



Short Paper

# Mathematical Competence of College Students Across Gender in Mathematics in the Modern World

Mark Jameson E. Perez

College of Education, Pampanga State University, Philippines  
[meperez@pampangastateu.edu.ph](mailto:meperez@pampangastateu.edu.ph)

*Date received:* February 9, 2025

*Date received in revised form:* October 6, 2025

*Date accepted:* October 20, 2025

Recommended citation:

Perez, M. J. (2025). Mathematical competence of college students across gender in Mathematics in the Modern World. *Puissant*, 6, 2969-2991.

## Abstract

This descriptive-correlational research study aimed to determine the mathematical competence level of college students and identify the significant relationship between their math competence and gender. The study involved 128 college students from the College of Education in one of the state universities in Central Luzon, all of whom had already taken Mathematics in the Modern World. A researcher-made, validated questionnaire was used for data gathering. The research tool consisted of questions related to learning competencies reflected in the MMW Learning Plan and Course Map. Results showed that students demonstrated mathematical competence in Mathematics in Our World, Mathematical Language and Symbols, Problem-Solving and Reasoning, Statistics and Data Management, Consumer Mathematics, Linear Programming, Mathematics of Graphs, and Apportionment and Voting. A very weak positive relationship was found, and there is no significant relationship between gender and mathematical competence. Moreover, the researcher recommends that undergraduate instructors be updated on gender-related topics and gender-based policies, and regular feedback mechanisms should be implemented to address academic concerns and the holistic development of learners. Additionally, the CORE (Contextualization, Observation, Reflection, and Evaluation) Method is recommended to be integrated and utilized by instructors as one of the teaching strategies. Furthermore, institutions should allocate funding for faculty training on gender and development.



## INTRODUCTION

Students from past and present generations oftentimes categorize mathematics as one of their most hated learning disciplines because it gives them a hard time understanding the nature and theories involved in the world of numbers. According to the study by Ukobizaba et al. (2021), students' interest in mathematics heavily depends on how it is taught. Some factors are considered, such as low performance in their examinations and the attitudes and approaches of teachers toward their learners. As is usually observed by educators, learners do not exert much effort and time in comprehending mathematical lessons because they believe that numbers and formulas are not in line with their interests. At the same time, they have negative feelings towards the subject. In the study by Munawar (2021), emotions have something to do with effective learning. Emotions and feelings are factors to be considered to foster proper thinking and to enhance the learning of mathematics with other people. Hence, with the existence of various developmental tools, innovations, and strategies, and with the aid of artificial intelligence, there is an assurance that students can expand their knowledge of mathematical concepts. It can also enable them to enhance their critical and analytical thinking, logical and reasoning skills, and problem-solving abilities.

People learn mathematics in different ways. Some are good with words, while some excel in solving problems but struggle with math formulas. Students typically perform poorly in mathematics due to their lack of understanding of basic operational concepts, poor mathematical skills, and even negative attitudes toward the subject. Also, in the study of Baran and Kabael (2021), it was revealed that students with a proficiency level of 0 or lower had the most difficulty understanding statements/questions and explaining concepts about the topic. Students with a level 1 and level-weighted-1 competency level have difficulty expressing a mathematical conclusion or offering a verbal/written reason. Finally, students with a skill level of 0 or below had considerably lower self-efficacy, anxiety, and openness to problem-solving than other students.

Comparing and contrasting are two of the most fundamental intellectual tasks in mathematics. There is still a venue for debate about who is more mathematically competent between the male and female genders. It has been anticipated that there are gender disparities in mathematics due to several factors, such as the control and value beliefs in mathematics. In relation to the study of Brown and Josephs (1999), women performed worse when told that the test would reveal their weakness in mathematics. On the other hand, they performed effectively when told that the given assessment indicates their exceptional mathematical ability. Contrary to men, they performed poorly when instructed that the test would simply measure their mathematical ability, but performed better when it was framed as indicating weaknesses. In connection with this

study, instructors should emphasize the learning and assessment objectives to the students. It is important to emphasize that studying mathematics is not just a prerequisite for some courses but a necessary and powerful tool to better understand the daily operations and systems of the world.

In relation to the study conducted by Hyde et al. (1990), girls from elementary and middle schools demonstrated slight superiority in the computation of numbers. In addition, no gender-related differences were observed in terms of problem-solving. Furthermore, differences were evident at high school and college levels, favoring men. Based on the study by Kanta et al. (2024), women remain marginalized in careers in higher education and Science, Technology, Engineering, Arts, and Mathematics (STEAM). This is due to stereotyping, lack of confidence, a deep sense of belongingness, and insufficient institutional support. As per the study of Xie et al. (2023), women with gender-math stereotypes usually have lower self-concepts that can negatively affect their mathematical performance. On the contrary, men's performance in mathematics was usually not significantly influenced by gender-math stereotyping about differences in mathematical abilities.

In relevance to these, students nowadays are giving more importance to mastering mathematical competencies than the intended learning competencies, depending on their gender, readiness, interests, and needs. The researcher chose Mathematics in the Modern World (MMW) as the concentration of the study since it involves contemporary topics and learning competencies, specifically in Algebra, Statistics, Probability, and Geographical Representations. These competencies were already discussed during the basic education years of undergraduate students, and MMW is offered as one of the general courses in all academic programs. Moreover, the research determined whether there is retention and mastery of learning competencies on the part of university students. This course includes topics about Mathematics in our World, which focuses more on mathematics' relevance, importance, and usefulness in how humans perceive the world. Also, it involves lessons about mathematics as a language and symbols. Like any other language, math has its way of interpretation, analysis, principles, symbols, syntax, and rules where figures and numbers correspond to a specific meaning. Moreover, mathematics is not all about numbers; it is also about solving complex problems and enhancing the critical, analytical, logical, and reasoning skills of the learners. In addition, data management is an essential component of this learning discipline. Statistics is a branch of mathematics that deals with processing, gathering, interpreting, and presenting numerical data. Furthermore, Geometry can help learners to enhance their geometrical analysis and artistic prowess. Lastly, it also involves lessons about enabling the development of using codes and deciphering symbols, which are integrated into the topics under Linear Programming, Mathematics of Finance, Apportionment and Voting, Logic, Mathematics of Graphs, and Mathematical Systems.

Furthermore, the researcher determined the level of mathematical competence of undergraduate students in the previous semesters and tested the significant relationship

between mathematical competence and the gender of college students. The results were used as a basis to develop or innovate a teaching strategy to enrich and reinforce their math competence in MMW.

## LITERATURE REVIEW

According to Becker and Hall (2024), with the paradigm shift and continuous transition from sex differences to gender differences that occurred in the 1990s and 2000s, some authors have redefined gender as non-binary and fluid. Up to this present time, gender remains one of the areas of research interest in mathematics education because of the persistent inequities in attitudes, achievement, representation, and lived experiences.

In the study of Tak et al. (2025), it was found that the attitude of students toward mathematics is affected by some factors, especially in their behavioral, affective, and cognitive aspects. It showed that their attitude is significantly related to their mathematical reasoning performance. This only indicates that students' learning habits and how they interact with the subject play a significant role in their learning process. In the study of Jankvist (2023), results indicated that mathematics anxiety directly leads to a negative impact on the computational fluency and mathematics vocabulary of the students. Having said this, it only means that it has a direct positive effect on their competence in mathematics. In general, students with mathematics learning difficulties are commonly detected with poor mathematics vocabulary, which significantly affects their mathematics competence. Therefore, students may be exposed to different types of appropriate and relevant interventions to further improve their mathematics competence. According to Doz et al. (2023), mathematical anxiety had an effect and implication directly and indirectly on the perceived difficulty in problem-solving performance. As reflected in the study, results showed that female students garnered high levels of math anxiety; however, in terms of problem-solving accuracy and perceived difficulty, no gender differences were observed. Therefore, educators need to consider emotional factors whenever they want to determine the causes of students' difficulties in studying mathematics. It is also necessary to introduce interventions that will address the math anxiety of students across all genders.

According to Makar (2024), mathematical modeling is an important aspect of developing the STEM-related abilities of students. It usually involves a content-rich mathematical process with findings and solutions to complex problems through the construction, evaluation, and refinement of representations in accordance with the mathematical structures of existing phenomena. According to Güner and Gökçe (2021), structural equation modeling is commonly used to analyze and evaluate the interconnectedness among cognitive flexibility, anxiety in mathematics, thinking disposition, and mathematical achievement for primary, intermediate, and high school learners to determine the level of mediating influence of math anxiety. They also

highlighted the predictive determinants of mathematical achievement and contrasted the overall tendency of these variables in terms of gender, grade level, and type of school as part of the scope.

As per the study of Van der Beek et al. (2024), male students have been reported to have higher mathematical competence beliefs compared with female learners, although there is no gender difference during actual performance. It was also found that male students have higher math enjoyment with lower anxiety levels than female students. As per the study's recommendations, interventions are needed to improve the attitude of girls toward mathematics and to eradicate the math gender stereotype. Despite expected mean level differences in beliefs and emotions, the structural linkages with regard to control, value beliefs, emotions, and prior achievement, among others, were consistently assumed across genders. Accordingly, boys usually outperform girls in more complex areas of mathematics, specifically topics that require advanced mathematical understanding, analysis, and problem-solving skills, as determined and indicated by meta-analyses of learners' performance outcomes from primary school through adulthood. On the other hand, no significant differences, and in some cases or situations, this is considered a slight advantage for girls on the topics related to basic numerical skills and mathematical problems with a defined solution technique. Although there are variations between the mathematical performance of male and female students from high school to college levels, in consideration of the mathematical tasks, generally, the disparity between their performances in mathematics remains relatively small.

According to Tang and Zhao (2024), girls from more gender-equal regions do not usually experience math-specific stereotypes, and most of the time, they receive more attention from their mathematics teachers. In addition, their parents have higher educational aspirations for them, and they have assurances about the success of their future paths. The study suggested that there must be policy initiatives to alleviate the gap in mathematics in terms of gender. According to Luo and Chen (2024), over half of the male students believe that boys are better than girls in the field of mathematics. Indeed, their parents and society dictate the same beliefs. Interestingly, despite these kinds of perceptions, the empirical evidence suggests that female students often outperform male learners in mathematics. This shows contradictions between the actual performance and societal beliefs. Nevertheless, regardless of gender, what is more important is the established teacher-student relationships that can highlight the students' attitudes toward mathematics and their academic performance (Karadaar et al., 2024).

According to Xie and Liu (2023), the perspectives of students and parents concerning gender roles have a significant impact on the capability of both sexes in mathematics. Most of the time, male students are perceived as having high mathematical competence compared to female students, who have a negative effect on it. Moreover, the major factor that should probably be considered is the stereotypical views of the relationship between gender and mathematics, especially for female students who are often viewed as less competent in the world of mathematics. The study conducted by

Gevrek et al. (2020) showed that gender equity is important in the labor market in consideration of the gender math gap. It was found that the lower gender wage gap is significantly associated with a smaller portion of the gender math gap, which is advantageous to boys. These results imply how societal beliefs and structures, economic trends and incentives, and gender norms affect the academic performance of students and their perception of the ideas of mathematics.

According to Casad et al. (2017), there is a need to examine the potential risks and gender stereotyping in the context of education. The lack of initiatives and interventions that can address these existing academic challenges could result in a threat to equal learning opportunities across all genders. Educators and administrators can collaborate with various stakeholders and experts to develop and implement innovations and interventions to promote education for all students and to foster equal chances of pursuing STEM-related courses for all willing, qualified, and persistent learners.

In general, regardless of who is more mathematically competent between the male and female genders, the classroom should be an avenue for showcasing the skills, abilities, and competence of all students. Teachers must update and upgrade their teaching innovations and strategies; curriculum planners must revisit and enhance the learning competencies that are gender-sensitive and economically appropriate; and students must apply their learning by translating their knowledge to create project-based and problem-based outcomes that are sustainable and beneficial to the community.

## **THEORETICAL FRAMEWORK**

This study is anchored on Stereotype Threat Theory (Steele & Aronson, 1995), which explains that when individuals are commonly reminded and categorized with negative stereotypes about their culture, group, and norms, their performance may be affected. There is a high possibility that they will have self-anxiety and self-doubt that will cause them to not perform well in what is expected of them. With this theory, this study explored the students' mathematical competence with respect to their genders.

Also, this is supported by the Gender Schema Theory (Bem, 1981), which suggests that students develop their cognitive abilities depending on their socialization and cultural norms. In this study, if students believe that mathematics is intended for male or female students only, either of the two genders is likely to develop strong mathematical competence.

Furthermore, this study is also anchored on John Dewey's Learning by Doing Theory (1938/1997), which states that students become lifelong learners when they apply what they are studying. Moreover, it should not be presented as finished abstractions but should include the perspectives, including the preconceptions, and the global point of view of the students. Dewey believes connections between the subject and the child's

life should be made. In connection with this study, this framework agrees to identify the mathematical competence of college students through learning by doing and determine if their gender has something to do with developing their learning competence.

## **METHODOLOGY**

### **RESEARCH DESIGN**

This study applied quantitative research through statistical and mathematical techniques in measuring and analyzing data. The researcher used descriptive-correlational research to determine college students' mathematical competence level and identify the significant relationship between their math competence and gender. Descriptive research follows a systematic and purposive process of gathering, organizing, tabulating, analyzing, and interpreting quantitative data to describe prevailing beliefs, trends, and conditions. This method has various approaches, such as the conduct of a survey to depict the current status and correlational studies, to show the relationship between and among variables. The descriptive type of research is generally valuable and necessary for determining and investigating educational issues that encompass attitudes, preferences, practices, methodologies, approaches, and perceptions (Siedlecki, 2020). On the other hand, correlational research is commonly used for non-experimental research that explains the relationship between two or more variables (Seeram, 2019).

### **RESPONDENTS**

The respondents of the study were 128 college students from the College of Education in one of the state universities in Central Luzon, all of whom had already taken Mathematics in the Modern World. This study utilized the simple random sampling procedure, wherein the respondents were given equal opportunities to be part of this study. Simple random sampling is a commonly used sampling method, especially for a quantitative research study employing survey instruments. This sampling method ensures that members of the population have an equal and unbiased chance of being selected (Noor et al., 2022).

### **RESEARCH INSTRUMENT**

In this study, the researcher utilized a researcher-made questionnaire, which was answered by college students who had already completed Mathematics in the Modern World. To ensure the validity of the tool, it was validated by research, language, and mathematics experts. Each indicator was constructed following the Commission on Higher Education (CHED) issued Mathematics in the Modern World Learning Plan and Course Map, and based on the related pieces of literature. The expert validators' insights, comments, and recommendations were incorporated into the final form of the questionnaire. Also, a statistician was asked if the Likert scale was appropriate to ensure the comprehensiveness and clarity of every indicator. In addition, the research

questionnaire was content-validated by both internal and external validators. It was pilot-tested on 15 volunteer respondents following the 4-point Likert scale. The computed value of the Cronbach Alpha was 0.94, with an internal consistency of excellent. The research tool consisted of questions related to learning competencies reflected in the MMW Learning Plan and Course Map: Mathematics in Our World, Mathematical Language and Symbols, Problem-Solving and Reasoning, Statistics and Data Management, Consumer Mathematics, Linear Programming, Mathematics of Graphs, and Apportionment and Voting.

## **DATA GATHERING**

As to the facilitation of the conduct of data collection, the researcher first asked for permission from the campus director and college dean, which was duly noted by the program chairpersons. Afterward, the respondents were oriented about the nature, scope, and objectives of the study. Then, the Google form or a hard copy of the questionnaire was distributed or provided to the respondents. The gathered data were properly tallied and tabulated to ensure that the information was valid and reliable.

## **DATA ANALYSIS**

After data collection, the researcher scrutinized, organized, and analyzed the data using the Statistical Package for the Social Sciences (SPSS) software. The researcher determined the weighted mean, standard deviation, and descriptive interpretation using the 4-point Likert scale and Point-biserial correlation since the college students' mathematical competence was tested to see if it has a significant relationship to their gender. Additionally, these were tabulated and analyzed using a 4-point Likert scale (1-Strongly Disagree, 2-Disagree, 3-Agree, and 4-Strongly Agree). The mean ranges and verbal interpretation include: 1.00-1.49 = Strongly Disagree, 1.50-2.49=Disagree, 2.50-3.49=Agree, 3.50-4.00=Strongly Agree.

## **RESULTS**

Table 1 presents the data about the distribution of the respondents in terms of gender. As indicated below, the male respondents were 64 or 50%, and the female respondents were 64 or 50%. Overall, there were 128 respondents from the College of Education.

Table 1. Distribution of respondents in terms of gender

<b>Indicators</b>	<b>Frequency</b>	<b>Percentage</b>
Male	64	50.00
Female	64	50.00
<b>Total</b>	<b>128</b>	<b>100.00</b>

Table 2 presents the data on the mathematical competence of college students across genders in terms of mathematics in our world.

As shown in the table, the highest calculated mean value was 3.34, with a descriptive interpretation of agree and a standard deviation of 0.75, which indicates that undergraduate students can determine and classify patterns in nature as well as regularities in the world. On the other hand, the indicators that have the lowest computed mean of 3.03 were 2 and 4, which agree, with a standard deviation of 0.80 and 0.76, respectively. This only indicates that the learners can predict the behavior of nature and phenomena in the world using mathematics, and they can apply the Fibonacci Sequence in real-life situations. The general weighted mean is 3.15, with a verbal interpretation of agree and a standard deviation of 0.73. It only indicates that college students across genders who took up mathematics in the modern world show mathematical competence in terms of mathematics in our world.

Table 2. Mathematical Competence of College Students Across Genders in terms of Mathematics in Our World

<b>Indicators</b>	<b>Weighted Mean</b>	<b>Std. dev.</b>	<b>Descriptive Interpretation</b>
I can determine and classify patterns in nature as well as regularities in the world.	3.34	0.75	Agree
I can predict the behavior of nature and phenomena in the world using mathematics.	3.03	0.80	Agree
I can articulately express and cognitively argue on the nature of mathematics and how it should be appropriately represented and applied.	3.15	0.68	Agree
I apply the Fibonacci Sequence in a real-life situation.	3.03	0.76	Agree
I know how to organize sequences, patterns, and regularities in the world.	3.19	0.68	Agree
<b>General Weighted Mean</b>	<b>3.15</b>	<b>0.73</b>	<b>Agree</b>
Legend: 3.50-4.00 Strongly Agree	2.50-3.49 Agree	1.50-2.49 Disagree	1.00-1.49 Strongly Disagree

Table 3 shows the data about the mathematical competence of college students across genders in terms of mathematical language and symbols.

As reflected in Table 3, the mean with the highest value was indicator 2, with a weighted mean of 3.28, a descriptive interpretation of agree, and a standard deviation of 0.69. It only indicates that college students acknowledge that mathematics as a learning discipline is a useful language that can enhance critical and analytical thinking. Also, the lowest mean value was 3.10 with a standard deviation of 0.74, which means that the learners agree that they can translate mathematical language into verbal phrases and vice versa. The general weighted mean of 3.17 with a computed standard deviation of 0.72 infers that the students agree they have mathematical competence in terms of mathematical language and symbols.

Table 3. Mathematical Competence of College Students Across Genders in Terms of Mathematical Language and Symbols

Indicators	Weighted Mean	Std. dev.	Descriptive Interpretation
I can discuss the symbols, language, and conventions in mathematics.	3.21	0.69	Agree
I acknowledge that mathematics as a learning discipline is a useful language that can enhance critical and analytical thinking.	3.28	0.69	Agree
I perform operations on mathematical expressions accurately.	3.13	0.76	Agree
I apply the fundamental concepts of sets, functions, relations, and binary operations.	3.15	0.74	Agree
I can translate from mathematical language to verbal phrases and vice versa.	3.10	0.74	Agree
<b>General Weighted Mean</b>	<b>3.17</b>	<b>0.72</b>	<b>Agree</b>

Legend: 3.50-4.00 Strongly Agree 2.50-3.49 Agree 1.50-2.49 Disagree 1.00-1.49 Strongly Disagree

Table 4 shows the interpretation of data about the mathematical competence of college students across genders in terms of problem-solving and reasoning.

As indicated below, indicator 1 has the highest mean value of 3.24 with a standard deviation of 0.65, which means that the college students agree that they used different types of reasoning to mathematically prove statements and arguments. On the other hand, the lowest mean value was 3.03, with a verbal interpretation of agree and a standard deviation of 0.82, indicating that the students can solve problems following Polya’s four steps. The computed general weighted mean value was 3.13, with a standard deviation of 0.77. This means that college students agree that they have mastered mathematical competence in terms of problem-solving and reasoning.

Table 4. Mathematical Competence of College Students Across Genders in terms of Problem-Solving and Reasoning

Indicators	Weighted Mean	Std. dev.	Descriptive Interpretation
I used different types of reasoning to mathematically prove statements and arguments.	3.24	0.65	Agree
I can solve problems using Polya’s four steps.	3.03	0.82	Agree
I write clear and logical proofs in mathematics.	3.06	0.78	Agree
I am using different methods and approaches for proving and solving mathematical problems.	3.12	0.86	Agree
I can apply inductive and deductive reasoning in solving mathematical problems.	3.19	0.74	Agree
<b>General Weighted Mean</b>	<b>3.13</b>	<b>0.77</b>	<b>Agree</b>

Legend: 3.50-4.00 Strongly Agree 2.50-3.49 Agree 1.50-2.49 Disagree 1.00-1.49 Strongly Disagree

Table 5 presents the data about the mathematical competence of college students across genders in terms of statistics and data management.

As reflected in the data, the mean score with the highest value was indicator 3, with a weighted mean of 3.31 and a standard deviation of 0.66. It means that college

students agree they can gather, organize, analyze, and present data using statistics. Moreover, the lowest mean score was 3.10 for indicator 5. It has a standard deviation of 0.76, which means that the students agree that they can create new knowledge about the measures of dispersion, such as range, standard deviation, and variance. The calculated general weighted mean was 3.16, with a standard deviation of 0.72. Furthermore, it indicates that college students agree that they have mathematical competence in terms of statistics and data management.

Table 5. Mathematical Competence of College Students Across Genders in Terms of Statistics and Data Management

<b>Indicators</b>	<b>Weighted Mean</b>	<b>Std. dev.</b>	<b>Descriptive Interpretation</b>
I can apply different types of statistical tools to process, analyze, interpret, and manage numerical data.	3.13	0.72	Agree
I can apply the methods of correlations and linear regression to predict the value of a variable, following certain given considerations.	3.13	0.72	Agree
I can gather, organize, analyze, and present data using statistics.	3.31	0.66	Agree
I apply the measures of central tendency, such as mean, median, and mode, in real-life situations.	3.12	0.73	Agree
I can create new knowledge about the measures of dispersion, such as range, standard deviation, and variance.	3.10	0.76	Agree
<b>General Weighted Mean</b>	<b>3.16</b>	<b>0.72</b>	<b>Agree</b>
Legend: 3.50-4.00 Strongly Agree    2.50-3.49 Agree    1.50-2.49 Disagree    1.00-1.49 Strongly Disagree			

Table 6 shows the data about the mathematical competence of college students across genders in terms of consumer mathematics. As indicated in Table 6, the highest mean score was 3.25, with a standard deviation of 0.66 and a verbal description of agree.

This only means that college students understand the concepts related to borrowing and loan repayment. The lowest mean value was 3.06 with a standard deviation of 0.72, which indicates that the learners agree that they can solve problems about accumulation and discounting. The general weighted mean was 3.13, with a standard deviation of 0.70. Therefore, it indicates that college students, regardless of their gender, agree that they have mathematical competence in terms of consumer mathematics.

Table 6. Mathematical Competence of College Students Across Genders in Terms of Consumer Mathematics

Indicators	Weighted Mean	Std. dev.	Descriptive Interpretation
I can solve word problems involving simple interests and compound interests.	3.19	0.70	Agree
I built prior knowledge of mathematics of investment in understanding and solving consumer credits and loans.	3.07	0.72	Agree
I understand concepts related to borrowing and loan repayment.	3.25	0.66	Agree
I demonstrate knowledge and understanding of the personal investment planning process.	3.09	0.71	Agree
I can solve problems about accumulation and discounting.	3.06	0.72	Agree
<b>General Weighted Mean</b>	<b>3.13</b>	<b>0.70</b>	<b>Agree</b>

Legend: 3.50-4.00 Strongly Agree 2.50-3.49 Agree 1.50-2.49 Disagree 1.00-1.49 Strongly Disagree

Table 7 reflects the mathematical competence of college students across genders in terms of linear programming. The highest mean value was 3.12, with a verbal description of agree and a standard deviation of 0.73. It infers that college students can use mathematical tools, strategies, and concepts in areas of voting, finance, logic, business, systems, and networks. On the other hand, the lowest mean score was 2.99, with a standard deviation of 0.75 and a verbal description of agree. This indicates that undergraduate students can use graphic solutions to resolve linear programming problems in industry and business. The calculated general weighted mean of 3.05 with a

standard deviation of 0.74 shows that the college students agree that they have mathematical competence in terms of linear programming.

Table 7. Mathematical Competence of College Students Across Genders in Terms of Linear Programming

Indicators	Weighted Mean	Std. dev.	Descriptive Interpretation
I understand the characteristics of linear programming problems.	3.00	0.78	Agree
I can use mathematical tools, strategies, and concepts in areas of voting, finance, logic, business, systems, and networks.	3.12	0.73	Agree
I used graphic solutions in resolving linear programming problems in industry and business.	2.99	0.75	Agree
I can solve linear inequalities in two variables.	3.10	0.70	Agree
I know how to apply the geometry of linear programming in real-life situations.	3.04	0.75	Agree
<b>General Weighted Mean</b>	<b>3.05</b>	<b>0.74</b>	<b>Agree</b>

Legend: 3.50-4.00 Strongly Agree 2.50-3.49 Agree 1.50-2.49 Disagree 1.00-1.49 Strongly Disagree

Table 8 presents the data about the mathematical competence of college students across genders in terms of the mathematics of graphs. As indicated below, the highest mean score of 3.12 with a standard deviation of 0.66 infers that college students agree that they can apply the concepts of graph theory in terms of decision-making and planning to design structures and networks. The lowest mean score of 2.87 with a standard deviation of 0.83 shows that the undergraduate students agree they have demonstrated knowledge of Eulerian graphs. The computed general weighted mean of 3.01 with a standard deviation of 0.73 indicates that the college students agree that they have mathematical competence in terms of the mathematics of graphs.

Table 8. Mathematical Competence of College Students Across Genders in Terms of

Mathematics of Graphs

Indicators	Weighted Mean	Std. dev.	Descriptive Interpretation
I can graph linear functions, quadratic functions, and polynomial functions.	3.10	0.70	Agree
I demonstrate knowledge of the basic concepts of graph theory.	3.04	0.64	Agree
I can apply the concepts of graph theory in terms of decision-making and planning to design structures and networks.	3.12	0.66	Agree
I demonstrate knowledge of Eulerian graphs.	2.87	0.83	Agree
I create knowledge on Hamiltonian graphs.	2.93	0.82	Agree
<b>General Weighted Mean</b>	<b>3.01</b>	<b>0.73</b>	<b>Agree</b>

Legend: 3.50-4.00 Strongly Agree    2.50-3.49 Agree    1.50-2.49 Disagree    1.00-1.49 Strongly Disagree

Table 9 presents the data about the mathematical competence of college students across genders in terms of apportionment and voting. As shown in the table below, the highest mean score was 3.07, with a standard deviation of 0.80 and a descriptive interpretation of agree. It infers that college students can apply various types of reasoning to justify mathematical statements and arguments in connection with the underlying concepts. In addition, the lowest mean value was 3.03 with a standard deviation of 0.80, which indicates that the undergraduate students agree that they can determine apportionment using different methods. Furthermore, the computed general weighted mean of 3.05 with a standard deviation of 0.80 indicates that the college students agree that they have mathematical competence in terms of apportionment and voting.

Table 10 presents the data about the significant relationship between the mathematical competence and gender of college students in mathematics in the modern world. As presented in the table, the mean value of the gender is 0.48, while the mathematical competence of the college students across genders is 3.07. Using the Point-biserial correlation, the r-value is 0.02901, which indicates that there is a very weak positive relationship between the variables, and the computed p-value of 0.81576, which is greater than the 0.05 level of significance, with these data, it is concluded that there is

no significant relationship between the mathematical competence and gender of college students in Mathematics in the Modern World.

Table 9. Mathematical Competence of College Students Across Genders in Terms of Apportionment and Voting

Indicators	Weighted Mean	Std. dev.	Descriptive Interpretation
I can apply various types of reasoning to justify mathematical statements and arguments in connection with the underlying concepts.	3.07	0.80	Agree
I determine apportionment using different methods.	3.03	0.80	Agree
I can compare the strengths and weaknesses of apportionment methods.	3.04	0.82	Agree
I determine whether the winner of an election has a plurality or a majority of the votes.	3.05	0.80	Agree
I determine the winner of a preference voting using different methods.	3.06	0.80	Agree
<b>General Weighted Mean</b>	<b>3.05</b>	<b>0.80</b>	<b>Agree</b>

Legend: 3.50-4.00 Strongly Agree 2.50-3.49 Agree 1.50-2.49 Disagree 1.00-1.49 Strongly Disagree

Table 10. Significant Relationship between the Mathematical Competence and Gender of College Students in Mathematics in the Modern World

Indicators	Gender	Mathematical Competence
Mean	0.48	3.07
R-value		0.02901
P-value		0.81576
Decision	There is no significant relationship between the mathematical competence and gender of college students in Mathematics in the Modern World.	

## DISCUSSION

As indicated above, 64 or 50% of the male respondents were male, and 64 or 50% of the female respondents were female, with a total of 128 respondents from the College of Education in one of the state universities in Central Luzon.

According to Steen (1988), mathematics studies the connections between numbers, quantities, and patterns. Arithmetic, algebra, trigonometry, geometry, statistics, and calculus are all included. Mathematics enhances human traits such as creativity, logic, critical thinking, and others. It allows the learners to use numerous ways to tackle simple and complicated issues in various real-world scenarios. Mathematics is a global language that makes sense of the world and communicates comprehension of concepts and rules via mathematical symbols, signs, proofs, language, and traditions. Mathematics helps to arrange the world's patterns and regularities. In relevance to the study, the students should have mastered the basic learning competencies of mathematics so that they can deal with complex numerical terms and problems.

In the study of Kharde (2016), mathematics is written in a symbolic language intended to express mathematical ideas. The English language is a source of information, but it is not intended for mathematical computation. In relevance to the study, this only shows how mathematical ideas, procedures, and facts are conveyed symbolically. That is, it stresses reading and writing mathematics.

In relevance to the study of Robertson (1996), the distinction between reasoning representation and the subsequent problem-solving process is emphasized, as is the significance of memory in problem-solving. The approaches for searching data and the distinctions between novices and experts are described. In connection with the study, college students must be exposed to various critical and analytical thinking problems so that their logical and reasoning skills will be enhanced and developed. In this study, it was found that undergraduate learners can enhance their statistical skills since they demonstrated certain knowledge about organizing, analyzing, interpreting, and presenting gathered data.

According to Lankford (1974), everyone is a consumer of products and services and must constantly decide what, when, and where to buy. The customers must also pick what items and services they can afford for themselves or their family, and how to pay for them. These and many other everyday purchasing decisions will be made intelligently, with the benefit of improved economic health, or foolishly, with disastrous repercussions. In connection with this study, college students are being taught how to become wise and practical consumers.

According to Britannica (2017), linear programming is a type of mathematical modeling approach in which a linear function is maximized or minimized within given constraints and certain considerations. This method has been utilized to provide support

in terms of decision-making in industrial engineering, corporate planning, and, to a lesser extent, in the physical and social sciences. In connection with the study, linear programming helped the students prepare themselves for the practical and real-life application of this in actual scenarios.

According to Weisstein (1966), in mathematics, the term "graph" has at least two conceptual definitions. In introductory mathematics, the term graph typically pertains to the graph of a function, or a plot that represents and shows relationships between given variables. In complex mathematics, a graph consists of points, referred to as vertices or nodes, and the lines that connect them are called arcs or graph edges.

According to El-Helaly (2019), the most sophisticated mathematical ideas employed in this work are combinatorics, the concept of a graph, the harmonic mean, and an order relation. They are adequately taught when necessary. However, there are several voting procedures and criteria for determining the winner.

Since the data suggested that there is no significant relationship between the mathematical competence and the gender of undergraduate students in learning Mathematics in the Modern World, it is necessary to implement a gender-based and relevant teaching strategy that will foster students' mathematical competence. This teaching innovation can be integrated to eliminate gender gaps, stereotyping, and other behavioral, affective, and cognitive factors that hinder effective and meaningful learning processes. Based on the results of this study and the existing pieces of literature, the CORE (Contextualization, Observation, Reflection, and Evaluation) Method is recommended as the teaching strategy to be utilized by educators in teaching Mathematics in the Modern World and other learning disciplines. The CORE Method is a teaching strategy that aims to develop, enrich, and integrate every student's cognitive, psychomotor, and affective domains. This is an effective and efficient way to stimulate the learners' curiosity as they deal with the realms and practical applications of mathematics. This method is applicable and limited to mathematics and can be used in other learning disciplines applicable across all genders. To further understand the method, it is discussed as follows:

**Contextualization.** Firstly, during the motivation as part of the preliminary activity, the teacher must have localized examples relevant to the topic to be discussed. These illustrations are one way of motivating the students to engage in the teaching-learning process. Contextualization plays an important role in helping the students relate to the nature and importance of the lesson they are exploring, discovering, and learning.

**Observation.** Secondly, during the discussion, the teacher must let the students observe the given examples first. For example, if it is an application of a formula, let the students decipher how it was solved. Let the students stimulate their curiosity and process the data. Students are innate organizers of information, and with their various learning styles and mechanisms, they can digest the topic being discussed.

**Reflection.** Thirdly, after the discussion, the teacher must assess the lesson's relevance to students by asking them about the topic's importance in their lives. An educator is not only honing the skills and igniting the minds of the students but also modifying their behaviors.

**Evaluation.** Lastly, outside the classroom, the teacher must let the students give examples or create knowledge based on their prior schema. In the CORE Method, the students are required to conduct a self-evaluation of what they have acquired. The assessment part will help the students to learn by and within themselves. Through self-assessment, they are becoming lifelong learners, combined with their experiences.

## **CONCLUSIONS**

As per the results of the analyzed and interpreted data, undergraduate students, regardless of gender, demonstrated mathematical competence, especially in the Mathematics in the Modern World course. The data showed there is no significant relationship between mathematical competence and the gender of college students. During the conduct of the study, it was also observed that they engaged more in the teaching-learning process if they were exposed to inclusive, gender-sensitive, and culturally oriented learning tasks. The teacher was also one of the major factors considered when using proper language and tone of voice when discussing the lesson. Students were motivated to participate and learn alongside their classmates when their ideas were acknowledged. It was also found that students effectively learn when they can relate the lessons to real-life situations. In addition, formulas became more meaningful when the teacher presented examples and allowed students to decipher or understand the process of solving problems, resulting in more mathematically competent learners.

## **RECOMMENDATIONS**

The Higher Educational Institutions (HEIs) instructors should ensure that they are knowledgeable about the present trends, issues, and demands in terms of the changes in the learning community, especially with the knowledge of gender identity, orientation, and expression, as it affects how students communicate within the learning community. The utilization of proper gender-sensitive and non-sexist words is essential so that the students can freely express their ideas, which can result in active engagement, participation, and involvement before, during, and after the class discussion. In addition, in mathematics class, teachers must have a welcoming personality so that students will not experience high levels of self-anxiety and self-doubt. There must also be gender-

based policies and initiatives that will address the academic concerns of the learners. A regular feedback mechanism is necessary to ensure goal-driven and holistic development among learners. Lastly, the CORE (Contextualization, Observation, Reflection, and Evaluation) Method is suggested to be utilized and integrated by instructors as one of the teaching strategies for making the class more interactive, goal-oriented, gender-based, and outcome-based. As to institutional support, the management may allocate funding to capacitate the knowledge of the instructors concerning gender and development and to conduct training relevant to the proper utilization of the aforementioned teaching strategy.

## **IMPLICATIONS**

This study may significantly influence the instructors to use gender-neutral and non-sexist words toward their students, which can produce an outcome of inclusive education. On the part of the learners, they can learn the lessons in mathematics effectively and efficiently without self-anxiety and self-doubt because gender stereotyping, norms, and discrimination will be lessened or eliminated in accordance with the implementation of educational policies related to gender and development. The CORE Method, as an output of the study, provides opportunities for curriculum development, review, and enhancement, ensuring that the learning and performance outcomes are aligned with the orientations, needs, interests, and competencies of both the instructors and students. As to the development of the mathematical competence of the students regardless of gender, there will be more learning experiences and opportunities that will surely showcase their mathematical abilities.

## **ACKNOWLEDGEMENT**

The author of this study acknowledges the contributions of the respondents and the experts toward the success of this research endeavor.

## **FUNDING**

This study was supported by the author's affiliation.

## **DECLARATIONS**

### ***Conflict of Interest***

The author confirms that no conflict of interest exists between the author and the concerned respondents and stakeholders that might affect the content of this article.

## **Informed Consent**

The author confirms that the respondents received informed consent before the conduct of this study.

## **Ethics Approval**

Throughout the research process, the researcher followed ethical guidelines. The respondents were properly informed about the nature, scope, and objectives of this research study. Also, the data were treated with utmost care and confidentiality. All communication letters were secured before the conduct of this study.

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## Author's Biography

Mr. Mark Jameson E. Perez, a licensed mathematics teacher, faculty researcher, and research consultant at Pampanga State University – Mexico Campus, Pampanga, Philippines, where he also serves as the Academic Chairperson. He holds a Master of Arts in Education major in Educational Management and is currently pursuing a Doctor of Education in Educational Management at Pampanga State University. His research interests include mathematics, educational management, quality management systems, curriculum and instruction, and assessment.