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Perceived importance and level of mathematical skills among math and non-math major students in mathematics in the modern world

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Abstract

The study assessed the extent of skills acquired by the mathematics and non-mathematics major students to the new general education course, MMW. Specifically, this study investigated the significance of the difference between the levels of mathematical skills and perceived important mathematical skills of the students for career success. Likewise, the correlation between perceived acquired mathematical skills and important mathematical skills in MMW. A descriptive research design, comparative, and correlational methods of analysis were utilized. Data were collected using a survey questionnaire with prior validation and reliability measurements. A random of 134 teacher education students were selected. The results revealed that the overall level of mathematical skills in the MMW of the mathematics major students was very good, while Good for the non-mathematics major students. On the other hand, the mathematics major students perceived the skills acquired in the MMW as very important for career success for a moderately important perception of the non-mathematics major students. A statistical significance of the difference was obtained between the level of mathematical skills ($t = 7.69$, $p = 0.001$), and the perceived importance of skills ($t = 4.65$, $p = 0.001$) between the group of students. A significance of the relationship was found between student's perceive important mathematical skills and perceived level of mathematical skills ($r=0.421$; $p=0.001$). It is recommended that the teacher education department faculty members should continue improving and strengthening its quality of instruction to increase the level of mathematical skills of the mathematics major students from very good to excellence, and good to excellence for the non-mathematics major students. Maximize the teaching motivation and learning motivation of the non-mathematics major students to increase their perception of the importance of mathematical skills from moderately important to very important.

Keywords: *General education course, Mathematics in the modern world, Perceived level of mathematical skills, Perceive important mathematical skills*

Introduction

The significance of mathematics in any field of discipline is cannot be denied. Eisen et al. (2005) argued that the necessity of acquiring mathematical knowledge and skills plays a crucial in any occupational field (as cited in McCormick & Lucas, 2011). Mathematical skills are one of the fundamental skills that employers are looking for (Rosenberg et al., 2012). Likewise, the level of mathematical thinking of students in this information-based society is vital in developing process skills such as innovative ways to find a solution to a problem (Anthony & Walshaw, 2009; Karadag, 2009). The need for continuous improvement of mathematical thinking in mathematics education is highly important for the reason that one of the concerns of today's mathematics education is to produce intelligent learners who will eventually become better citizens of the future (Cordova & Tan, 2018). In almost future jobs, college-level mathematical skills will be one of the most required skills (Huebner & Corbett, 2008).

Laursen (2009) defined eight mathematics competencies that students must possess: mathematical thinking, problem handling, modeling, reasoning, representation, symbols and formalism, communications, and aids and tools (as cited in Zeidmane, 2012). Similarly, Cordova and Tan (2018) broken down mathematical proficiency into five strands into conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and productive disposition. Further, according to Corbeshly and Traxsaw (2010), the mathematical skills that can be acquired by the students upon entering the university can be categorized into four: subject knowledge, number sense, measurement and data, reasoning, and generalization. These mathematical competencies can be grouped into a) competences concerning the ability to ask and answer questions about utilizing mathematics (mathematical thinking, problem handling, reasoning, and modeling); and b) competencies that concern the students' ability to engage with mathematical language and tools (representation, symbols and formalism, communications, and aid and tools). The above categorization of mathematics skills were the demands skills nowadays. According to Achieve (2005), in today's demands, employers want to have individuals who have the ability and skills to be effective in oral and written communications, to be independent researchers, and be complex problem solvers (as cited in McCormick & Lucas, 2011).

As a response to the fast-changing academic and non-academic environment in the demands of the different sectors, the Commission on Higher Education (CHED) of the Philippines embarked on the revision of the general education curriculum and set a new minimum standard for the general education curriculum components of all degree programs that applies to any private and public HEI (Francisco, 2017). This includes the Mathematics in the Modern World (MMW) course as the new general education mathematics subject that was stipulated in CHED Memorandum Order No. 20 Series of 2013 (CHED, 2013). This course deals with the different topics in Mathematics that focus on the nature of mathematics, appreciation of its practical, intellectual, and aesthetic dimensions, and application of mathematical tools in daily life (CHED, 2013). This was one of the CHED's initiatives to ASEAN integration to increase the effectiveness of higher education in the Philippines (CHED, 2016). Since one of the core missions of any academic institution is to continuously improve the quality of instruction, it has a direct long-term impact on students (Cornillez, 2019). Unlike the previous mathematics general education course that focuses on one learning area per semester in the first-year study, this new mathematics general education course requires students to study the modern approaches and applications of the various learning areas of mathematics. On the other hand, there were only a few studies in the literature were available that centered on MMW. These studies were focused on the assessment of students' performance in MMW, student's level of difficulty experienced in MMW, and the extent of skills acquisition in MMW (Remo, 2019; Roman & Villanueva, 2020). This current study extends on the assessment of the perceived level of skills acquired by the students, and exploring the skills perceived by the students as significantly important for career success. In any Higher Educational Institutions (HEI), students are trained to be equipped with necessary mathematical knowledge and skills and these become one of the core indicators in producing competent and excellent graduates.

It is time to evaluate the effectiveness and value of the skills and topics discussed in the current general education course, MMW, and determine whether they meet the demands of today's needs. This research will inform teachers in both senior high school and university settings about the skills that students struggle with and do not possess, allowing them to develop necessary strategies to better prepare students. The analysis will also serve as an indicator for HEI understudy students to see if their admission into the mathematics program despite their lack of training in k-12 education has a negative or positive impact on the program's current success.

Objectives of the study

This study aimed to determine the breadth of skills acquired by mathematics and non-mathematics major students enrolled in the CHED-mandated new general education course, MMW. The researchers also evaluated the relative value of the skills taught in the course. The report specifically addressed the following issues.

1. To ascertain the perceived level of acquired mathematical skills of MMW students.
2. To determine which mathematical skills in the MMW students believe are important for career success.
3. To measure the significance of the difference in the perceived level of acquired mathematical skills between mathematics and non-mathematics major students in MMW.
4. To measure the significance of the difference in perceptions of important mathematical skills in MMW between mathematics and non-mathematics major students.
5. To investigate the significance of the relationship between students' perceived important skills and their perceived level of mathematical skill acquisition in MMW.

Theoretical and conceptual framework of the study

The study was anchored in the theory of Social Learning advocated by Bandura (1977). The theory assumed that personality and behavior can be best explained based on the unique learning experiences of the individual (Bandura, 1977). This assumption does not deny the significance of innate and developmental processes. Social learning theory describes the acquisition of skills that are developed exclusively or primarily within social groups (Bandura, 1977; Ormrod, 1999). Moreover, social learning theory acknowledges the significance of self-efficacy that is people's beliefs about their skills, and the outcomes that are likely to result from using these skills, have a significant impact on behavior (Ashford & LeCroy, 2010). This study identified different mathematical skills as the course MMW prescribed. In this study, the students evaluate the level of their acquired skills in the course and perceived that these acquired mathematical skills are significantly important for career success.

The variables and hypotheses that were used in the analysis are shown in figure 1. The students' acquired level of mathematical skills and perceived value of the skills acquired were the dependent variables in this analysis. The division of students into mathematics and non-mathematics majors was the independent variable. To see whether these levels of acquired mathematical skills and the perceived value of the skills covered in the course differed significantly between students who major and non-major in mathematics, an independent-samples t-test for two population means was used. On the one hand, correlation analysis was used to assess the importance of the relationship between learned skills and perceived essential skills in MMW.

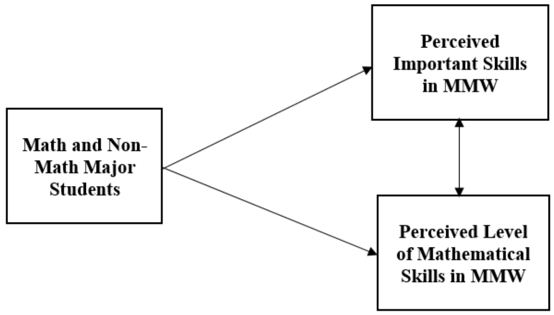

Figure 1. Conceptual Framework of the Study

H_1 : there is no statistical significance of the difference between the acquired mathematical skills of the mathematics and non-mathematics major students in MMW;

H_2 : there is no statistical significance of the difference between the perceived important skills of the mathematics and non-mathematics major students in MMW;

H_3 : there is a statistical significance of the relationship between perceived important skills and the level of acquired mathematical skills of the students in MMW.

Methodology

Research Design

The study took a quantitative approach, with descriptive, comparative, and correlational designs (Nassaji, 2015). The study's nature was suitable since the primary goal was to evaluate the students' respondents' level of ability in MMW and their perception of the value of these acquired skills. It assessed the association between perceived essential skills and the degree of acquired skills, so it is correlational. To address the study's research questions, descriptive, comparative methods of analysis, and correlation were used.

Research respondents

The study's respondents were Visayas State University Alangalang campus undergraduate second-year teacher education students from Alangalang, Leyte, Philippines enrolled in the first semester of the school year 2019-2020 in the Bachelor of Elementary Education (BEED) and Bachelor of Science in Secondary Education with a major in mathematics (BSEd-Math) programs. Using the electronic student's management system (e-SMS) of the HEI under review, the population size of the target respondents was determined to be 206 (59 BSEd and 147 BEEd students). The sample size was estimated at 134 using the sample size formula for finite population (Israel, 1992) with a degree of precision of 5%, a level of confidence of 95%, and a proportion of data variability of 50%. To ensure that the survey respondents were representative of the degree programs, the researchers used a stratified random sampling technique (Rahi, 2017) in the selection process. The proportionate distribution of the representative sample was as follows: The BSEd Mathematics program yielded 38 students, while the BEEd program yielded 96.

Female respondents account for 82.1 percent of the 134 student respondents, while male respondents account for 17.9 percent. The majority of the respondents, 80.6 percent, are between the ages of 19 and 21, with just 17.9% over the age of 22. 74.6 percent of respondents were enrolled in a BEEd program, while 25.4 percent were in a BSEd mathematics program.

Research instrument

The researchers used survey questionnaires created by the researchers. The elements used were taken from a CHED sample syllabus (CHED, 2017). The questions were all closed-ended and consisted of the following main components: Part I delves into the demographics of the respondents in terms of age, gender, and degree program, while Part II delves into the level of mathematical skills acquired and the respondents' perceptions of level value for the defined mathematical skills. For measuring the level of mathematical skills acquired, respondents were asked to rate the survey questionnaire using a 5-point scale rating (Vagias, 2006), ranging from strongly disagree (1) to strongly agree (5), while a 7-point scale rating (Vagias, 2006), ranging from not all important (1) to extremely important (7), was used to assess the perceived level of importance of the skill. Each of the identified competencies consists of five items/statements where respondents were asked to rate using a five-point Likert scale ranging from (1) Not Competent to (5) Very Competent. Similarly, respondents were asked to rate their overall satisfaction towards their science teacher's teaching competence using the scale response (1) Very Dissatisfied to (5) Very Satisfied.

Validity and reliability of the research instrument

The questionnaire consisted of 33 questions that assessed the extent of acquired mathematical skills as well as the perceived value of those skills. The researchers performed a validity and reliability evaluation of the research instrument before the final data collection process. Face validity (Connell et al., 2018) was used to measure the items on the adequacy, comprehensiveness, and significance of a specific instrument. This means that all-important items are included and all items that are unacceptable to a particular construct are eliminated. Four senior mathematics faculty members with at least five years of teaching experience were selected to participate in the face validity process. Furthermore, a dry-run survey of the updated instrument after face validity was conducted with 116 student respondents on one of the HEI understudy's external campuses. Cronbach's alpha and Composite reliability were used to assess the reliability of the produced data (Taber, 2017, Peterson & Kim, 2013). The Statistical Product and Service Solution program was used to calculate the reliability metric (Brace et al., 2012).

Following the face validity procedure, 29 of the 33 objects were agreed to be held. Four items were omitted, and slight changes were made to the grammar and layout of some of the items that were kept. Table 1 shows the results of the survey questionnaire's reliability test.

Table 1. Reliability Measurement

Construct	CA	CR	Interpretation
PLMS	0.943	0.901	Reliable
PIMS	0.907	0.899	Reliable

Notes: PLMS – Perceived Level of Mathematical Skills; PIMS – Perceived Important Mathematical Skills; CA – Cronbach's alpha; CR – Composite reliability

If CA and CR ≥ 0.70 *– Reliable*

Test of reliability or internal consistency was used to assess the consistency of the items in terms of what the items are supposed to measure (Taber, 2017; Kim & Peterson, 2013; Roldán & Sánchez-Franco, 2012). A coefficient value of Cronbach's alpha and composite reliability of equal to or greater than 0.70 must be met to obtain high reliability or internal consistency of items being measured (Kock & Lynn, 2012). As presented in Table 1, the items' measured of the instrument were reliable.

Data gathering procedure

Before collecting data, the researchers made certain that all procedures were followed. The actual data collection process began on November 25, 2019 and was concluded on November 27, 2019. The researchers administered the survey questionnaire to the selected respondents after outlining the study's goals and importance, as well as its ethical considerations, and assuring them that all data collected would be treated with the utmost confidentiality and used solely for the study. All of the collected data was electronically coded and stored for review.

Ethical Consideration

Prior to the conduct of the study, the researchers ensured that they had all the required permit letters and sent them to the various deans of the HEI where the study was performed. Informed consent was signed by the interested respondents, ensuring voluntary involvement of the selected respondents. All of the respondents were given a thorough explanation of the study's goals and significance. The data collected was kept in strict confidence and was only used for the analysis.

Data analysis

The researchers hypothesized that there was no substantial difference between mathematics and non-mathematics students' levels of acquired mathematical skills and perceived significance. Similarly, there is no significance of the correlation between mathematical ability level and perceived importance of these skills. To test the study's hypotheses, the independent-samples t-test for two population means (Kim, 2015) and

Pearson r correlational analysis was used. Also computed were descriptive statistics including percentage, mean (M), and standard deviation (SD). We rejected the study's null hypotheses, the degree of significance alpha was set at 0.05.

Result and discussion

The objectives of this study were to determine the breadth of skills acquired by mathematics and non-mathematics major students enrolled in MMW, a new general education course. The researchers used comparative and correlational analysis to determine if there was a substantial gap between the students' acquired level of mathematical skills and their perceived value of those skills and a significant relationship between variables under study.

Students Perceived Level of Mathematical Skills in MMW

Table 1 indicates the perceived level of competence in the science teaching competence of the students towards their science teachers in Tolosa Leyte. It can be gleaned that students perceived their teachers as competent in terms of commitment, knowledge of the subject matter, application of teaching strategy, and classroom management with a corresponding weighted mean of 3.60; 3.85; 4.19; 4.04, respectively. It can be noted further that the overall science teacher's teaching competence obtained a weighted mean of 3.92 (SD = 0.468), interpreted as competent with the standard deviation of 0.468 is interpreted as satisfied in terms of the student's level of satisfaction.

The level of mathematical skills gained by BEEd students in the MMW is shown in Table 3. The ability to express the importance of mathematics in human life received the highest mean score (M = 3.92, SD = 0.77). The skills "I can build my conjecture" (M = 3.01, SD = 0.77) and "I can prove the given conjecture" (M = 3.05, SD = 0.66), on the other hand, had the lowest mean scores and were interpreted as strong. The non-mathematics students' overall level of mathematical skills is considered high (M = 0.40, SD = 0.45).

Table 2. Level of Acquired Mathematical Skills in the MMW Among Mathematics Major Students

Acquired Mathematical Skill	WM	*SD*	Interpretation
1. I can identify the Fibonacci sequence.	4.03	0.72	Very Good
2. I can identify patterns in nature and regularities in the world.	3.65	0.77	Good
3. I can articulate the significance of mathematics in human life.	4.12	0.81	Good
4. I can determine the significance of mathematics in predicting the behavior of nature and phenomena in the world.	3.68	0.88	Good
5. I can explain the nature of mathematics as a language.	3.62	0.82	Good
6. I can calculate sets, functions, relations and binary operations.	3.88	0.69	Good
7. I can use some basic concepts of elementary logic such as connective, quantifiers, negations, and variables.	3.82	0.76	Good
8. I can use a calculator properly in solving mathematical and statistical problems.	4.18	0.76	Very Good
9. I can find connections between mathematical ideas.	3.68	0.64	Very Good
10. I can reflect on my mathematical reasoning.	3.71	0.68	Very Good
11. I can prove a given conjecture.	3.24	0.78	Good
12. I can justify my answer to my given solution.	3.53	0.90	Very Good
13. I can apply the given for solving problems in multiple contexts.	3.56	0.79	Very Good
14. I can develop my conjecture.	3.35	0.77	Very Good
15. I can use various forms of reasoning to problem solve.	3.44	0.75	Very Good
16. I can use appropriately inductive and deductive reasoning.	3.50	0.79	Very Good
17. I can use appropriately Polya's	3.50	0.93	Very Good

4-steps in solving real-world problems.			
18. I can use different mathematical strategies in solving real-world problems.	3.68	0.84	Very Good
19. I can solve real-world problems related to simple interests.	3.62	0.82	Very Good
20. I can solve real-world problems related to compound interest.	3.74	0.75	Very Good
21. I can solve real-world problems related to credit cards and consumer loans.	3.50	0.79	Very Good
22. I can explain the difference between data, information, and variable.	3.65	0.85	Very Good
23. I can determine the appropriate level of the measurement scale of a given variable.	3.71	0.84	Very Good
24. I can construct different graphical presentations appropriate to a given data set.	3.68	0.73	Very Good
25. I can calculate the measures of central tendency (mean, weighted mean median, and mode) of a given data set.	4.15	0.74	Very Good
26. I can calculate the measures of dispersion (range, variance, and standard deviation) of a given data set.	3.91	0.75	Very Good
27. I can calculate the correlation between two variables.	3.79	0.69	Very Good
28. I can calculate the linear regression between variables.	3.50	0.86	Very Good
29. I can distinguish the use of correlation and linear regression.	3.44	0.79	Very Good
Overall	**3.68**	**0.48**	**Very Good**

Notes: 1.00-1.80-Poor; 1.81-2.60 - Fair; 2.61-3.40- Good; 3.41-4.20-Very good; 4.21-5.00-Excellent

Table 3. Level of Acquired Mathematical Skills in the MMW Among Non-Mathematics Major Students

Acquired Mathematical Skill	Mean	*SD*	Interpretation
1. I can identify the Fibonacci sequence.	3.88	0.69	Very Good
2. I can identify patterns in nature and regularities in the world.	3.63	0.63	Very Good
3. I can articulate the significance of mathematics in human life.	3.92	0.77	Very Good
4. I can determine the significance of mathematics in predicting the behavior of nature and phenomena in the world.	3.37	0.58	Good
5. I can explain the nature of mathematics as a language.	3.47	0.73	Very Good
6. I can calculate sets, functions, relations, and binary operations.	3.26	0.72	Good
7. I can use some basic concepts of elementary logic such as connective, quantifiers, negations, and variables.	3.50	0.70	Very Good
8. I can use a calculator properly in solving mathematical and statistical problems.	3.80	0.74	Very Good
9. I can find connections between mathematical ideas.	3.48	0.75	Very Good
10. I can reflect on my mathematical reasoning.	3.44	0.77	Very Good
11. I can prove a given conjecture.	3.03	0.66	Good
12. I can justify my answer to my given solution.	3.50	0.85	Very Good
13. I can apply the given for solving problems in multiple contexts.	3.36	0.66	Good
14. I can develop my conjecture.	3.01	0.77	Good
15. I can use various forms of reasoning to problem solve.	3.25	0.81	Good
16. I can use appropriately inductive and deductive reasoning.	3.65	0.82	Very Good
17. I can use appropriately Polya's 4-steps in solving real-world problems.	3.40	0.82	Good
18. I can use different mathematical	3.41	0.79	Very Good

strategies in solving real-world problems.			
19. I can solve real-world problems related to simple interests.	3.39	0.79	Good
20. I can solve real-world problems related to compound interest.	3.18	0.72	Good
21. I can solve real-world problems related to credit cards and consumer loans.	3.13	0.68	Good
22. I can explain the difference between data, information, and variable.	3.33	0.84	Good
23. I can determine the appropriate level of the measurement scale of a given variable.	3.30	0.80	Good
24. I can construct different graphical presentations appropriate to a given data set.	3.24	0.77	Good
25. I can calculate the measures of central tendency (mean, weighted mean median, and mode) of a given data set.	3.56	0.84	Very Good
26. I can calculate the measures of dispersion (range, variance, and standard deviation) of a given data set.	3.32	0.80	Good
27. I can calculate the correlation between two variables.	3.38	0.69	Good
28. I can calculate the linear regression between variables.	3.17	0.70	Good
29. I can distinguish the use of correlation and linear regression.	3.13	0.79	Good
Overall	**3.40**	**0.45**	**Good**

Notes: 1.00-1.80- Poor; 1.81-2.60- Fair; 2.61-3.40-Good; 3.41-4.20-Very good; 4.21-5.00- Excellent

Students perceived important skills in the MMW

Tables 4 and 5 show the various mathematical skills that students believe are necessary for career success. To answer the research questions, the mean score and standard deviation for each specified ability were calculated. The statistics ability "I can calculate the measurements of central tendency (mean, weighted mean median, and mode) of a given data set" received the highest mean score (M = 6.12, SD = 0.88) and was interpreted as very significant. The capacity "I can express the importance of mathematics in human life" (6.03, SD = 1.17) follows. The skill "I can apply the given for solving problems in multiple contexts" had the lowest mean score (M = 4.00, SD = 0.00) among the listed skills. It's worth noting that the ability in question received an SD value of 0, indicating that all of the respondents gave the same grade. Almost all of the skills listed were rated as excellent. Overall, mathematics major students viewed their MMW skills as critical to their career success.

Table 4. Perceived Important Skills in the MMW Among Mathematics Major Students

Acquired Mathematical Skill	WM	*SD*	Interpretation
1. I can identify the Fibonacci sequence.	5.68	1.07	Very Important
2. I can identify patterns in nature and regularities in the world.	5.38	1.10	Very Important
3. I can articulate the significance of mathematics in human life.	6.03	1.17	Very Important
4. I can determine the significance of mathematics in predicting the behavior of nature and phenomena in the world.	5.65	0.98	Very Important
5. I can explain the nature of mathematics as a language.	5.41	1.02	Very Important
6. I can calculate sets, functions, relations, and binary operations.	5.47	1.16	Very Important
7. I can use some basic concepts of elementary logic such as connective, quantifiers, negations, and variables.	5.62	0.92	Very Important
8. I can use a calculator properly in solving mathematical and statistical problems.	5.94	1.15	Very Important

9. I can find connections between mathematical ideas.	5.59	0.96	Very Important
10. I can reflect on my mathematical reasoning.	5.41	1.02	Very Important
11. I can prove a given conjecture.	5.09	0.90	Moderately Important
12. I can justify my answer to my given solution.	5.44	1.11	Very Important
13. I can apply the given for solving problems in multiple contexts.	4.00	0.00	Neutral
14. I can develop my conjecture.	5.15	1.28	Moderately Important
15. I can use various forms of reasoning to problem solve.	5.47	1.26	Very Important
16. I can use appropriately inductive and deductive reasoning.	5.68	0.88	Very Important
17. I can use appropriately Polya's 4-steps in solving real-world problems.	5.65	1.12	Very Important
18. I can use different mathematical strategies in solving real-world problems.	5.59	1.18	Very Important
19. I can solve real-world problems related to simple interests.	5.74	1.05	Very Important
20. I can solve real-world problems related to compound interest.	5.65	0.88	Very Important
21. I can solve real-world problems related to credit cards and consumer loans.	5.74	1.05	Very Important
22. I can explain the difference between data, information, and variable.	5.68	1.04	Very Important
23. I can determine the appropriate level of the measurement scale of a given variable.	5.59	0.92	Very Important
24. I can construct different graphical presentations appropriate to a given data set.	5.50	1.08	Very Important
25. I can calculate the measures of central tendency (mean, weighted mean median, and mode) of a given data set.	6.12	0.88	Very Important
26. I can calculate the measures of dispersion (range, variance, and standard deviation) of a given data set.	5.82	1.09	Very Important
27. I can calculate the correlation between two variables.	5.79	0.88	Very Important
28. I can calculate the linear regression between variables.	5.56	0.96	Very Important
29. I can distinguish the use of correlation and linear regression.	5.53	1.05	Very Important
Overall	**5.55**	**0.73**	**Very Important**

Notes: 1.00-1.85- Not at all important; 1.86-2.71-Low important; 2.72-3.57-Slightly important; 3.58-4.43-Neutral; 4.44-5.29-Moderately important; 5.30-6.1-Very important; Extremely important

Table 5 shows that non-mathematics major students considered the skills "I can express the importance of mathematics in human life" (M = 5.45, SD = 1.27), "I can use a calculator properly in solving mathematical and statistical problems" (M = 5.43, SD = 1.26), and "I can define Fibonacci sequence" (M = 5.33, SD = 1.20) to be very important. The capacity "I can prove a given conjecture" (M = 4.38, SD = 1.30) had the lowest mean score and was considered reasonably fine. Overall, non-mathematics major students rated the MMW skills as a moderately significant factor in achieving career success.

Table 5. Perceived Important Skills in the MMW Among Non-Mathematics Major Students

Acquired Mathematical Skill	WM	*SD*	Interpretation
1. I can identify the Fibonacci sequence.	5.33	1.20	Very Important
2. I can identify patterns in nature and regularities in the world.	5.18	1.13	Moderately Important
3. I can articulate the significance of mathematics in human life.	5.45	1.27	Very Important
4. I can determine the significance of mathematics in predicting the behavior of nature and phenomena in the world.	4.83	1.19	Moderately Important
5. I can explain the nature of mathematics as a language.	4.98	1.36	Moderately Important

6. I can calculate sets, functions, relations, and binary operations.	4.79	1.31	Moderately Important
7. I can use some basic concepts of elementary logic such as connective, quantifiers, negations, and variables.	5.06	1.28	Moderately Important
8. I can use a calculator properly in solving mathematical and statistical problems.	5.43	1.26	Very Important
9. I can find connections between mathematical ideas.	4.92	1.29	Moderately Important
10. I can reflect on my mathematical reasoning.	4.96	1.35	Moderately Important
11. I can prove a given conjecture.	4.48	1.30	Moderately Important
12. I can justify my answer to my given solution.	4.99	1.36	Moderately Important
13. I can apply the given for solving problems in multiple contexts.	4.90	1.40	Moderately Important
14. I can develop my conjecture.	4.49	1.38	Moderately Important
15. I can use various forms of reasoning to problem solve.	4.70	1.33	Moderately Important
16. I can use appropriately inductive and deductive reasoning.	5.13	1.43	Moderately Important
17. I can use appropriately Polya's 4-steps in solving real-world problems.	5.17	1.32	Moderately Important
18. I can use different mathematical strategies in solving real-world problems.	4.90	1.36	Moderately Important
19. I can solve real-world problems related to simple interests.	4.95	1.27	Moderately Important
20. I can solve real-world problems related to compound interest.	4.74	1.32	Moderately Important
21. I can solve real-world problems related to credit cards and consumer loans.	4.74	1.35	Moderately Important
22. I can explain the difference between data, information, and variable.	4.96	1.38	Moderately Important
23. I can determine the appropriate level of the measurement scale of a given variable.	4.81	1.31	Moderately Important
24. I can construct different graphical presentations appropriate to a given data set.	4.72	1.35	Moderately Important
25. I can calculate the measures of central tendency (mean, weighted mean median, and mode) of a given data set.	5.07	1.45	Moderately Important
26. I can calculate the measures of dispersion (range, variance, and standard deviation) of a given data set.	4.74	1.43	Moderately Important
27. I can calculate the correlation between two variables.	4.78	1.28	Moderately Important
28. I can calculate the linear regression between variables.	4.65	1.26	Moderately Important
29. I can distinguish the use of correlation and linear regression.	4.67	1.38	Moderately Important
Overall	**4.88**	**0.98**	**Moderately Important**

Notes: 1.00-1.85-Not at all important; 1.86-2.71-Low important; 2.72-3.57-Slightly important; 3.58-4.43-Neutral; 4.44-5.29-Moderately important; 5.30-6.15-Very important; Extremely important

Difference between the acquired mathematical skills and perceived important skills of students

Table 6. The difference on the Acquired Mathematical Skills in the MMW between the Mathematics and Non-Mathematics major Students.

Group	Mean	*t*-value	*p*-value	Interpretation
Mathematics Major	5.55	7.69	0.001	Significant
Non-Mathematics Major	4.88			

Notes: If p – value ≤ 0.05 =Significant

There was an important gap in mathematical skills gained by mathematics and non-mathematics major students (t =7.69, p = 0.001), as shown in Table 6. At a 5% level of significance, the null hypothesis of no significant difference between the variables was rejected. Based on the mean scores, the finding suggests that mathematics major students in the MMW have more skills than non-mathematics major students. The discrepancy wasn't due to chance, then.

Table 7. The difference on the Perceived Important Skills in the MMW between the Mathematics and Non-mathematics major Students

Group	Mean	*t*-value	*p*-value	Interpretation
Mathematics Major	3.68	4.65	0.001	Significant
Non-Mathematics Major	3.40			

If p-value ≤ 0.05 – Significant

The perceived significance of mathematical skills gained by mathematics and non-mathematics major students differed significantly (t =3.40, p = 0.001), as shown in Table 7. At a 5% level of significance, the null hypothesis of no distinction between the variables was rejected. According to the results, mathematics major students regarded their MMW skills as extremely important for career success, while non-mathematics major students regarded their MMW skills as only moderately important for career success based on the mean scores given. Then the difference could not have happened by chance.

Table 8. Relationship between Perceived Level of Mathematical Skills and Perceived Important Mathematical Skills of Students

Variable	*r*-value	*p*-value	Interpretation
PLMS and PIMS	0.431	0.001	Significant

Notes: PLMS = Perceived Level of Mathematical Skills; PIMS = Perceived Important Mathematical Skills; p ≤ 0.05 – Significant; N = 134

Table 8 presents the analysis of the correlation between student's perceived level of the acquired skills and perceived important acquired skills in the MMW. The results show that there was a statistical significance of the correlation was found between variables understudy at a 5% level of significance alpha. The correlation was moderately strong and direct which means that as they perceived the skills acquired to be very good to excellence, they perceived these skills acquired to be very important skills for career success. These results imply that students' level of acquired skills in the MMW has a significant bearing on their perceived skills in MMW.

Conclusion and recommendations

Based on the results of the report, it can be inferred that student majoring in mathematics and students majoring in non-mathematics perceived their gained mathematical skills significantly at different levels. In comparison to the learning of good mathematical abilities by non-mathematics major students, mathematics major students have a very good mathematical skill set. In comparison to non-mathematics major students, mathematics major students saw the value of MMW skills for job success as substantially different. These findings show that mathematics majors consider their acquired skills to be a very important factor in their career performance, while non-mathematics majors consider their acquired skills to be a moderately important factor in their career success. Math major students' skills were statistically significantly different from non-math major students' skills. The difference in the perceived significance of the learned skill between the groups of students was similarly statistically significant, favoring the math majors in their perception of the skills as highly important for professional success. Moreover, assessment of the importance of MMW skills has a significant association with MMW skills acquisition. The study's findings support the concept that math majors are expected to have superior mathematical ability than non-math major students. This research supports the social learning theory by showing that students' self-efficacy assumptions about the number of skills they have learned have a major effect on their behavior. As a result, having appropriate mathematics skills is needed for students to succeed in their careers. The researchers suggest that faculty members of the teacher education department continue to improve and enhance their standard of teaching to raise the level of mathematical ability acquisition of mathematics major students from very good to excellent, and good to excellent for non-mathematics major students. Increase non-mathematics major students' perceptions of the value of mathematical skills from moderately important to very important through increasing teaching and learning inspiration.

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The authors declare that there is no conflict of interest.

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