

Students' Difficulty in Mathematics in the Modern World (Mmw): Basis for Modular Construction

OLGA D. UNAY*, IDA E. ESQUIERDO, MARY JANE B. CALPA, EMILIA VANESSA SELENA B. PINCA, CHRISTINE MOLLEJON AND FEL B. MUNCADA JR.

Department of Mathematics, University of Eastern Philippines,
University Town, Catarman, Northern Samar 6400

*Email Address: ounay2873@gmail.com

ABSTRACT

Mathematics has always been viewed to be a difficult subject for some. It is in this subject wherein majority of the students could hardly understand the basic concepts and real word problems which result to poor performance. Student's difficulty in learning the subject must be given emphasis in terms of developing instructional materials suited for their learning abilities. This study assessed the student's level of difficulty in Mathematics in the Modern World in terms of areas of content. It also tried to determine the level of difficulty in terms of confidence, engagement and usefulness. The level of difficulty of teaching and the extent of use and effectiveness of instructional objectives were also assessed. Results showed that the core content areas of the subject have moderate level of difficulty. The level of learning difficulty in terms of confidence and engagement was high and in terms of usefulness was moderate to high level of difficulty. In terms of the level of difficulty in teaching the subject, the faculty believed that all the indicators were needed in teaching MMW. On the other hand, the extent of usefulness of instructional objectives, chalk was the weak level of usefulness and the module was found to be the highest in mean score considering the fact that the Philippine educational system is facing educational crises in delivering flexible learning amidst covid 19 pandemic. The results of this study suggested that the faculty handling Mathematics in the Modern World should be guided in modular construction. Competencies, strategies, and difficulties have all seen significance in making the module and research in language utilization in teaching MMW is highly recommended since the students have difficulty in operations on statements.

Keywords: mathematics education, modules, level of difficulty, learning abilities

I. INTRODUCTION

Mathematics is one of the important subjects in the academe even in human life. The absence of mathematics makes everything chaotic. Pagtalunan (2018) stated that Mathematics is all around us. Numbers, measurements, angles, shapes, and the like can be found everywhere. Our basic necessities involve the basic processes of Mathematics. A building cannot be erected without measuring the exact sizes of its corners, otherwise, the structure will collapse. Construction of infrastructures such as roads, bridges, and the like, numbers count a lot.

Mathematics plays a major role in a number of scientific fields such as biology, meteorology, engineering, physics, medical services, and many others (Unay, et.al.2016). According to Carl Friedrich Gauss, mathematics is a queen of all sciences because it is the main driving force

behind scientific discovery. Behind any scientific inventions and discoveries, mathematics plays a vital role to support any claim of discovery. This discovery requires a strong mathematical background, and scientific experiments by scientists need mathematical techniques. They are a language to describe scientists' work and achievements.

Yet, the subject viewed to be tough to some. Freshmen College students could hardly get over the difficulty of Mathematics in the Modern World (GE1). Oftentimes, researchers or even experts wanted to figure out the different causes of difficulty in any subject to be able to source out any solutions for ease of learning specifically the new subject, Mathematics in the Modern World. The researchers tried to ask college freshmen students as to the difficulty of the subject, but most students have a negative attitude towards the subject. Hence, this study tried to assess this difficulty in order to utilize the result as the basis to construct a module in Mathematics in the Modern World intended for college freshmen students.

This study was conducted to assess the difficulty in learning Mathematics in the Modern World among college freshmen students in the University of Eastern Philippines. Specifically, this study tried to (1) assess the areas of difficulty in terms of course content; (2) determine the level of learning difficulties encountered by the college freshmen students; (3) determine the extent of difficulty of teaching Mathematics in the Modern World; and (4) assess the instructional strategies utilized by the teacher in terms of extent of use and effectiveness.

II. METHODOLOGY

This study utilized the descriptive method of research to determine the areas of difficulty of the students in Mathematics in the Modern World. A survey questionnaire was used to gather the data. The questionnaire composed of two parts. Part I are questions on areas of difficulty in terms of content and Part II are learning difficulties encountered by the students in the subject. A separate survey questionnaire was also given to the faculty members handling the subject. This questionnaire consists of Part I for the learning difficulties in teaching the subject as assessed by the teachers and Part II are for the effectiveness of the Instructional objectives in terms of extent of use and effectiveness. The questionnaire was made and sent through google form.

The respondents were the college freshmen students taking up GE 1 (Mathematics in the Modern World) of the Department of Mathematics and Faculty members handling the subject. The survey questionnaire was submitted to experts for validity. The respondents of this study were 630 college freshmen students enrolled in the department and 8 faculty members answered the survey questionnaire. Responses were then computed and tabulated and treated using frequency counts and mean scores.

The level of difficulty was classified and interpreted using the 5 – point Likert Scale according to the following scales:

- | | |
|-------------|-----------|
| 1.00 – 1.80 | Very Weak |
| 1.81 – 2.60 | Weak |
| 2.61 – 3.40 | Moderate |

3.41 – 4.20 High

4.21 – 5.00 Very High

III. RESULTS AND DISCUSSION

This section of the study presents the results on the level of student's difficulty in Mathematics in the Modern World (MMW) in terms of course content, level of difficulty in terms of confidence, engagement, and usefulness. Presented also the level of difficulty in terms of teaching the subject and the extent of use and effectiveness of instructional objectives.

Areas of Difficulty in terms of Course Content. Table 1 showed the level of difficulty on the topics of Mathematics in the Modern World. As reflected on the result patterns and numbers showed a weak level of difficulty with mean score of 2.55. The rest of the areas of the course content have moderate level of difficulty. These indicate that there is a need to look into these topics in order to meet the difficulty of learning the subject on the part of the students. Topics such as operation on statements, inductive reasoning, polygonal numbers, terms of sequence and Polya's four-step problem solving strategy are the top five among the contents of the course. Among the 5 core contents, operation on statement showed the highest mean with 3.14. This implies that the students have difficulty in understanding logical statements and reasoning. This result supports to the study of Blaich, et. al (2016) on instructional clarity and organization which that clear course structure and teaching clarity motivates students, improves their persistence, raises their performance and grades.

Table 1. Areas of Difficulty in MMW in Terms of Course Content

MMW Content	Mean	Interpretation
1. Patterns and numbers in nature and the world.	2.55	Weak
2. Math for our world	2.69	Moderate
3. expression versus sentence	2.68	Moderate
4. conventions in the mathematical language	2.81	Moderate
5. language of sets	2.70	Moderate
6. language of relations and functions	2.83	Moderate
7. binary operations	3.00	Moderate
8. logical statements	2.98	Moderate
9. operations on statements	3.14	Moderate
10. truth table	2.58	Moderate
11. equivalent statements	2.56	Moderate

12. quantifiers and negations	2.70	Moderate
13. arguments and valid diagram	2.72	Moderate
14. arguments and Euler diagram	3.01	Moderate
15. inductive reasoning	3.12	Moderate
16. deductive reasoning	3.05	Moderate
17. terms of sequence	3.10	Moderate
18. nth-term formula of a sequence	3.05	Moderate
19. polygonal numbers	3.10	Moderate
20. Polya's four-step problem solving strategy	3.05	Moderate
21. measures of central tendency	2.85	Moderate
22. measures of dispersion	2.99	Moderate
23. measures of relative position	2.63	Moderate
24. normal distribution	2.76	Moderate
25, linear regression and correlation	2.95	Moderate
26. simple interest	2.63	Moderate
27. compound interest	2.76	Moderate
28. stocks and bonds	2.95	Moderate

Level of Learning Difficulties in terms of Confidence in Mathematics. As reflected in Table 2, the level of learning difficulty in terms confidence among students was high in terms of developing their mathematical skills and Mathematics helps them develop their mind and teaches them to think with mean score of 4.11 and 3.96, respectively. This learning difficulty is an important reaction among students that even though mathematics is difficult, they are still eager and motivated to learn. The weak level of confidence showed the common reaction of any students taking math subjects. According to Mulop, et.al (2014) confidence level of students in learning certain courses is related to their understanding of the courses as well as their knowledge that goals can be achieved. If their understanding is good, they confidence level is high and vice versa.

Table 2. Level of Learning Difficulty in terms of Confidence in Math

Learning Difficulty	Mean	Interpretation
1. I want to develop my mathematical skills.	4.11	High
2. I get a great deal of satisfaction out of solving a mathematics problem.	3.40	Moderate
3. Mathematics helps develop the mind and teaches a person to think.	3.96	High
4. Mathematics is one of my most dreaded subjects	3.33	Moderate
5. My mind goes blank and I am unable to think clearly when working with mathematics	3.12	Moderate
6. Studying mathematics makes me feel nervous.	3.28	Moderate
7. Mathematics makes me feel uncomfortable	2.93	Moderate
8. I am always under a terrible strain in a math class.	2.94	Moderate
9. It makes me nervous to even think about having to do a mathematics problem.	3.16	Moderate
10. Mathematics does not scare me at all	2.60	Weak
11. I have a lot of self-confidence when it comes to mathematics	2.69	Moderate
12. I am able to solve mathematics problems without too much difficulty.	2.56	Weak
13. I expect to do fairly well in any math class I take	3.15	Moderate
14. I feel a sense of insecurity when attempting mathematics.	2.99	Moderate
15. I learn mathematics easily.	2.75	Moderate
16. I am confident that I could learn advanced mathematics.	2.89	Moderate
17. I would like to avoid using mathematics in high school.	2.48	Weak
18. I am comfortable expressing my own ideas on how to look for solutions to a difficult problem in math.	3.04	Moderate
19. I am comfortable answering questions in math class.	2.85	Moderate
20. I believe I am good at solving math problems.	2.69	Moderate
21. I am good at using formulas to work out math problems.	2.80	Moderate

Level of Learning Difficulties in terms of Engagement in Mathematics. Table 3 shows the level of learning difficulty in terms of engagement. Results showed that the students believed that mathematics is a very interesting subject with mean score of 3.44. This implies that the student's level of engagement in learning the subject is high. Lambert and Sugita (2016) stated that student engagement matters in learning mathematics and further stated that the more students participate, the more they learn in all content areas of the subject.

Table 3. Level of Learning Difficulties in terms of Engagement in Math

Learning Difficulty	Mean	Interpretation
1. When I hear the word mathematics, I have a feeling of dislike.	2.72	Moderate
2. I am always confused in my mathematics class.	3.04	Moderate
3. I have usually enjoyed studying mathematics in school.	3.20	Moderate
4. Mathematics is dull and boring.	2.23	Weak
5. I like to solve new problems in mathematics.	3.22	Moderate
6. I would prefer to do an assignment in math than to write an essay.	2.93	Moderate
7. I really like mathematics.	3.02	Moderate
8. I am happier in a math class than in any other class.	2.77	Moderate
9. Mathematics is a very interesting subject.	3.44	High
10. I am willing to take more than the required amount of mathematics.	2.99	Moderate
11. The challenge of math appeals to me.	3.22	Moderate
12. I like working on the topics that requires critical thinking skills like puzzles and word problems.	3.26	Moderate

Level of Learning Difficulties in terms of Usefulness in Math. Table 4 showed the level of difficulties in terms of usefulness of mathematics. Based on the result, the respondents answered moderate to high level of usefulness. This implies that students knew the importance of mathematics in real the real world. Das (2017) stated that all careers require a foundation of mathematical knowledge, more students must pursue an educational path that will prepare them for lifelong work as teachers, professors, mathematicians, statisticians, engineers,

scientists, and the like. And those who understand, and can-do mathematics will have opportunities and options for shaping their future brighter.

Table 4. Level of Learning Difficulties in terms of Usefulness in Math

Learning Difficulties	Mean	Interpretation
1. Mathematics is a very worthwhile and necessary subject.	3.66	High
2. Mathematics is important in everyday life.	4.15	High
3. Mathematics is one of the most important subjects for people to study.	4.09	High
4. Math subjects would be very helpful no matter what I decide to study.	4.00	High
5. I can think of many ways that I use math outside of school.	3.66	High
6. I plan to take as much mathematics as I can during my education.	3.33	Moderate
7. I think studying advanced mathematics is useful.	3.80	High
8. I believe studying math helps me with problem solving in other areas.	3.87	High
9. A strong math background could help me in my professional life.	3.83	High
10. know the application of math lessons in real life.	3.83	High

Extent of Difficulty of Teaching Mathematics in the Modern World. Table 5 showed the teaching difficulties in implementing teaching strategies among the faculty handling MMW. Based on the result, the faculty believed that all the indicators were needed in teaching MMW.

Table 5. Extent of Difficulty of Teaching Mathematics

Teaching Difficulties	Mean	Interpretation
1. student's individual differences	4.375	Very High
2. variety of evaluation procedures.	4.125	High
3. proficiency with computers	4.375	Very High
4. desirable learning outcomes	4.25	Very High

5. student's learning style	4.625	Very High
6. use of appropriate student-centered approaches	4.25	Very High
7. learner's motivation	4.25	Very High
8. individualized instructions	3.625	High
9. implementation of teaching strategy	4.25	Very High
10. student's individual problems.	4.75	Very High

Extent of Usefulness and Effectiveness of Instructional Objectives. Table 6 shows the extent of usefulness and effectiveness of instructional objectives. Based on the result, modular, exams, assignments and problem-solving approaches were the top 4 instructional objectives in terms of the extent of usefulness in teaching MMW. Chalk was the weak level of usefulness since the study was conducted during the pandemic. Modular was the top because of the need in delivering flexible learning amidst pandemic. In terms of effectiveness, lecture and discussion were the top instructional objectives.

Table 6. Usefulness and Effectiveness of Instructional Objectives

Instructional Objectives	Extent of Use		Effectiveness	
	Mean	Interpretation	Mean	Interpretation
1. self-study	3.75	High	3.75	High
2. demonstration	3.75	High	4.125	High
3. problem solving approaches	4.375	Very High	4.125	High
4. chalk board	2.25	Weak	3.625	High
5. exams	4.625	Very High	3.75	High
6. discussions	4.0	High	4.5	Very High
7. assignments	4.5	Very High	3.0	Moderate
8. role play	2.625	Moderate	2.875	Moderate
9. lecture	4.125	High	4.625	Very High
10. group study	3.375	Moderate	4.0	High
11. brainstorming	3.25	Moderate	4.375	Very High
12. cooperative learning	3.625	High	3.625	High

13. projects	4.125	High	3.75	High
14. film showing	2.5	Weak	3.375	Moderate
15. group dynamics	3.25	Moderate	3.75	High
16. workshops	3.375	Moderate	2.9	Moderate
17. simulations	2.5	Weak	4.375	Very High
18. reporting	2.25	Weak	3.5	High
19. dimensional questions approach	3.25	Moderate	3.625	High
20. buzz sessions	2.75	Moderate	1.875	Weak
21. informal creative groups	3.625	High	3.75	High
22. team teaching/tandem teaching	4.0	High	3.875	High
23. computer-assisted instruction	3.875	High	4.25	Very High
24. interactive learning	4.0	High	4.125	High
25. modular	4.625	Very High	3.75	High
26. others, specify				

IV. CONCLUSION

The results of this study came out to the following conclusions. The level of difficulty on the core content areas of the subject has moderate level of difficulty. The level of learning difficulty in terms confidence among students was high in terms of developing their mathematical skills and Mathematics helps them develop their mind and teaches them to think. The student's level of engagement in learning the subject is high. The level of difficulty in terms of usefulness of mathematics was found to be moderate to high level. The level of difficulty in teaching the subject, the faculty believed that all the indicators were needed in teaching MMW. In terms of extent of usefulness of instructional objectives, chalk was the weak level of usefulness since the study was conducted during the pandemic. Modular was the top because of the need in delivering flexible learning amidst pandemic. In terms of effectiveness, lecture and discussion were the top instructional objectives.

The faculty handling Mathematics in the Modern World should be guided by the result of this study in modular construction. The competencies, strategies and difficulties have all seen

significance in making MMW modules. Research in language utilization in teaching MMW is highly recommended since the students have difficulty in operations on statements.

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