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RESEARCH ARTICLE

A phenomenological study of mathematics in the world: discriminate learning experience, impressions and actual encounters of students

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ABSTRACT

Mathematics in the Modern World had become one of the subjects that undergraduates took in that was believed to be very useful in everyday living. However, some still perceived it as a boring, and hard subject to take. This study had used the phenomenology in which it allowed the researchers to examine, and discover Mathematics in the Modern World through the perspective of the students. The study utilizes an open-ended question centered on the detail of "what it was like to learn or teach Mathematics in the Modern World. The nature of the question being open-ended is to draw a wide range of responses in which one can verbally describe the experience. From this question and the tacit knowledge of the researcher, follow up questions were made to elucidate and even model the experience if necessary. The instrument was pilot tested and undergone pilot analysis to assure that it is sufficient to draw the essence of the phenomenon. Student participants from Northern Samar State University were randomly selected from a roster of students in the following substratum (a) those who failed in the course, (b) students with grade ranging from 3.0 to 2.6, (c) students with grades ranging from 2.5 to 2.0 and (d) those with grades from 1.9 to 1.0 distributed across the four colleges of the university. Responses were later on transcribed and analyzed using the MaxQDA. Findings was that positive views of students towards the subject provides for a connection to the feeling of belongingness in the class activities. The course was also described to be "easy" which translates to the appreciation to the course, to change in perception – the mitigation of the sigma that is math, and to the attitudinal levels of impact such as efficacy and sense of responsibility.

Keywords: mathematics; modern world; teaching; strategies; outcome-based education; experiences

1. Introduction

The favorable benefits of the home learning environment have been the subject of a significant amount of research, which includes studies that investigate home-based activity interventions, parent-child interactions, and math talk[1]. Existing research has also highlighted the significance of children's home surroundings in terms of fostering their comprehension of numerical concepts[2]. Participation, engagement, and involvement on the side of the learner are all necessary components of the learning process, which is an active activity. Along the way, the teaching and learning environment has evolved from a face-to-face mode

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in a conventional classroom to an online mode in a virtual classroom to a hybrid learning mode that combines the two modes of instruction through a combination of both. On the other hand, results from the study of Krishnan[3], revealed that face-to-face instructions helps the students to learn better than during the online learning mode. Burns et al.[4], existing research indicates that there are small to no significant differences in the effectiveness of the various forms of learning and the perceptions that students have of these modes of learning. These modes include the traditional mode, the online mode, and the hybrid mode. The researchers Vernadakis et al.[5] discovered that when they compared the satisfaction of students with traditional and online learning styles, they found mixed results. Level of satisfaction between traditional learning and blended learning on various research studies suggests contradictory results[6,7].

Math is crucial to education and daily life, so the Commission on Higher Education evaluated the general education curriculum. From 63 to 36 GE units, this review reduced course count. A core of the updated general education program is "Mathematics in the Modern World"[8], one of eight courses. Studying and teaching Mathematics should consider other sciences' distinctive phenomenology. This includes applying arithmetic to real-world problems, interdisciplinary connections, problem-solving and critical thinking, technology and graphics, collaborative learning, and tailored education. Applying mathematical principles to real-world problems helps students appreciate their application. Math is easier to understand and visualize using technology. In the study of Inoferio et al.[9], the usage of technology greatly helps the integration of mathematics in real-world. The integration of appropriate software in mathematics education enhances students' creativity and problem-solving abilities by facilitating the creation of visuals and mathematical representations. By incorporating AI technologies into educational settings, computer-based learning systems can perform multiple functions, including acting as knowledgeable tutors, valuable resources, or even learners themselves. Additionally, they can aid in streamlining policy-making procedures. Aside from reading, mathematics has the most rigorous research, thus the evidence movement in education has made the greatest impact on it. This study will focus on the experiences, and perspectives in teaching, and learning Mathematics to have a better grasp and understanding on its importance. The volume and quality of educational program studies have increased, creating a stronger foundation for evidence-informed mathematical practice[10]. In the study of Espartero, et al.[11] revealed various levels of student engagement in the field of mathematics. Within the educational setting, specifically in face-to-face learning, students engaged in this mode of learning demonstrate a clear increase in interest and enjoyment when it comes to learning mathematics. However, in comparison to modular learning, where students are required to learn independently at their own homes, students may lose interest in learning since they lack the presence of a teacher to guide them.

Students learn about mathematics and how it applies to their daily lives in Mathematics in the Modern World. This course allows students to solve issues that will help them understand and appreciate mathematics' usage in various sectors and human endeavors[12]. These opportunities should help students understand mathematics beyond its usual view as a set of methods. By examining natural patterns, students can understand mathematics and its beauty[13]. Intelligence and environment can affect math retention and learning. In education, "intellectual factor" means intelligence. This may affect the student's ability to complete duties. Emotions and social dynamics include instincts, feelings, collaboration, and rivalry. Mathematics has always been hard to understand, especially when it combines enormous numbers and letters with several operations and symbols. Math anxiety causes this bad emotion and avoidance[14]. Negative perceptions of math contribute to Philippine students' underachievement[15]. Additionally, one student's math concern makes others negative[16]. Besides thinking and reasoning, learning mathematics depends on

learners' attitudes toward learning and mathematics[17]. Han and Carpenter[18] found that people react cognitively, emotionally, and behaviorally to objects and environments based on their feelings and interests. These responses form attitudes. Sosyal et al.[19] states that stressful circumstances and adverse emotions, such as anxiety, can significantly impair an individual's mathematical aptitude. This further add to the idea that learning mathematics can be influence by one's feeling and emotions. Additionally, students become uncomfortable when they link studying to academic learning's structural complexity. This process involves employing, internalizing, and progressing[20]. Students' motivational factors are revealed by the emotional component. The concept of self-awareness helps mend emotional anguish and social guilt linked with mathematics. Self-aware adults are problem-centered, independent, self-driven, and self-contained[21]. Thus, the mind has internalized[22] the stigma of math and perception.

Flipped teaching improves students' academic achievement attitudes and motivation. A student-centered learning technique called the flipped classroom involves students doing more than the educator. Here, the instructor motivates, guides, and evaluates students[23]. Instruction approach affects how pupils understand and learn a subject. But it just considers one aspect that can affect learning and appreciation. Student-only information is also shown. additional than instructional materials and methods, additional things affect math performance.

This study aims to gain a deeper understanding of the process of studying and teaching Mathematics in the Modern World, a new curriculum course. It adopts a phenomenological approach to explore the intricacies of this subject.

2. Materials and methods

This research uses retrospective examination of individuals' experiences to understand the phenomenon. The first question was regarding modern math education. We asked participants about their experiences in this situation. This question was open-ended to elicit oral responses about their experience. Based on this question and the researcher's implicit interpretation, more questions were asked to clarify and replicate the experience.

A pilot interview was used during instrument validation to examine the question's ability to generate responses, tentatively develop follow-up questions, and evaluate the responses' analytical validity in relation to the study's research topics. Three qualitative researchers used content validation to evaluate these components[24]. Students' Modern World Mathematics learning experiences were described to collect data. The participant described their daily experience in this first-person report.

Before data collection, Samar State University validated and ethically assessed the interview guide and recommended the study to the selected state university's President, the study's location. Participants consented to the study before the interview. The interviews were transcribed for analysis. Members reviewed and explained in the interview. To protect participants' and others' privacy, the Data Privacy Act of 2012 required pseudonyms or other representations for all identifiable information. Transcribing replaced identifiers, so only participants and researchers knew identities and other sensitive facts. MaxQDA's visual tools analyzed freely coded interview transcripts for themes and patterns. Key tale moments—demarcation points—established significance. Similar or related themes were then investigated to build interaction patterns or processes as the experience continued. Only students and professors saw the essence afterward. Modern mathematics education and learning became more united as the two disciplines' concepts and structures interacted. After that, researchers split structures by individual experience. This method provides reference points and evidence to guide study[25]. Final step: meaning transformation. Previous milestones or

demarcations were linked to descriptive phenomena definitions, which guided this investigation[26]. Constructivism and experiential learning were used to examine participant data. This phase of the inquiry uses teacher and student codes to start a healthy conversation about teaching and learning. Synthesis incorporates these transformed meanings to provide current math instruction[25,26].

3. Results

A discussion of the analysis and interpretation of the data that was collected will take place in this section. It will also show the various themes that surfaced during the process of data collection.

3.1. What are the personal experiences of the students who completed the Mathematics in the Modern World course?

The study's findings are based on the stories shared by the participants, highlighting the influence of preconceived ideas about Mathematics. The study uncovered a deep and meaningful learning and teaching experience, where teachers and students exchanged ideas, structures, and core concepts.

The students' impression of Math was influenced by their prior experiences before to enrolling in the course. There are contrasting opinions regarding Mathematics in the contemporary society, with students using terms like challenging, easy, intriguing, and fun to describe its importance compared to other disciplines. They also mention that Mathematics promotes a sense of belongingness while some consider their experience with it to be just average. What is intriguing about the positive perspectives expressed in the narratives is that the course promotes a strong sense of belonging. The sense of belonging in the class is ascribed to the activities carried out, which fosters a favorable perspective towards the course. The course was characterized as easy due to the learner's ability to have control over the learning process, allowing them to conduct research on the lesson material (CC_P, Pos. 17). The documented beneficial effects of Mathematics in the Contemporary World encompass a broad spectrum, including the cultivation of an enhanced understanding and perspective of the subject, as well as the reduction of the stigma associated with Mathematics. This influence represents a level of attitude, including effectiveness and a feeling of accountability. Another student stated that Mathematics is significant since it has the potential to reduce a person's introversion (CD_J, Pos. 55). These anecdotes illustrate how the students' attitudes about the course change from negative to positive as they learn it. The concluding account accepts that one's affinity for Mathematics is unrelated to their proficiency in the subject, as stated by CA_B in position 51. Instead, it is based on its practical use in human pursuits. Although there are generally favorable opinions about the course, there have also been instances of unfavorable feedback. The unfavorable perspectives encompass a wide spectrum of opinions, from perceiving the lecture as challenging to students expressing a desire for the class to conclude. Furthermore, there are students who express a sentiment of strong aversion towards Mathematics, stating: "My difficulty in comprehending the lesson stems from my personal distaste for the subject" (CA_M, Pos. 16). The narrator also offers a concrete example of a dislike for arithmetic problem-solving. Another student was also queried about any aspects of the course that piqued their attention. Frankly, the individual responded with a direct statement: "There are no mathematics resources available, and I have no interest in the subject" (CB_M2, Pos. 49-50). Additionally, certain students have psychosomatic reactions that can be related to their dislike of Mathematics. This encompasses the sensation of experiencing dizziness, the state of boredom, which is connected to feeling tired, and the characterization of Mathematics as being stressful. Another compelling account focused on the firsthand encounter with discrimination. This statement was made by a diligent student who is enthusiastic about studying Mathematics in order to avoid being unfairly treated with comments such as: "You are already in college, yet you are unable to solve a problem" (CB_M1, Pos. 31). Despite the presence of a positive aspect in the story, what remains is clear proof of

discrimination against those who do not learn Math, which is often attributed to the negative perception around the subject. This examination of the students' actual experiences observed that students who perform above average do not hold any unfavorable perceptions about the course. The average students in the course have varying opinions about the role of Mathematics in the Modern World. Ultimately, students who have achieved below average performance or have failed in the course have expressed negative perspectives of the course.

3.2. What are the interpretations, frameworks, and fundamental nature of the actualized encounters in acquiring knowledge of Mathematics in the Contemporary World as articulated by the students?

3.2.1. The positive perception of studying "Mathematics in the Modern World" is rooted in its ability to positively influence one's life.

3.2.2. The stigma around math is a collection of unfavorable opinions about learning the subject.

- Views towards Mathematics in the real world is an articulation of Experience

3.2.3. The focus of Mathematics in the Modern World lies on practical applications that are relevant to real-life situations.

3.2.4. Personal challenges and constrictions impact success in Mathematics in the Modern World [1] [1]

- Nightmare to Dreams: Learning Mathematics in the Modern World is a participative and facilitative encounter with real-life applications of Mathematics bordered by the quality of the teacher, and the attributes and challenges of the learner.
- Personal challenges can be mitigated by personal positive attributes towards learning Mathematics in the Modern World.
- Nightmare to Dreams: Learning Mathematics in the Modern World is a participative and facilitative encounter with real-life applications of Mathematics bordered by the quality of the teacher, and the attributes and challenges of the learner

3.3. How do these lived in experience in learning Mathematics in the Modern World related in terms of meanings, structures, and essence?

The limited intersections between ideas generated by students and teachers limit the possibility of developing a new framework. The limited intersections arise naturally in the narrative, as they are essential to a phenomenological investigation of the interaction between groups from each perspective. Nevertheless, the fundamental nature of teaching and learning was formed as a combination of intersections, incorporating the unique characteristics of the experiences reported by each set of participants. These experiences ranged from being isolation to active interaction. Education and acquiring knowledge on Mathematics in the Modern World aims to foster an appreciation for mathematics by overcoming the negative perceptions of the past. This is achieved through an interactive and supportive approach that emphasizes real-life applications. The effectiveness of the course depends on the teacher's expertise and the abilities and difficulties faced by the students.

4. Discussion

Students encounter difficulties in comprehending mathematics as a result of the abstract nature of its concepts, variations in learning preferences, inadequate mastery of fundamental skills, feelings of worry, and external demands, especially when dealing with advanced subjects such as algebra. This finding corroborates

Inoferio[9], which demonstrates that students encounter difficulty and face challenges while dealing with mathematics, including even the most fundamental concepts.

Cotič et al.[27] defines meaning as the cognitive process of conceptualizing the subjects being studied in order to obtain the fundamental nature of a particular experience. The researchers divided the learning process into four areas for this case. All topics focused on students' learning roles. Studying mathematics today is about importance and structure. Mathematical study and recognition of its impact may promote self-awareness. Actively learning math helps people understand themselves and their skills. Proactive learners develop problem-solving skills and see the practical value of their knowledge. This transforming adventure encourages self-reliance, motivation, and personal growth. Steiner[28] found similar beliefs. Preconceived assumptions, societal stigma, unfavorable perceptions associated to low success, a perceived lack of connection to personal aspirations, and life repercussions might alter one's view of mathematics. Experience is vital to shaping opinions. The narratives emphasize real-world application of principles. The focus shifts from providing these concepts in a conceptual or theoretical framework to illustrating their real-world application. The stories demonstrate the concepts' real-world applications and benefits. Tales use this strategy to increase audience awareness and emotional attachment to topics. The narratives highlight how the principles solve practical problems and achieve activity goals in a collaborative and supportive manner. Students experience challenges connected to internal and school-related factors that affect course achievement[29]. A person's capacity is limited by their constraints.

Financial factors and academic workload management are crucial to students' success. A person's will can win, regardless of the circumstances, according to the story. The narrative also encourages us to consider the positive aspects of students' educational challenges, demonstrating that we don't always require direction to learn. These conceptualizations of students' Mathematics in the Modern World learning experience form the course's foundation. Students come from diverse origins and have different issues. These issues may stem from personal fears about inclusion or societal criticism of a topic like math. These are skill limits. Extending one's limits, and sometimes exceeding them, is possible yet difficult. Teachers take many forms. Teachers vary in age, marital status, and income. Their experience ranges from 32 to two years. They may also face several challenges. Narratives place the phenomenon at school. In modern society, math education may be both stressful and rewarding. Since it haunts many even after twelve years of study, it causes great grief. They consider their dreams their greatest accomplishments. Student engagement or facilitation determines whether real-life math applications are tough or pleasurable. After this exchange, people must choose depending on their limits or use their strengths to overcome their challenges.

This study examined the mathematical problem-solving skills of first-year Sulu State College students using flexible learning approaches in 2021–2022. Only students with online, blended, and modular learning experience were included. We will study modern mathematics teaching dynamics, focusing on the course's negative perception, to create an intervention approach. We will also examine how a teaching method that encourages facilitation and active involvement affects other outcomes-based courses. The project also intends to establish scales to assess students' negative learning attitude, learning behavior and dynamics, enthusiasm to learn, teacher preferences, and performance. The contact between teachers and students, particularly those who failed the course, should be reexamined and case analyzed.

5. Conclusion

The favorable dispositions of students towards the subject engender a feeling of inclusion and affiliation with class activities. This cultivates a sense of value for the course and results in a shift in perspective, reducing the negative perception commonly associated with mathematics. Furthermore, it has a beneficial

impact on attitudinal factors, such as self-efficacy and a feeling of accountability. On the other hand, unfavorable opinions about the course typically center on the perceived level of complexity, especially in regard to problem-solving. Students reported that the teaching methods employed were focused on achieving specific results, involved active participation, and facilitated learning. The teacher was noted to employ discovery and exploratory learning methodologies, actively engaging students in the process of acquiring knowledge. In this sense, acquiring the knowledge regarding the subject and its connection to real-world scenario are articulated in a sense that this subject continues to play an important role in each of the students' lives. Additionally, real-life encounters of the theories, methods, and other ideas involving Mathematics helps the students more to have a better grasp of the connection, and importance of learning the subject matter. The attributes of the teacher were discovered to influence pupils' motivation, self-assurance, and degree of self-directed learning. Students offered suggestions for enhancing the teaching methodology based on their personal experiences. The strategies encompassed building strong relationships among students, integrating research or cognitive strategies in report writing, delivering the course in a systematic manner, employing language that successfully communicates the lesson, and contemplating morning recitations for mathematics topics. The students' conduct during the learning process encompassed a constructive attitude, effective time management, critical analysis of errors, enthusiasm for acquiring knowledge, independent study, and a genuine sense of pleasure. In addition, cultivating a positive rapport with classmates proved to be a robust means of support through peer mentoring and reciprocal aid. These characteristics had a role in fostering positive study habits and achieving success in the course. One student demonstrated their learning experience by presenting a conception of success, which encompassed attaining a decent grade and acquiring further knowledge. This understanding emphasized the arduousness of mathematics, a subject that can only be overcome with active involvement and unwavering determination.

Conflict of interest

The authors declare no conflict of interest.

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