.69 standard deviation, defined as very high for a useful way to learn mathematics is to discuss multiple solutions to a mathematical problems; a score of 4.42 for mean and a 0.77 standard deviation, defined as very high for attempting to learn the mathematics they are taught; with a score of 4.41 for mean and a 0.71 standard deviation, defined as very high for mathematics is a subject that is both desired and necessary; a score of 4.41 for mean and a 0.74 standard deviation, defined as very high for mathematics has relevance in my life; a score of 4.39 for mean and a 0.67 standard deviation, defined as very high for importance of learning multiple solutions for solving the same problem; a score of 4.39 for mean and a 0.71 standard deviation, defined as very high for it is not a waste of time to study mathematics; a score of 4.37 for mean and a 0.75 standard deviation defined as very high for what they are learning in class is useful to them; a score of 4.37 for mean and a 0.76 standard deviation, defined as very high for they will be able to make a living if they can master mathematics; a score of 4.36 for mean and a 0.79 standard deviation, defined very high for studying mathematics because they recognize its value; a score of 4.34 for mean and a 0.75 standard deviation, defined very high for mathematics allows us to gain a deeper understanding of the world we live in; a score of 4.33 for mean and a 0.76 standard deviation, defined as very high for students can apply mathematics concepts to other subjects; a score of 4.32 for mean and a 0.75 standard deviation, defined as very high for time spent figuring out why something works is time well spent.

With a score of 4.38 for mean and a 0.63 standard deviation, difficulty earned the third greatest mean score, which was classified as very high. The data shown in appended Table 1.4 bring to light that the respondents have observed the following order of importance: a score of 4.47 for mean and a 0.70 standard deviation, defined as very high for their teacher understands everything; a score of 4.43 for mean with a 0.70 standard deviation, defined as very high for in mathematics, you must find the correct answer and understand why it works; a score of 4.42 for mean and a 0.72 standard deviation, defined as very high for everyone must think to complete a mathematics problem; a score of 4.41 for mean and a 0.72 standard deviation, defined as very high for their interest in mathematics is to understand the content and get a good grade; a score of 4.40 for mean and a 0.70 standard deviation, defined as very

high for it is worthwhile to learn mathematics; a score of 4.39 for mean and a 0.79 standard deviation, defined as very high for there are many alternative methods to solve a mathematics problem; a score of 4.38 for mean and a 0.80 standard deviation, defined as very high for all students can comprehend mathematics; a score of 4.37 for mean and a 0.74 standard deviation, defined as very high for mathematics learning will be easier if you have a good memory; a score of 4.36 for mean and a 0.77 standard deviation, defined as very high for their teacher expects them to memorize and grasp the content of this mathematics subject; a score of 4.34 for mean and a 0.76 standard deviation, defined as very high for it is not time wasted when their teacher encourages them to think for themselves, and regular students can comprehend mathematics rather than simply memorizing the principles they are taught; a score of 4.22 for mean and a 0.88 standard deviation, defined as very high for they can solve mathematics problems in a matter of minutes.

Competence had the lowest score of 4.18 for mean with a 0.72 standard deviation, which is considered high. The data presented in appended Table 1.2 unmask that the respondents have observed the following order of importance: a score of 4.40 for mean and a 0.68 standard deviation, defined as very high for they are enjoying what they are learning in the class.; a score of 4.40 for mean and a 0.73 standard deviation, defined as very high for consider what they are discovering in class to be interesting; a score of 4.30 for mean and a 0.77 standard deviation, defined as very high for expecting to perform well on mathematics examinations and assessments; a score of 4.28 for mean and a 0.80 standard deviation, defined as very high for preferring tough class work in order to learn new things; a score of 4.27 for mean and a 0.78 standard deviation, defined as very high for when students have to work hard to find a solution, they prefer mathematics; a score of 4.21 for mean and a 0.86 standard deviation, defined as very high for they are particularly engaged in mathematics; a score of 4.19 for mean and a 0.84 standard deviation, defined as high for believing they will do well in mathematics this year; a score of 4.18 and a 0.83 standard deviation, defined as high for they can usually solve difficult mathematics problems; a score of 4.17 for mean and a 0.90 standard deviation, defined as high for comprehending what they have done in mathematics this year; a score of 4.16 for mean and a 0.85 standard deviation, defined as high for liking mathematics and understanding mathematics; a score of 4.12 for mean and a 0.90 standard deviation, defined as high for they are highly likely to learn how to solve the most challenging mathematical problem; a score of 4.10 for mean and a 0.90 standard deviation, defined as high for being able to understand mathematics easily; a score of 4.06 for mean and a 0.92 standard deviation, defined as high for they can comprehend even the most complex mathematics concepts; a score of 4.06 for mean and a 1.02 standard deviation, defined as high for they believe they are good at mathematics in comparison to their classmates and study hard in mathematics to show the teacher and their peers how good they are; a score of 4.01 for mean and a 1.05 standard deviation, defined as high for trying to show their teacher that they are better at mathematics than other students by doing their best.

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Level of Students' Mathematical Attitudes

The mean scores for the indicators of students' mathematical attitudes is shown in Table 2 with a total mean score of 4.29 whereas described as very high with a 0.62 standard deviation. The very high level could be attributed to the very high rating given by the respondents on most indicators in the items of confidence, importance, and engagement.

The cited total mean score was the outcome acquired from the subsequent computed mean scores from the highest to lowest indicators: 4.31 or very high for engagement with a 0.65 standard deviation; 4.28 or very high for importance with a 0.68 standard deviation; and 4.27 or very high for confidence with a 0.67 standard deviation.

Table 2. Level of Students' Mathematical Attitudes

Indicator	Mean	SD	Descriptive Level
Confidence	4.27	0.67	Very High
Importance	4.28	0.68	Very High
Engagement	4.31	0.65	Very High
Overall	4.29	0.62	Very High

The highest mean score of 4.31 with a 0.65 standard deviation, defined as very high, was gained by engagement. The data indicated from appended Table 2.3 reveal that the respondents have observed the following order of importance: a score of 4.42 for mean and a 0.69 standard deviation, defined as very high for willingness to spend more time than is required in mathematics; a score of 4.40 for mean and a 0.71 standard deviation, defined as very high for like working on the Angle of Elevation/Depression; a score of 4.40 for mean and a 0.73 standard deviation, defined as very high for consider mathematics to be an interesting subject; a score of 4.40 for mean and a 0.75 standard deviation, defined as very high for someone who likes mathematics; a score of 4.35 for mean and a 0.74 standard deviation, defined as very high for those who find the challenge of mathematics appealing; a score of 4.34 for mean and a 0.82 standard deviation, defined as very high for students who enjoy mathematics more than any other subject; a score of 4.33 for mean and a 0.75 standard deviation, defined as very high for like the topic of Special Right Triangle; a score of 4.28 for mean and a 0.83 standard deviation, defined as very high for constantly being pleased in a mathematics class; a score of 4.27 for mean and a 0.85 standard deviation, defined as very high for would rather do a mathematics project than write an essay; a score of 4.26 for mean and a 0.84 standard deviation, defined as very high for believing mathematics is both exciting and challenging; a score of 4.23 for mean and a 0.85 standard deviation, defined as very high for desire to solve new mathematics problems; a score of 4.21 for mean and a 0.82 standard deviation, defined as very high for believing that when they hear the phrase mathematics, they get excited; a score of 4.20 for mean and a 0.84 standard deviation, defined as very high for like working on the Angle of Elevation/Depression.

With a score of 4.28 for mean and a 0.68 standard deviation, importance received the second highest mean score, which was rated as very high. The data shown in appended Table 2.2 bring to light that the respondents have observed the following order of importance: a score of 4.39 for mean and a 0.71 standard deviation, defined as very high for mathematics is a very worthwhile and necessary subject; a score of 4.36 for mean and a 0.74 standard deviation, defied as very high for one of the most important subjects for people to study is mathematics; a score of 4.32 for mean and a 0.79 standard deviation, defined as very high for mathematics is essential in daily life; a score of 4.30 for mean and a 0.77 standard deviation, defined as very high for whatever they choose to do in life, high school math courses would be extremely valuable; a score of 4.29 for mean and a 0.80 standard deviation, defined as very high for mathematics helps individuals solve problems in other areas as well; a score of 4.28 for mean and a 0.86 standard deviation, defined as very high for studying advanced mathematics is beneficial; a score of 4.26 for mean and a 0.82 standard deviation, defined as very high for many ways people use mathematics outside of school, and a strong mathematics education could aid them in their professional lives; a score of 4.24 for mean and a 0.85 standard deviation, defined as very high for students who intend to take as much mathematics as possible during their schooling; a score of 4.14 for mean and a 0.90 standard deviation, defined as very high for understanding the application of Trigonometry in everyday life.

Confidence received the lowest mean score of 4.27 with a 0.67 standard deviation, which is considered very high. The data presented in appended Table 2.1 unmask that the respondents have observed the following order of importance: a score of 4.52 for mean and a 0.67 standard deviation, defined as very high for would like to improve their mathematics skills; a score of 4.45 for mean and a 0.72 standard deviation, defined as very high for getting a lot of pleasure from solving a mathematics problem; a score of 4.41 for mean and a 0.72 standard deviation, defined as very high for believe that mathematics helps to develop the intellect and teaches students to think critically; a score of 4.39 for mean and a 0.80 standard deviation, defined as very high for those who want to study mathematics in college; a score of 4.33 for mean and a 0.80 standard deviation, defined as very high for expect to do well in any mathematics class they take in; a score of 4.30 for mean and a 0.82 standard deviation, defined as very high for in mathematics class, they feel at ease answering questions; a score of 4.29 for mean and a 0.79 standard deviation, defined as very high for suppose mathematics is one of my favorite subjects; a score of 4.27 for mean and a 0.80 standard deviation, defined as very high for studying mathematics makes me feel excited; a score of 4.26 for mean and a 0.83 standard deviation, defined as very high for feeling confident when doing mathematics; a score of 4.25 for mean and a 0.83 standard deviation, defined as very high for the ability to think clearly when working with mathematics; a score of 4.25 for mean and a 0.84 standard deviation, defined as very high for it motivates them to solve mathematics problems and gives them a lot of confidence in their ability to do so; a score of 4.23 for mean and a 0.85 standard deviation, defined as very high for learn mathematics quickly; a score of 4.22 for mean and a 0.86 standard deviation, defined as very high for good at solving Trigonometry problems using formulas; a score of 4.21 for mean and a 0.90 standard deviation, defined as very high for confident in their ability to grasp advanced mathematics; a score of 4.20 for mean and a 0.90 standard deviation,

defined as very high for have a lot of self-confidence when it comes to mathematics; a score of 4.20 for mean and a 0.92 standard deviation, defined as very high for being able to answer tough mathematics problems; a score of 4.18 for mean and a 0.89 standard deviation, defined as high for mathematics does not scare them at all; a score of 4.17 for mean and a 0.88 standard deviation, defined as high for mathematics makes me feel comfortable; a score of 4.17 for mean and a 0.89 standard deviation, defined as high for they are competent at solving mathematics problems; a score of 4.14 for mean and a 0.89 standard deviation, defined as high for a mathematics subject is usually challenging.

Level of Students' Mathematical Ability

The mean and standard deviation for the examination score of students' mathematical abilities are presented in Table 3, with a score of 17.10 for mean and a 5.59 standard deviation, respectively.

Table 3. Level of Students' Mathematical Ability

Indicator	Mean	SD	Descriptive Level
Exam Score	17.10	5.59	Moderate

Significance of the Relationship between Levels of Students' Mathematical Beliefs and Students' Mathematical Ability

Relatively, determining whether the students' mathematical beliefs have significant relationship with the students' mathematical ability is one of the objectives of this study. After that, Pearson r was utilized to govern the correlation between two variables. More so, presented in Table 4 is the analyzed and interpreted results.

The gathered outcomes exposed that all the indicators of students' mathematical beliefs such as teacher's role, competence, relevance, and difficulty are significantly related to students' mathematical ability. The R-value for the teacher's role is 0.322*, shows a positive correlation with a p-value of 0.001 and a coefficient of determination of 0.1037. Next, competence has a positive correlation with an R-value of 0.227*, a p-value of 0.001, and a coefficient of determination of 0.0515. The third indicator, relevance, exhibits a positive correlation with an R-value of 0.279*, a p-value of 0.001 and a coefficient of determination of 0.0778. The last indicator, difficulty, exhibits a positive correlation with an R-value of 0.263*, a p-value of 0.001 and a coefficient of determination of 0.0692.

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Table 4. Significance of the Relationship between Levels of Students' Mathematical Beliefs and Students' Mathematical Ability

Independent Variable	Dependent Variable	r-value	r-squared	p-value	Decision
Teacher's Role	Mathematical Ability	0.322*	0.1037	0.001	H_0 is rejected
Competence		0.227*	0.0515	0.001	H_0 is rejected
Relevance		0.279*	0.0778	0.001	H_0 is rejected
Difficulty		0.263*	0.0692	0.001	H_0 is rejected

*Significant at 0.05 level of significance.

The table above shows that teacher's role has the most significant relationship with the R-value of 0.322*, followed by relevance with 0.279*, next is difficulty with 0.263*, and competence with 0.227*. Thus, the interdependence of the variables shows that teacher's role, competence, relevance, and difficulty have significant relationship to the students' mathematical ability.

Significance of the Relationship between Levels of Students' Mathematical Attitudes and Students' Mathematical Ability

Comparably, determining whether the students' mathematical attitudes have significant relationship with the students' mathematical ability is also one of the objectives of this study. After that, Pearson r was utilized to govern the correlation between two variables. More so, presented in Table 5 is the analyzed and interpreted results.

Another collected outcomes exposed that all the indicators of students' mathematical attitudes such as confidence, importance, and engagement are significantly related to students' mathematical ability. With a p-value of 0.001 and a coefficient of determination of 0.0548, the R-value for confidence is 0.234*, indicating a positive correlation. Next, importance indicates a positive correlation with an R-value of 0.221, a p-value of 0.001 and a coefficient of determination of 0.0488. The last indicator, engagement, exhibits a positive correlation with an R-value of 0.215, a p-value of 0.001, and a coefficient of determination of 0.0462.

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Table 5. Significance of the Relationship between Levels of Students' Mathematical Attitudes and Students' Mathematical Ability

Independent Variable	Dependent Variable	r-value	r-squared	p-value	Decision
Confidence	Mathematical Ability	0.234*	0.0548	0.001	H_0 is rejected
Importance		0.221	0.0488	0.001	H_0 is rejected
Engagement		0.215	0.0462	0.001	H_0 is rejected

*Significant at 0.05 level of significance.

The table above reveals that confidence has the highest R-value of 0.234*, followed by importance at 0.221, and engagement at 0.215. As a result of the interdependence of the variables, it is clear that students' mathematical ability is influenced by confidence, importance, and involvement.

Furthermore, as presented in the table, the first hypothesis, which states that there is no significant relationship between students' mathematical beliefs and attitudes to students' mathematical ability is rejected. In addition, the second hypothesis which states that students' mathematical beliefs and attitudes do not significantly predict to students' mathematical ability in Grade 9 level of New Bataan District is also rejected.

Regression Analysis on the Influence of Students' Mathematical Beliefs and Students' Mathematical Ability

The regression analysis on the influence of students' mathematical beliefs and students' mathematical ability is presented in Table 6. The table shows a computed F-ratio of 8.170 and a p-value of 0.001, indicating that students' mathematical beliefs have a significant influence on students' mathematical ability. The R-value of 0.331 indicates that there is a positive relationship between mathematical beliefs and mathematical ability among the students. The overall R2 is 0.110 indicating that 11% of the level of students' mathematical beliefs is explained by teacher's role, competence, relevance, and difficulty and the remaining percentage is accountable to the other indicators not included in the study.

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Table 6. Regression Analysis on the Influence of Students' Mathematical Beliefs and Students' Mathematical Ability

Independent Variable	Unstandardized Coefficients		Standardized Coefficients Beta	t-value	p-value	Decision
	B	SE				
Constant	1.926	2.690				
Teacher's Role	3.391	1.176	0.338*	2.833	0.004	H_0 is rejected
Competence	-0.935	0.803	-0.120	-1.165	0.245	H_0 is not rejected
Relevance	0.155	1.129	0.017	0.137	0.891	H_0 is not rejected
Difficulty	0.798	0.927	0.089	0.861	0.390	H_0 is not rejected
Dependent Variable			Mathematical Ability			

R = 0.331 R^2 = 0.110
F-ratio = 8.170 P-value = 0.001

Moreover, teacher's role has beta of 0.338* with a p-value of 0.004; competence has a beta of -0.120, a p-value of 0.245; relevance has a beta of 0.017, p-value of 0.891; and difficulty has a beta of 0.089 with a p-value of 0.390. Only the first indicator of the independent variable, teacher's role, has a p-value lesser than 0.05 level of significance. Hence, only teacher's role significantly predicts to mathematical ability among the students. More so, teacher's role is the domain that best influence the mathematical beliefs of the students to mathematical ability.

Regression Analysis on the Influence of Students' Mathematical Attitudes and Students' Mathematical Ability

The regression analysis on the influence of students' mathematical attitudes and students' mathematical ability is presented in Table 7. The computed F-ratio is 5.485, with a p-value of 0.001, indicating that there is a significant relationship between students' mathematical attitudes and students' mathematical abilities. The R-value of 0.241 indicates that there is a positive relationship between mathematical attitudes and mathematical abilities among the students. The overall R2 is 0.058 indicating that 5.8% of the level of students' mathematical attitudes is explained by confidence, importance, and engagement and the remaining percentage is accountable to the other indicators not included in the study.

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Table 7. Regression Analysis on the Influence of Students' Mathematical Attitudes and Students' Mathematical Ability

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	p-value	Decision
	B	SE	Beta			
Constant	7.988	2.319				
Confidence	1.263	1.001	0.151	1.261	0.208	H_0 is not rejected
Importance	0.784	0.888	0.095	0.884	0.378	H_0 is not rejected
Engagement	0.085	1.083	0.010	0.078	0.938	H_0 is not rejected
Dependent Variable			Mathematical Ability			

$R = 0.241$ $R^2 = 0.058$

F-ratio = 5.485 P-value = 0.001

Moreover, confidence has beta of 0.151 with a p-value of 0.208; importance has a beta of 0.095, a p-value of 0.378; and engagement has a beta of 0.010 with a p-value of 0.938. No indicators of the independent variable has a p-value lesser than 0.05 level of significance. Hence, no indicators significantly influence the mathematical attitudes of the students to mathematical ability.

Therefore, as presented in the table, the third hypothesis, which states that there is no domain in mathematical beliefs that significantly predicts to mathematical ability among the students is rejected only on the first indicator which is the teacher's role. In addition, the fourth hypothesis which states that there is no domain in mathematical attitudes that significantly predicts to mathematical ability among the students is not rejected.

CHAPTER 4

DISCUSSION

The data obtained on the students' mathematical beliefs, students' mathematical attitudes, and students' mathematical ability are presented in this chapter and said further discussions are based on the findings showed in the previous section.

Level of Students' Mathematical Beliefs

In the previous chapter, it was found out that the degree of students' mathematical beliefs of the eight (8) secondary institutions of New Bataan district in the division of Davao de Oro was very high. This is because of the very high-level rating assumed by the respondents in terms of teacher's role, competence, relevance, and difficulty, which means that the students' mathematical beliefs was very much high. Specifically, the students' mathematical beliefs in terms of teacher's role was very much high.

More so, it was presented in the studies of Lauermann (2013) and Murati (2015) that teacher's role is an essential formula for students' mathematical ability. The teacher is the one who plans the lesson, teach the content, manages the students and the classroom, and most especially the one who transfers knowledge and skills to the learners. Also, teacher's personal sense of responsibility towards the teaching-learning process influences the students' learning performance. Students work hard when their teachers recognize their efforts, even if the results are not perfect.

Moreover, it was presented in the studies conducted by Kusmaryono (2014) and Fitzmaurice, O'Meara, & Johnson (2021) that when students perceive a lack of relevance, it can lead to poor learning outcomes, a lack of interest in studying mathematics, mathematical incompetence, an easy willingness to give up and dislike a challenge, failure to complete homework, cheating on tests or exams, and even complete disengagement from mathematics. As a result, in order to have a strong mathematical competence, kids must feel a high level of relevance.

Additionally, students' mathematical beliefs in terms of difficulty was very much high, indicating that students consider mathematics to be one of the most challenging subjects. According to Gafoor & Kurukkan (2015), difficulty in learning mathematics is found as a common and significant problem throughout the school years. It is found that due to reasons of lack of content knowledge about the subject matter they get worsen as they move to higher grades.

In addition, students' mathematical beliefs in terms of competence was high, which means that students' employ strategies to solve mathematics problem. It entails understanding and applying strategies for analyzing and completing tasks and activities, as well as solving problems, in order to master mathematics content.

Level of Students' Mathematical Attitudes

The previous chapter revealed the level of students' mathematical attitudes in the eight (8) secondary schools in New Bataan District of the Division of Davao de Oro was very high. This is because the very high-level rating assumed by the respondents in confidence, importance, and engagement means that the level of students' mathematical attitudes was very satisfactory. Specifically, the students' mathematical attitudes in terms of engagement was very much high.

Students' mathematical attitudes in terms of student engagement was very satisfactory. According to Alrajeh & Shindel (2020), student engagement is defined as the practices that produce demonstrable effects both within and beyond the classroom. Students' willingness and effort to participate effectively in school activities lead to positive outcomes. Behavioral, cognitive, and emotional engagement are the three types of student engagement. In addition, the study conducted by Fung, Chen, & Tan (2018) also states that academic accomplishment may be higher for children who are more engaged affectively, behaviorally, or cognitively.

Seemingly, the students' mathematical attitudes in terms of importance was also very satisfactory. Mathematics, according to Hodanova and Nocar (2016), is essential for life and improves all elements of personal development. Nature, technology, architecture, manufacturing, the construction industry, banking, research, mapping, and other fields all have mathematical applications. Because mathematics is a part of our daily lives and has an impact on our quality of life and job choices, we can increase learners' interest in mathematics by providing them with high-quality instruction.

Moreover, the students' mathematical attitudes in terms of confidence was also very satisfactory. According to Inkeeree, Fauzee, and Othman (2017), boosting a student's self-confidence can help them get better mathematics results. If a student lacks confidence in mathematics, it will be difficult for them to learn; they will find it boring and uninteresting, affecting their mathematical performance. As a result, students' outcomes will improve as a result of their positive attitudes about mathematics.

Level of Students' Mathematical Ability

The previous chapter revealed the level of students' mathematical ability in the eight (8) secondary schools in New Bataan District of the Division of Davao de Oro was moderate.

Mathematic ability is defined as the capability to successfully use or manipulate numbers in clerical, administrative, scientific, and other disciplines where numbers are required. It's the ability to comprehend and manipulate numerical concepts and numbers (Nizoloman, 2013). The ability to solve mathematical problems and utilize mathematical data efficiently is referred to as mathematical ability. This could apply to a specific area of mathematics or to the entire field of mathematics. Students' mathematical ability is typically demonstrated through the completion of tasks connected to the mathematics curriculum. The ability to understand and apply new mathematical concepts and skills, as well as solve unique and non-routine situations, is a potential or future dimension of mathematical ability (Koshy, Ernest & Casey, 2009).

Significance of the Relationship between Levels of Students' Mathematical Beliefs and Students' Mathematical Ability

The current study reveals a strong link between mathematical beliefs and mathematical ability among the students. This supports Eleftherios and Theodosios' (2007) theory, according to which students' beliefs about mathematics, as well as their mathematical ability and capacity to interpret proofs, are influenced by it.

According to Goldin (1999), a belief is "the multiply encoded cognitive configuration to which the bearer assigns a high value, including related warrants". A belief is "a collection of dispositions to perform various things in various settings," according to Cooney (1999), which leads to acceptance. "Distinct situations may cause different belief clusters to emerge" (Presmeg 1988). Mc Leod (1992) divides beliefs into four categories: beliefs about mathematics, beliefs about oneself, beliefs about mathematics education, and beliefs about the situations in which mathematics is taught.

Significance of the Relationship between Levels of Students' Mathematical Attitudes and Students' Mathematical Ability

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"Attitudes may develop from the automatization of a recurring emotional reaction to mathematics," according to Mc Leod (1992), or from "the assignment of an already existing attitude to a new but related activity." Hannula (2002) examines four "different emotional-cognitive processes that produce an expression of an evaluation of mathematics": the emotions evoked by a student's participation in a mathematical activity; the emotions evoked by a student's expectations regarding the consequences of a mathematical situation; and the cognitive analysis (often unconscious) that the student performs while evaluating the role of mathematics in the achievement of his perceptual goals. "Attitude is not considered as a unitary psychological entity, but as a category of behavior produced by multiple evaluative processes," Hannula agrees. Students' feelings about mathematics may be influenced by emotions, expectations, or ideals," according to the study, which also stated that views might shift under the right circumstances.

Regression Analysis on the Influence of Students' Mathematical Beliefs and Students' Mathematical Ability

The regression analysis on the influence that significantly predicts students' mathematical beliefs on students' mathematical ability showed that only one domain significantly influenced most to the students' mathematical ability. The domains are teacher's role, competence, relevance, and difficulty. Only the teacher's role significantly influenced to the students' mathematical ability.

There were three subcategories of ideas about mathematics education, according to Op't Eynde and De Corte (2003): mathematical learning and problem solving, and mathematics instruction. Internal goal orientation, extrinsic goal orientation, self-efficacy, task-value, and control were identified as five subcategories of self-beliefs. Finally, in relation to the class situation, student opinions about how their teachers interact and teach them were investigated. They also pay attention to their perceptions of their teachers' motivation to teach them.

Regression Analysis on the Influence of Students' Mathematical Attitudes and Students' Mathematical Ability

The regression analysis on the influence that significantly predicts students' mathematical attitudes on students' mathematical ability showed that no domain significantly influenced the students' mathematical ability. The domains are confidence, importance, and engagement.

Learning mathematics entails more than just thinking and reasoning; students' attitudes about learning and mathematics also play a role. People's cognitive, emotional, and behavioral reactions to an item or environment based on their emotions or interests, according to Han and Carpenter (2014). What a person thinks or believes about mathematics is the cognitive component of attitude (Mensah, Okyere, & Kuranchie, 2013). A person's feelings or emotions concerning math learning are referred to as the affective component of attitude (Ingram, 2015). The tendency to respond in a certain way when studying mathematics is the behavioral side of attitude (Mensah et al., 2013).

CONCLUSION

Considering the discoveries of the investigation, conclusions are attracted this segment. The level of students' mathematical beliefs is very high for teacher's role, relevance, and difficulty and high for competence and the overall mean of very high for students' mathematical beliefs. This simply means that the different students' mathematical beliefs were very much high in the eight (8) secondary schools of New Bataan district. The level of students' mathematical attitudes is very high for confidence, importance, and engagement and the overall mean of very high for the level of students' mathematical attitudes. The level of students' mathematical ability has an overall mean of moderate. This means that mathematical ability was satisfactory in the eight (8) secondary schools of New Bataan District.

There is a significant relationship between students' mathematical beliefs and students' mathematical ability. This implies that students' mathematical beliefs in terms of teacher's role, competence, relevance, and difficulty significantly influence students' mathematical ability. There is also a significant relationship between students' mathematical attitudes and students' mathematical ability. This also implies that students' mathematical attitudes in terms of confidence, importance, and engagement significantly influence students' mathematical ability.

Recommendations

On the bright side of the preceding and conclusion, the following recommendations are offered: from the results of the study, the researcher understood that the students' beliefs and attitudes concerning mathematics greatly affect the students' mathematical ability. In regards to our findings, factor like teacher's role indicates a significant influence towards mathematical ability of the students.

Second, the government should provide resources for teaching and learning. For efficient mathematics learning, there should be adequate trained teachers, books, computers, and other teaching tools. School administrators must enlist the participation of their teachers in seminars that will assist them in molding today's students. Furthermore, because competency received the lowest mean score in students' mathematical beliefs, they may offer seminars and training on the mathematics curriculum to help students become more competent in the topic.

Third, teachers should utilize instructional strategies that account for learners' differences or learning barriers, eliminate fear, and encourage active engagement and enjoyment in what they are teaching

and learning. They should take steps to minimize tension and offer help to their kids as needed. In a non-threatening teaching and learning environment, this will promote mutual understanding.

Fourth, students should make good use of their time so that they can practice and comprehend mathematical topics covered in class. They should be taught how to study and take mathematics examination properly. This may help with skill acquisition and, as a result, increase mathematical performance and ability.

Lastly, future researchers may provide a starting point on expanding the coverage of the research in terms of the variables covered in the study. They can include other indicators that are possible factors of the students' behavior aside from the indicators mentioned and presented in this study.

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