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Attitudes and Challenges in Learning Mathematics in The Modern World: Foundation for Effective Intervention

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ABSTRACT

This study aims to analyze students' attitudes concerning their learning of Mathematics in the Modern World (MMW) and the problems they experience. This is important because if we understand the students' attitudes and issues, we can provide constructive interventions that improve learning. The study uses a descriptive-quantitative design to survey students in Criminology by administering quantitative surveys to a broad spectrum of respondents, representing a range of students who have enrolled in the course. The survey focused on pre-defined measures of students' attitudes, anxiety, motivation, and perceived challenges about Mathematics in the Modern World. The results indicate a significant relationship between students' attitudes and performance in MMW. The results suggest many students showed a considerable amount of anxiety regarding their perceived level of knowledge in mathematics, along with a lack of confidence in their expertise as a result of prior experiences and backgrounds, including socio-economic factors. The conclusion reflects some of these psychological and contextual factors facing students and the need to address these to improve students' attitudes toward mathematics. Constructive interventions are recommended, including various teaching methods/programs and pseudo-support mechanisms that can influence students toward a more benign way of learning and thinking about mathematics. Indeed, with more constructive interventions, educators can have a greater impact on students' engagement and learning in mathematics education.

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KEYWORDS:

attitudes, challenges, mathematics education, mixed-methods, intervention.

1. INTRODUCTION

Education within the academe serves as the bedrock for intellectual development and societal progress by promoting rigorous academic standards and encouraging scholarly inquiry; education in academe not only prepares individuals for professional success but cultivates informed citizens capable of addressing global challenges. This dual role underscores education's indispensable value in shaping personal and collective futures (Lewis, 2018).

The Commission on Higher Education (CHED) in the Philippines, which is responsible for overseeing tertiary education, implemented the General Education Curriculum (GEC) through CHED Memorandum Order No. 20, series of 2013. This curriculum reform aimed to align higher education with the K to 12 Basic Education Program, ensuring a seamless transition from secondary to tertiary education.

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The GEC emphasizes holistic understandings, intellectual competencies, and civic responsibilities, reducing redundancy by transferring some subjects to senior high school. Despite controversies, such as the initial exclusion of Filipino language courses, the GEC strives to provide a well-rounded education that prepares students for the complexities of modern society.

As prescribed by the CHED, the course "Mathematics in the Modern World" (MMW) explores the multifaceted nature of mathematics, emphasizing its practical, intellectual, and aesthetic dimensions. This subject aims to foster an appreciation for mathematics by highlighting its relevance and application in daily life. Students engage with mathematical concepts and tools, learning to apply them in various real-world contexts, from problem-solving and decision-making to understanding patterns and structures in nature and society. The course encourages critical thinking and analytical skills, demonstrating how mathematics underpins many aspects of the modern world, enhancing students' overall educational experience.

According to PhilStar Global, students in the Philippines remain among the world's weakest in math, reading, and

science, new findings by the Program for International Student Assessment (PISA) 2022 showed, with recent test scores showing no significant improvement from the country's performance in 2018. Various factors contribute to the complexity of learning mathematics, including conceptual difficulties and external influences such as educational resources and socioeconomic backgrounds. Mathematical concepts are often abstract, posing challenges for students to grasp them conceptually. A comprehensive understanding of the underlying reasons and tailored constructive interventions are necessary to address these obstacles.

In summary, it takes deliberate effort to address the complexity of attitudes toward and barriers to learning mathematics. Educators can establish a more stimulating and effective learning environment by addressing the different issues that students deal with and comprehending the fundamental causes of unfavorable attitudes. Based on the information, the researchers aim to investigate students' attitudes and the day-to-day difficulties they face when learning MMW. Considering the dynamic nature of mathematics education, delivery methods, and potential learning barriers, these challenges could hinder students' academic advancement. The primary objective of the current study is to assess the attitudes and challenges students face in learning MMW as a basis for crafting constructive interventions.

Statement of the Problem

This study aims to determine the Challenges and Attitudes to Learning Mathematics in the Modern World during the School Year 2023-2024.

Specifically, it aims to answer the following questions:

1. What is the profile of the respondents in terms of:
    1.1 age;
    1.2 sex;
2. What is the student's attitude toward MMW?
3. What are the challenges faced by students when learning MMW?
4. Is there a significant relationship between the students' attitudes and the challenges they encountered in MMW?
5. What are the suggested intervention initiatives aimed at mitigating the difficulties experienced by the students?

Scope and Limitation of the Study

This study evolves on attitudes and challenges in learning MMW of the Bachelor of Science in Criminology students at Northeastern College in Santiago City during the First Semester of the Academic Year 2023-2024.

It underscores the respondents' demographic profiles like age and sex. Moreover, the study revolves around the relationship between attitudes and challenges in learning MMW.

II. REVIEW OF LITERATURE AND STUDIES

This chapter discusses related literature and studies gathered from different online resources related to this work.

Education is a cornerstone of societal development and individual growth. It is a powerful tool for personal empowerment, enabling individuals to acquire knowledge, develop critical thinking skills, and foster a sense of responsibility towards their communities. Through education, people learn to navigate the complexities of the modern world, equipping them with the skills necessary to contribute meaningfully to society. Moreover, education promotes social cohesion by instilling shared values and norms, fostering unity and collective identity (Schiefer & Van der Noll, 2017).

Mathematics proficiency highlights the critical role of attitudes, teaching methods, and technological integration in modern education (Liljedahl & Oesterle, 2020). It indicates that students' confidence, motivation, and enjoyment significantly impact their mathematical achievement. Traditional views of mathematics as a fixed body of knowledge often alienate students, suggesting a need for more dynamic and engaging teaching approaches. Technology integration in mathematics education has also shown promise in enhancing students' understanding and interest. These findings underscore the importance of addressing cognitive and affective factors to improve mathematics proficiency in the contemporary educational landscape.

Mathematical proficiency is essential for societies to prosper economically and for nations to grow scientifically and technologically (Roth & Radford, 2011). This significance results from comprehending mathematics as essential for understanding various academic subjects, including the social sciences, engineering, physics, and even the arts. The diverse uses of mathematics in science and technology are highlighted, who note that these applications cut across all academic disciplines as well as business and technology (Enu & Nkum, 2015). Owing to its importance, mathematics has been included in school curricula as an essential topic. The main goal of the mathematics curriculum is to give students the knowledge and abilities they need to succeed in today's quickly changing world.

The study assessed the attitudes towards Mathematics and proficiency in Mathematics of Senior High School Students across different strands. The respondents of the study were 868 grade 11 senior high students of Science, Technology, Engineering, and Mathematics (STEM), Pre-baccalaureate Maritime (Maritime), Accountancy, Business and Management (ABM), Humanities and Social Sciences (HUMSS), and Technical Vocation and Livelihood (TVL) strands. It aimed to ascertain the selected SHS students' Mathematics proficiency level and attitudes towards Mathematics. The Attitudes Toward Mathematics Inventory (ATMI) was used to measure and determine the students' value, enjoyment, motivation, and self-confidence attitudes (Phonapichat et al., 2014). Mathematics proficiency was based on the core subject, General Mathematics; the content

was functions and graphs. The two variables were correlated across different strands.

As a result, the overall mean of 25.37 with a standard deviation of 6.43 indicated that Dr. Carlos Lanting College's senior high school students were proficient in Mathematics. The students of the STEM strand had the highest mean score (M=29.33, SD=4.32), indicating an advanced proficiency level in Mathematics, while students from ABM (M=26.54, SD=5.71), HUMSS (M=24.48, SD=6.76) (Abe & Gberno (2014). Students from different strands possess different mathematical abilities. Generally, students have negative attitudes toward mathematics; however, they have positive attitudes in terms of value. Also, students from different strands have varied attitudes toward Mathematics, and their attitude toward Mathematics influences their proficiency in the subject (Noussa & Mbuti, 2017). Thus, attitude is a significant factor in learning mathematics.

Attitude refers to the ability to react favorably or unfavorably to various stimuli such as circumstances, items, concepts, or individuals. Attitudes are not static; they can evolve and change over time. A positive attitude toward mathematics can enhance students' academic performance, while a negative mindset can hinder learning outcomes (Cerbito, 2020). Therefore, attitude is a critical factor that cannot be overlooked. Depending on the learner, attitude can have either a positive or negative impact on their mathematical performance.

On the other hand, another significant issue in learning mathematics is difficulty understanding and applying abstract concepts to real-world problems, essential for developing critical thinking and problem-solving skills. Additionally, many students struggle with retaining mathematical facts, formulas, and procedures, which are fundamental for mastering more complex topics (Sarmah & Puri, 2014). External factors such as overcrowded classrooms, lack of access to quality instructional materials, and insufficient support from teachers and parents exacerbate these difficulties. In addition, negative attitudes towards mathematics and math anxiety can hinder students' motivation and confidence, making it harder for them to engage with the subject matter effectively (Syyeda, 2016). Addressing these challenges requires targeted interventions, such as improving teaching methods, providing additional resources, and fostering a positive learning environment.

One of the primary challenges in mathematics education is students' performance in the subject, with many perceiving mathematics as one of the most challenging core courses to learn. This pessimistic outlook may stem from various factors hindering their understanding of mathematics (Matthee & Turpin, 2019). To gain insight into these impediments, this study investigated the challenges, hurdles, and difficulties students face in learning mathematics. Employing a case study design with qualitative investigation, a stratified random sample technique was used to select 150 secondary school students from Forms 2 and 4 to respond to an open-ended questionnaire (Mazana et al, 2019). The results revealed thirteen subthemes and five main themes: self-factors (low self-regulation, negative perception), teacher-related factors (behaviors, practices, and characteristics), parental influence (lack of emotional, financial, and cognitive support), peer dynamics (negative attitudes, behaviors, and lack of support), and other factors (nature of math and assessment pressure). These findings carry significant implications for practitioners and researchers working with students to help them overcome obstacles in their academic endeavors, particularly in mathematics education (Segooa & Molise, 2023).

Indeed, students require more profound mathematics knowledge, skills, and values to pursue higher education, engage in the technologically advanced workforce, and become informed citizens (Rameli & Kosnin, 2016). In response to these needs and changes, the K– 12 Enhanced Basic Education Program, a component of the revamped Philippine educational system, aims to develop each student into "a holistically developed Filipino with 21st-century skills." The Commission on Higher Education (CHED) issued CMO No. 20 series 2013 to address these challenges, outlining the New General Education Curriculum (NGEC) within the K–12 curriculum framework. HEIs can design curricula suitable for their specific contexts and purposes to meet these predetermined program outcomes.

Mathematics in the Modern World (MMW) is among the general education courses required for all first-year college students (Bearneza, 2020). This course explores the nature of mathematics, its applications in real-world situations, and its intellectual, practical, and artistic components. Students are first introduced to mathematics as an investigation of patterns and a practice in deductive and inductive reasoning. Students are urged to go beyond the traditional understanding of mathematics as only a collection of formulas during the course. Instead, the patterns seen in nature inspire students to view mathematics as a complex language based on reasoning and logic and a source of aesthetic beauty. The course aims to show how mathematics can be a flexible tool for comprehending and handling various modern problems.

Topics covered include personal finance management, social decision-making, an appreciation of geometric designs, understanding data transmission and security codes, and equitable allocation of scarce resources (CHED MMW Syllabus). Students can demonstrate the diverse character of mathematics as a method of knowledge by applying mathematical concepts in real-world contexts through their engagement with these elements. Students can use these applications to evaluate their understanding and ability in various mathematical scenarios. Improved learning outcomes are associated with positive attitudes about learning mathematics, such as preparedness and motivation to engage with the subject matter, active engagement in classroom

activities, resilience in the face of difficulties, and reflective learning practices. Conversely, college students with low self-efficacy in mathematics may exhibit decreased motivation to study, potentially leading to lower academic achievement in mathematics (CHED Memorandum Order No. 1, Series of 2013).

Research has examined students' attitudes toward mathematics and the different elements influencing such attitudes. In mathematics education, attitudes toward the subject matter are crucial because they directly affect students' mathematical performance (Commission on Higher Education Handbook on Typology, Outcomes-Based Education, and Institutional Sustainability Assessment, 2014). Students' impressions of mathematics are shaped by various factors, including how mathematics is taught, the degree of support the educational system offers, family dynamics, and individual student attitudes toward learning.

A study explores students' attitudes and challenges in learning Mathematics in the Modern World (MMW). The data gathered were used to formulate intervention programs. The study utilized the descriptive research method and employed a survey questionnaire as the main data-gathering instrument. It involved the participation of all college students from the University of Batangas in Mathematics in the Modern World (MMW) during the school year 2022-2023. As a result, most students are 19-21 years old, male, and enrolled in Criminology courses. Students strongly agreed and exhibited a positive attitude toward wanting to develop their mathematical skills. It was observed that there is a positive and moderate correlation between the attitude and the challenges encountered by the students in learning Mathematics in the Modern World (MMW). The main challenge identified is difficulty remembering math facts, concepts, rules, formulas, sequences, and procedures.

To promote student success, practitioners and researchers must emphasize the significance of teachers' warmth and the relevance of their instructional content. The instructional materials as constructive interventions play a vital role in teaching mathematics in the modern world and cannot be overstated. A study stated that materials, including textbooks, manipulatives, technology tools, and digital models, make learning more engaging and accessible for students. They help concretize abstract mathematical concepts, making them easier to understand and apply in real-life situations Carandang et al., 2024). Additionally, instructional materials and constructive interventions support differentiated learning by catering to diverse student needs and learning styles. Integrating technology in these materials further enhances interactive learning, allowing students to visualize and experiment with mathematical ideas (Shin et al., 2017). Overall, the effective use of instructional materials in mathematics education fosters a more profound understanding, promotes active learning, and improves student achievement.

III. RESEARCH METHODOLOGY

This discussion focused on the research design, respondents, locale, data gathering instruments, data gathering procedure, and statistical treatment of data used in the study to arrive at significant findings. 15

A. Research Design

This study utilized a descriptive method. A study stated that descriptive research aims to describe a population, situation, or phenomenon accurately and systematically. It can answer the what, when, and how questions but not the why questions (Boelens et al., 2018). This method was appropriate because the researcher wanted to identify the Attitudes and Challenges in Learning Mathematics in the Modern World and their significant relationship.

Quantitative research was used to determine the attitudes and challenges among respondents. Quantitative research is the process of collecting and analyzing numerical data. It can be used to find patterns and averages, make predictions, test causal relationships, and generalize results to broader populations (Radovic et al., 2020).

B. Respondents of the Study

The respondents of this study were first-year students under the College of Criminology enrolled during the First Semester of 2023-2024 at Northeastern College.

A simple random sampling was utilized as a sampling technique in this study. Each population member is equally likely to be selected using this sampling method.

This method is the most straightforward of all the probability sampling methods since it only involves a single random selection and requires little advance knowledge about the population. Because it uses randomization, any research performed on this sample should have high internal and external validity.

Using the Raosoft Sampling Calculator with a 95% confidence level and 5% margin error, 225 out of 539 criminology students were utilized in this study.

C. Local of the Study

The study was conducted at Northeastern College. This institution is considered the "Valley's True Mint of Wisdom" because it produces topnotchers in Board Examinations and nurtures competitive students in the region and worldwide. It is also the oldest institution in the Province of Isabela.

D. Instrument

The first part of the questionnaire obtained the respondents' profiles in terms of age and sex.

The second part focused on students' attitudes toward learning MMW, utilizing 40 items adapted from the Attitude Towards Mathematics Inventory (ATMI) (Tapia, 1996). This instrument underwent rigorous validity and reliability testing, yielding a mean validity score of 4.30 and a reliability coefficient of 0.92 via Cronbach Alpha.

The third part addressed the challenges encountered, with the research instrument undergoing validation and expert review to ensure its efficacy.

E. Data Gathering Procedure

After the proposal's approval, the researcher asked the permission of the Dean of the Graduate School to conduct the study. The request was approved, and the researcher started to survey.

Administration of the Questionnaire. With the adviser's approval, the questionnaire was ready for administration, and all the suggestions were incorporated. The questionnaire was administered and retrieved on the same day through the face-to-face method.

Interpreting the Responses. After the questionnaires were retrieved, the data gathered was tallied, tabulated, and analyzed using Excel 2013 and the Statistical Package for Social Sciences (SPSS) version 26.

IV. RESULT AND DISCUSSION

This chapter presents the results arrived at data gathered, interpreted and analysis of data.

Table 1. Respondents According to Age

Particulars	Frequency	Percent (%)
19-21 years old	187	83.1
22-24 years old	32	14.2
25-27 years old	6	2.7
Total	225	100

As presented in Table 1, out of the 225 respondents,187, or 83.1%, were 19-21 years old, while 32, or 14.2%, were in the 22-24 age bracket. 2.7%, or six respondents, were 25-27 years old.

The age distribution indicates that a significant majority of the respondents are between 19 and 21 years old. This could be due to the typical age range for college students in the College of Criminology, reflecting that most students enroll in this college soon after completing their secondary education.

The predominance of younger students suggests that most of the interventions and support programs in learning mathematics should cater primarily to this age group. Younger students might have different learning preferences, challenges, and attitudes towards mathematics compared to older students.

According to study, younger college students often face various challenges in adapting to the abstract and complex nature of college-level mathematics (Smith, 2022). This includes factors such as anxiety, lack of foundational skills, and the need for more engaging and contextually relevant teaching methods.

Although the majority are younger students, the minority age groups (22-24 and 25-27 years old) should not be overlooked. Tailored interventions to meet their unique needs and challenges should also be considered.

Hence, most of the College of Criminology's students are between the ages of 19 and 21. This demographic information is essential for creating math learning interventions that work. Instructors can use focused tactics to improve students' attitudes and mathematical performance by knowing the age distribution and related difficulties. 21

Table 2. Respondents According to Sex

Particulars	Frequency	Percent (%)
Male	135	60.0
Female	90	40.0
Total	225	100 .0

Table 2 revealed that males comprised the majority of respondents, with a frequency of 135 or 60%, as opposed to females, who comprised 40% or 90.

According to the sex distribution, men make up a significant portion of the responses. This may indicate that there are more male students enrolled than female students, which would be consistent with the gender dynamics in the College of Criminology.

Given that male students represent the majority, it stands to reason that the majority of interventions and support programs for math learning should target this demographic. Compared to female students, male students may have distinct learning styles, difficulties, and attitudes on mathematics.

In the study, male students frequently show greater confidence in their mathematical skills, but they also struggle with issues like overconfidence and a lack of attention to detail. However, female students may have weaker self-efficacy and higher levels of math anxiety, which might affect their performance (Papyrina et al., 2021).

Thus, it is necessary to guarantee that male and female students receive equal assistance in their mathematics education. Improved outcomes and more positive attitudes toward studying mathematics can result from interventions that are specifically designed to meet the particular challenges that each group encounters.

Moreover, majority of students in the College of Criminology are male. This demographic detail is important for designing effective interventions in learning mathematics. By understanding the sex distribution and associated challenges, educators can implement targeted strategies to enhance students' attitudes and performance in mathematics.

Table 3. Attitudes Towards Learning MMW

Particulars	Mean	Qualitative Description
1. I get a great deal of satisfaction out of solving a mathematics problem.	3.05	Agree
2. I have usually enjoyed studying mathematics in school.	3.35	Strongly Agree
3. Mathematics is fun and exciting.	2.97	Agree
4. I like to solve new problems in mathematics.	3.26	Strongly Agree
5. I would prefer to do an assignment in mathematics than to write an essay.	3.17	Agree
6. I like mathematics.	3.12	Agree
7. I am happier in a math class than in any other class.	3.17	Agree
8. Mathematics is a very interesting subject.	3.12	Agree
9. I am comfortable expressing my ideas on how to look for solutions to a difficult problem in mathematics.	2.79	Agree
10. I am comfortable answering questions in math class.	2.83	Agree
11. Mathematics is a very worthwhile and necessary subject.	2.92	Agree
12. I want to develop my mathematical skills.	3.47	Strongly Agree
13. Mathematics contributes to mental development and fosters critical thinking skills.	2.65	Agree
14. Mathematics holds significance in daily activities and practical situations.	3.48	Agree
15. Studying mathematics is vital as it ranks among the most crucial subjects for individuals to learn.	2.68	Agree
16. Regardless of my chosen field of study, mathematics would prove highly beneficial.	2.63	Agree
17. I can think of many ways that I use math outside of school.	2.64	Agree
18. I think studying advanced mathematics is useful.	2.63	Agree
19. I believe studying math helps me with problem-solving in other areas.	2.76	Agree
20. A strong math background could help me in my professional life.	2.77	Agree
21. Mathematics is not one of my most dreaded subjects.	2.86	Agree
22. I can think clearly when working with mathematics.	2.64	Agree
23. Studying mathematics does not make me feel nervous.	2.90	Agree
24. I feel at ease with Mathematics.	2.92	Agree
25. I never feel excessively stressed during math class	2.14	Disagree
26. The mention of mathematics brings me a sense of enjoyment.	2.26	Agree
27. The thought of solving a mathematics problem fills me with excitement	2.65	Agree
28. I am not afraid of mathematics at all.	2.38	Disagree
29. I am very confident in my abilities in mathematics.	2.78	Agree
30. I can tackle mathematics problems with ease.	2.55	Agree
31. I anticipate performing adequately in any math class I enroll in.	2.91	Agree
32. I rarely experience confusion during my mathematics class.	2.76	Agree
33. I feel a sense of confidence when tackling mathematics.	2.79	Agree
34. I grasp mathematical concepts effortlessly.	2.96	Agree
35. I believe I possess proficiency in solving math problems.	3.14	Agree
36. I am confident in my ability to grasp advanced mathematics concepts.	2.95	Agree
37. I am eager to continue utilizing mathematics throughout my college education.	2.89	Agree
38. I am open to enrolling in additional mathematics courses beyond the minimum requirement.	2.74	Agree
39. I intend to maximize my exposure to mathematics throughout my academic journey.	3.70	Strongly Agree
40. I find the challenges presented by mathematics intriguing.	2.71	Agree
Overall Mean	**2.87**	**Agree**

Table 3 indicated that the attitudes of respondents from the College of Criminology towards learning mathematics in the modern world. The overall mean score is 2.87, which corresponds to an overall attitude of "Agree."

The data indicates that most respondents have a positive attitude towards mathematics, as evidenced by the high mean scores for statements such as "I usually enjoyed studying mathematics in school" (3.35) and "I intend to maximize my exposure to mathematics throughout my academic journey" (3.70).

Statements related to enjoyment and satisfaction in learning mathematics, like "I get a great deal of satisfaction out of solving a mathematics problem" (3.05) and "Mathematics is fun and exciting" (2.97), also reflect a generally positive disposition towards the subject.

While respondents generally agreed with statements regarding confidence in mathematics (e.g., "I am confident in my ability to grasp advanced mathematics concepts" with a mean of 2.95), there were lower scores for statements indicating a lack of anxiety, such as "I never feel excessively stressed during math class" (2.14) and "I am not afraid of mathematics at all" (2.38), suggesting areas for potential intervention.

Addressing math anxiety and building confidence are critical for improving student performance. Interventions such as math anxiety workshops and confidence-building exercises can be beneficial (Fencl, 2024).

Respondents acknowledge the practical importance of mathematics in daily life and future careers, as shown by the high scores for "Mathematics holds significance in daily activities and practical situations" (3.48) and "A strong math background could help me in my professional life" (2.77).

Overall, with a mean score of 2.87, which shows agreement with the majority of positive items, the data suggest that respondents from the College of Criminology generally have a good attitude about learning mathematics. In order to ensure students, get the most out of their mathematical education, additional effort must be done in areas like math anxiety and confidence. A stronger foundation in mathematics and more effective learning outcomes can result from interventions that are specifically designed to address these challenges.

Table 4. Challenges Encountered in Learning MMW

Particulars	Mean	Qualitative Description
1. Difficulty with abstract concepts of time and direction.	2.74	Agree
2. Inability to visualize; appearing absentminded or lost in thought.	2.72	Agree
3. Struggles with retaining math facts, concepts, rules, formulas, sequences, and procedures.	2.75	Agree
4. Challenges in adhering to sequential procedures and instructions in mathematical steps.	2.78	Agree
5. Delays in comprehending mathematical concepts presented within word problems	2.74	Agree
6. Confusing operations signs or performing them in the wrong order.	2.79	Agree
7. Difficulty understanding complex mathematical concepts can lead to frustration and a lack of motivation to learn.	2.71	Agree
8. Lack of regular practice to retain mathematical concepts.	2.90	Agree
9. Poor study habits	2.56	Agree
10 Lack of understanding of basic concepts in Mathematics	2.84	Agree
Overall Mean	**2.75**	**Agree**

Table 4 presents the challenges encountered by respondents from the College of Criminology while learning mathematics in the modern world. The overall mean score is 2.75, which corresponds to an overall qualitative description of "Agree."

The data indicates that respondents generally agree on facing several challenges in learning mathematics. The highest mean score (2.90) relates to the "Lack of regular practice to retain mathematical concepts," suggesting that consistent practice is crucial for mathematical proficiency.

Several items indicate difficulties with understanding and retaining mathematical concepts, such as "Struggles with retaining math facts, concepts, rules, formulas, sequences, and procedures" (2.75) and "Challenges in adhering to sequential procedures and instructions in mathematical steps" (2.78).

In addition, the challenge "Difficulty understanding complex mathematical concepts can lead to frustration and a lack of motivation to learn" (2.71) highlights the emotional aspect of learning mathematics. Interventions to reduce math anxiety and improve motivation, can be effective.

Therefore, the result suggests that respondents from the College of Criminology encounter several challenges while learning mathematics. The overall mean score of 2.75 indicates that these challenges are generally acknowledged by the respondents. Addressing these challenges through targeted instructional strategies, regular practice, and support for developing better study habits can lead to improved learning outcomes and a more positive attitude towards mathematics.

Table 5. Overall Weighted Mean of Attitudes and Challenges Encountered in Learning MMW

Particulars	Mean	Qualitative Description
1.Overall Mean on Attitudes in Learning MMW	2.87	Agree
2. Overall Mean on Challenges Encountered in Learning MMW	2.75	Agree
Overall Weighted Mean	**2.81**	**Agree**

Table 5 above presents the overall weighted mean of attitudes and challenges encountered in learning Mathematics in the Modern World (MMW) among respondents from the College of Criminology. The data reflects the respondents' general agreement with both the positive attitudes and the challenges they face.

The overall mean score of 2.87 indicates that respondents generally agree with positive attitudes towards learning mathematics. This suggests that students recognize the importance and relevance of mathematics in their education and future careers.

The mean score of 2.75 for challenges encountered suggests that while students face several difficulties in learning mathematics, they also acknowledge these challenges and are aware of the areas that need improvement.

The overall weighted mean of 2.81 indicates a general agreement among respondents about both their positive attitudes towards learning mathematics and the challenges they face. Addressing these challenges through targeted interventions and support systems can enhance students' learning experiences and outcomes in mathematics.

Table 6. Hypothesis Testing - Correlation of Attitudes and Challenges in learning Mathematics in the Modern World

	Attitudes
Challenges	Pearson's r = 0.5254 p <.001 n = 225

Table 6 illustrates the relationship between students' attitudes and their challenges in learning MMW. Among the criminology students of Northeastern College, attitudes and challenges in learning mathematics were significantly correlated, r (223) = .5254; p= <.001.

The Pearson's r value of 0.5254 indicates a moderate to strong positive correlation between attitudes and challenges in learning mathematics. This suggests that as students' attitudes towards mathematics improve, the challenges they encounter may decrease, and vice versa.

The p-value of less than 0.001 indicates that the correlation is statistically significant. This means that there is a very low probability that the observed correlation occurred by chance, and we can be confident in the relationship between attitudes and challenges in learning mathematics.

Improving students' attitudes towards mathematics can lead to a reduction in the challenges they face. Interventions aimed at boosting confidence, reducing math anxiety, and fostering a positive learning environment can be effective in achieving this (Boaler et al., 2022).

Therefore, the data collected reveals that among respondents from the College of Criminology, attitudes and difficulties in learning mathematics have a strong correlation. This research emphasizes how crucial it is to address attitudes as well as difficulties in educational interventions in order to enhance students' performance in mathematics and their overall educational experience.

Table 7. Intervention Programs to Address the Challenges Encountered by the Students

Programs	**Objectives**	**Descriptions**
MATHulungan Tayo Program (MTP) *(Mentorship)*	The MATHulungan Tayo Program aims to offer individualized one-on-one counseling, peer group discussion, group caucus mentorship, and support to help students who struggle in math to develop a solid basic understanding of the different topics and areas in mathematics.	This initiative partners struggling students with math-savvy mentors, mathematics major students, and math clubs or organizations that can offer focused assistance. In close collaboration with the students, these mentors determine their challenges and create sessions and events that specifically address them. The course aims to develop a solid grasp of mathematical ideas, enhance students' problem-solving ability, and boost their

		confidence in the subject. Interactions can occur in person and virtually to meet learning needs and preferences.
MATHatag na Buhay Program *(Seminar and Workshops)*	This program's primary goal is to educate students on the importance of math in our daily lives and show them how mathematics can be used practically by linking it to pertinent real-world situations.	These seminars and workshops aim to demonstrate to students how mathematics is used practically in various contexts and daily life. Through hands-on activities and projects, students discover the relationships between mathematics and fields like science, technology, engineering, and finance. The curriculum highlights mathematics as a valuable tool for decision-making and problem-solving through these experiences.
Math Adaptive Learning Software	The goal of this is to personalize math instruction based on each student's unique strengths and the shortcomings of every student.	Each student's mathematical proficiency is evaluated using adaptive learning software, and a customized learning path is created to meet their individual needs. This software makes real-time dynamic adjustments, speeding up mastery of concepts while offering more practice on complex subjects. The curriculum is designed to offer tailored learning experiences, enabling students to develop a solid mathematical foundation at their speed.

The table presents various intervention programs designed to address the challenges encountered by students in learning Mathematics in the Modern World. Each program aims to provide targeted support to improve students' mathematical understanding and performance.

Mentorship Programs (MATHulungan Tayo Program - MTP): This initiative focuses on personalized mentorship to help struggling students. Peer mentoring can significantly improve academic performance and confidence in mathematics (Pasion, 2024).

Practical Application (MATHatag na Buhay Program): By linking mathematics to real-world situations, this program helps students see the practical value of math. A study emphasize that contextual learning can enhance students' engagement and motivation (Lam et al., 2012).

Adaptive Learning (Math Adaptive Learning Software): Adaptive learning software tailors the learning experience to each student's needs. As discussed in a study, personalized learning paths can lead to better retention and understanding of mathematical concepts.

In conclusion, the intervention programs outlined aim to address the specific challenges faced by students in learning mathematics. By providing mentorship, practical applications, and personalized learning experiences, these programs can enhance students' attitudes towards mathematics and improve their overall performance.

V. CONCLUSION

The Attitude Towards Mathematics Inventory (ATMI) by Tapia (1996) assessed the attitudes and challenges in learning MMW to provide constructive interventions. This study was conducted to analyze the information received, and as a result, the researcher concluded that:

The age distribution in the College of Criminology suggests that the majority of students are between 19 and 21 years old. This demographic insight is crucial for tailoring educational interventions to meet the learning needs and preferences of this age group. Tailored strategies focusing on engaging teaching methods and foundational skill development can help address the challenges faced by younger students.

The gender distribution indicates a predominance of male students, accounting for 60% of the respondents. This suggests that educational programs should consider gender-specific approaches to support both male and female students effectively. Interventions addressing the unique learning challenges and attitudes of each gender can enhance overall student performance in mathematics.

The overall positive attitude towards mathematics, with an average score of 2.87, reflects the students' recognition of the subject's importance and relevance. Despite this, areas such as math anxiety and confidence require targeted interventions. Programs aimed at reducing anxiety and building confidence can further improve students' attitudes and performance in mathematics.

On the other hand, respondents acknowledge several challenges in learning mathematics, with a mean score of 2.75. The most significant challenge is the lack of regular practice, highlighting the need for consistent engagement with mathematical concepts. Addressing these challenges through regular practice, targeted instructional strategies, and support can lead to better learning outcomes.

The positive correlation between attitudes and challenges in learning mathematics, as indicated by Pearson's r value of 0.52, underscores the interdependence of these factors. Improving students' attitudes can potentially reduce the challenges they encounter, emphasizing the need for holistic interventions that address both attitudes and challenges.

Lastly, he proposed intervention programs, such as the MATHulungan Tayo Program, MATHatag na Buhay Program, and adaptive learning software, are designed to address the specific challenges faced by students. These programs aim to provide personalized mentorship, practical applications of mathematics, and tailored learning experiences, thereby enhancing students' mathematical understanding and performance.

Recommendations

Based on the conclusions arrived, the following recommendations are hereby presented:

1. Criminology Students. Despite diverse ages and sexes, they should be exposed to various mathematical activities and teaching methodologies within MMW classes to practice their understanding of complex mathematical concepts and motivate them to have a healthy habit of learning mathematics.

2. Instructors. To motivate students, instructors are encouraged to continuously enhance their teaching methodologies through participation in training sessions and workshops. Additionally, it is advised that the proposed intervention programs be presented to the Dean and academic chairs for their input and feedback.

3. Parents. Encourage and motivate their children to enhance their mathematical ability, especially in analyzing and comprehending complex problems, because it will help them in their future careers as law enforcers.

4. Future Researchers. Future Researchers. Study and put much effort into evaluating the effectiveness of the intervention programs in mitigating the challenges encountered by students in MMW.

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