

Effectiveness of Integrating Real-Life Problems into Mathematical Concepts

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Abstract:

Teachers have laboured for years, by providing students with problems and examples that highlight how math is used in real-world situations, they may make math more engaging for them. This research focuses on how well mathematical concepts can be applied to real-life problems by students taking Math101 at Mandaue City College in the 2022-2023 academic year. The study looks at how teachers connect math to real-world problems and other subjects, use examples and case studies, give time for practice, coordinate classwork and assignments, and teach math in an abstract way. The study used a questionnaire from a previous study and made some changes to it. This questionnaire helped measure how well the students' felt math was connected to the real world. The results showed a strong link between students' grades and the teaching methods used. The students agreed that teachers who used real-world examples and helped them understand how math can solve real-life problems were more effective. They also found that linking math to other subjects, providing examples and case studies, spending enough time for practice, coordinating classwork and assignments, and giving clear examples and explanations helped them understand math better. In conclusion, the study showed that integrating real-life problems into math teaching can improve students' performance. It also highlighted the importance of teachers' strategies in teaching math and how these can influence students' interest in the subject.

Keywords: Mathematical Concepts, Real-life Problems, Teaching Strategies, Student Performance, Math 101 Course

Introduction:

Mathematics was a crucial subject in schools, promoting overall human growth and influencing educational opportunities and moral education. It helped students develop higher-order cognitive skills, logical thinking, critical thinking, problem-solving, and creative thinking. Math concepts were the way of big ideas, and understanding them allowed students to work behind the answer rather than memorizing answers or formulas. Mathematical concepts were connected to practical circumstances, making students' understanding more relevant. Teachers and students used both the abilities and principles of math learned through daily practice. They helped students comprehend patterns, specify relationships, and make future predictions. Mathematical principles were used in various aspects of our experiential world, such as art, architecture, nature, and finance.

The complexity of learning and comprehending mathematics grew with various instructional methods, and it could be terrifying for students. Conventional teaching techniques controlled the learning process, leading to low arithmetic performance and knowledge. Limited curriculum standards and inadequate presentation of mathematical concepts often led to students struggling to remember mathematical facts, concepts, rules, formulas, sequences, and procedures.

To address these challenges, researchers aimed to determine the effectiveness of integrating real-life problems into mathematical concepts for first-year students at Mandaue City College. The Enhance Mathematical Concepts Program aimed to improve students' academic performance and practice the value of mathematics in their day-to-day lives.

Literature Review:

The study explored the impact of real-life problems on college students' mental health and the role of critical thinking in problem-solving. It emphasized the importance of introducing students to real-world applications of mathematical concepts in the classroom. According to Lester (1980), a "problem"



was a circumstance in which a person or a group was asked to do such a task. The fact that problem-solving had been the topic of so much research, the focus of multiple curriculum development attempts, and the subject of countless books, journals, and conference reports attested to its relevance in the study of mathematics. The study also highlighted the importance of problem-solving in the study of mathematics, with research and curriculum development efforts highlighting its relevance. Glaser (1982) identified three factors determining problem-solving performance: task-specific skill competency, issue detection, feature scanning, goal analysis procedures, and task environment aspects. Problem solving was a crucial component of mathematics and a key method of learning the subject. Outside of math classes, students encountered challenging circumstances that called for these problem-solving abilities (Romberg, 1994).

Mathematics helped students improve their problem-solving skills; it was also explained as the ability to critically evaluate our surroundings known as analytical thinking. Our capacity to reason involved applying logic to a given situation. This enabled everyone to address issues and find answers. Mathematics was used to quantitatively and spatially quantify both natural and artificial circumstances. It was utilized to address issues and had aided in social, economic, and technical advancements (Dendane, 2009). Although learning arithmetic facts and concepts was necessary, it was not sufficient. Students should have been taught how to use these data to sharpen their problem-solving abilities. Mathematics educators had agreed that problem-solving skills should receive special attention (Stanic and Kilpatrick, 1989), and real mathematical problem solving was one of the most crucial elements of any mathematics program or curriculum (Stacey, 2005; Halmos, 1980; Cockcroft, 1982).

Research Method:

The study utilized descriptive research as a quantitative approach that used measurable data to analyze real-world situations. It helped decision-makers evaluate options and determine the effectiveness of integrating mathematical concepts in real-life problems. Descriptive research design used surveys, polls, and personal experiences to reveal patterns, linkages, and trends. It focused on conditioned relationships, attitudes, processes, and emerging trends, often considering past effects. Quantitative methods were used in descriptive research to characterize, analyze, and interpret actual situations. Correlational research design examined the link between variables, while documentary analyses used gradebook data. The study was conducted at Mandaue City College (MCC), a local government unit with a total enrollment of 2,005 students. The school offered five programs and was located in Mandaue City Sports Complex. The researchers chose MCC for its convenient data collection and analysis, aiming to identify problems causing poor performance and develop intervention programs to improve student performance.

This study focused on first-year students at Mandaue City College in the first semester, specifically in Mathematics in the Modern World - Math101. The researchers used accidental sampling, selecting students who were present at the time of research until the sample size was completed. The researchers used a standard questionnaire from Yarhands Dissou Arthur, et. al.'s 2018 study to assess the effectiveness of mathematical concepts in real-world situations. The survey was based on a 4-point scale and included responses from three teacher experts. The instrument underwent validation and refinement, with the adviser and research coordinator's approval.

Findings and Discussion:

Level of Effectiveness of Integrating Mathematical Concepts in the Real-life Problems of Students.

In this research study, we investigated the level of effectiveness of integrating mathematical concepts into real-life problems for students. By exploring the impact of practical applications on students' learning outcomes, we aimed to assess the effectiveness of connecting mathematical concepts to real-world scenarios in enhancing students' understanding and performance in mathematics.

Table 1. Teachers connect mathematical concept to real-life problems

Particulars	Mean	DE	Interpretation
Teachers teach the mathematical concepts to the students by applying real-life situations.	3.04	A	Positive
Teachers facilitate students mathematical reasoning in the application of problem solving in the real-life situation.	3.09	A	Positive
WEIGHTED MEAN	3.07	A	Positive

Legend: 3.26-4.0 – Strongly Agree (Highly Positive), 2.51-3.25 – Agree (Positive), 1.76-2.50 – Slightly Agree (Slightly Positive), 1.0-1.75 – Disagree (Negative)

The table above revealed the average score of the responses from the respondents regarding the teacher's way of teaching in connecting mathematical concepts in the real-life problems of the students, which garnered a total mean of 3.07 with a degree equivalent of agree. It implied that the teachers taught the mathematical concepts to the students by applying real-life situations. Teachers also facilitated students' mathematical reasoning in the application of problem-solving in day-to-day activities.

The data agreed with the study of Reys et al. in 2001 that mathematical problem-solving helped students improve and develop their standard ability to solve real-life problems. These also agreed with the study of Freudenthal in 1977 cited in the study of Hough and Gough in 2007, which stated that Mathematics had to be connected to reality, stay close to children, and be relevant to society in order to be of human value. The data results presented



in this part indicated that the students were highly positive that connecting Mathematical concepts to real-life situations was an effective strategy to enhance students' performance. This implied that there was a need for the teachers to connect to the mathematical concept towards the students.

Table 2. Teachers link Mathematics to other subject areas

Particulars	Mean	Interpretation
Teachers use concepts of Mathematics to other subject areas to discuss topics thoroughly.	2.88	Positive
Teachers led to students perform well in other subject areas (e.g measuring ingredients in making a product in TLE, balancing chemical equation in science).	2.95	Positive
WEIGHTED MEAN	2.92	Positive

Legend: 3.26-4.0 – Strongly Agree (Highly Positive), 2.51-3.25 – Agree (Positive), 1.76-2.50 – Slightly Agree (Slightly Positive), 1.0-1.75 – Disagree (Negative)

Table 2 revealed the average score of the responses from the respondents regarding the teacher's way of teaching in linking Mathematics to other subject areas, with a total mean of 2.92 having a degree equivalence of agree. It reflected that teachers used concepts of Mathematics to other subject areas to discuss topics thoroughly, and teachers also facilitated students' mathematical reasoning in the application of problem-solving in day-to-day activities. There were many fascinating applications in genetics and the use of Mathematics in nature according to Mannone in 2019. Mathematics was one of the common subjects that students studied since their childhood. It was generally used in daily life. Even counting money also included math.

The researchers also noted that math reflected on how its concepts were applied in students' daily lives. Math was essential for the reason to gain knowledge and to develop critical thinking skills and logical reasoning; hence for the everyday encounter, Math was visible in mind for all that to improve the ability skills in solving problems.

Table 3. Teachers provide examples and case studies

Particulars	Mean	DE	Interpretation
Teachers give and provide case studies to support their ideas when discussing.	2.93	A	Positive
Teachers follow the discussion-example strategy where after discussing a topic, teacher will then discuss and give example to answer.	3.16	A	Positive
WEIGHTED MEAN	3.05	A	Positive

Legend: 3.26-4.0 – Strongly Agree (Highly Positive), 2.51-3.25 – Agree (Positive), 1.76-2.50 – Slightly Agree (Slightly Positive), 1.0-1.75 – Disagree (Negative)

Table 3 showed the average score of the responses from the respondents regarding the teacher's way of teaching in providing examples and case studies, with a total mean of 3.05 with a degree equivalent of agree. It yielded the result that teachers provided case studies to support their ideas during discussions, and teachers also followed a discussion-example strategy in which students were given a set of examples to work on after every discussion.

Table 4. Teachers dedicate quality time for practicing class exercise



Particulars	Mean	DE	Interpretation
Teachers will conduct formative assessments base on topics discussed by giving more examples for the students to work on.	3.28	SA	Highly Positive
Teachers will provide assignment task to students to work on so students will not forget the topic easily.	3.16	A	Positive
WEIGHTED MEAN	3.22	A	Positive
<i>Legend: 3.26-4.0 – Strongly Agree (Highly Positive), 2.51-3.25 – Agree (Positive), 1.76-2.50 – Slightly Agree (Slightly Positive), 1.0-1.75 – Disagree (Negative)</i>			

Table 4 above showed the average score of the responses from the respondents regarding the teacher's way of teaching in dedicating quality time for practicing class exercises, with a total mean of 3.22 with a degree equivalent of agree. It implied that teachers provided and conducted formative assessment based on topics discussed and provided assignment works to give long-term retention of the lessons. The results implied that teachers needed to apply quality time for the students to comprehend all aspects of mathematics, that students understood these concepts and related them to real-life situations. Spending time together mindfully was the key to demonstrating appreciation and interest in learning and strengthening the bond between people who enjoyed math classes. It entailed deciding and participating actively to use time productively rather than just being in the same room at the same time.

The table below showed the average score of the responses from the respondents regarding the classwork and assignment's coordination to the topics discussed by the teachers, with a total mean of 2.45 with a degree equivalence of disagree. The main goal for this data gathered was to determine if there was no coordination on the two variables provided (class work and assignment to the topic discussed by the teachers).

Table 5. There is no coordination between class work and assignment given by the mathematics teacher.

Paticulars	Mean	DE	Interpretation
Activities provided by the teachers do not match with the learning outcomes of the discussion	2.41	SA	Slightly Positive
Teachers' activity mismatch leads to students not getting the intended learning for the discussion	2.49	SA	Slightly Positive
WEIGHTED MEAN	2.45	SA	Slightly Positive
<i>Legend: 3.26-4.0 – Strongly Agree (Highly Positive), 2.51-3.25 – Agree (Positive), 1.76-2.50 – Slightly Agree (Slightly Positive), 1.0-1.75 – Disagree (Negative)</i>			

Based on the result, respondents did not agree that there was no coordination between the two variables, and students found teachers effective in providing activities to meet the learning outcomes of every discussion. Teachers gave assignment tasks that helped the students better understand the concepts. The study revealed that coordination between classwork and assignment had to work hand in hand with the given topic for the improvement of the students' academic standing. Some academic research indicated that homework was frequently linked to improved academic performance. The students' memory and cognitive abilities were enhanced by it. When a student received homework from their teacher, they attempted to complete it as efficiently as possible in order to receive good grades.

Table 6. Mathematics is abstractly taught.

The table above showed the average score of the responses from the respondents regarding the mathematics subject that was abstractly taught by a teacher, having a total mean of 2.40, with a degree equivalence of Slightly Agree. The goal for this data was to determine if there was a possible learning



Particulars	Mean	DE	Interpretation
Teachers does not discuss thoroughly the topic by digging deep in giving examples for students to answer	2.45	SA	Slightly Positive
Teacher only read what is in the instructional material during discussion.	2.34	SA	Slightly Positive
WEIGHTED MEAN	2.40	SA	Slightly Positive

Legend: 3.26-4.0 – Strongly Agree (Highly Positive), 2.51-3.25 – Agree (Positive), 1.76-2.50 – Slightly Agree (Slightly Positive), 1.0-1.75 – Disagree (Negative)

to a student by digging deep in giving examples provided by teachers and instructional material during discussion. Based on the result, respondents did not agree to a question provided that teachers discussed thoroughly the topic and read on what was in the instructional material during the discussion.

Table 7. Summary of the level of effectiveness in integrating mathematics in facing real-life problems.

Particulars	Mean	DE
Teachers connect mathematical concept to real-life problems	3.06	A
Teachers link mathematics to other subject areas	2.92	A
Teachers provide examples and case studies	3.04	A
Teachers dedicate quality time for practicing class exercise.	3.22	A
There is no coordination between class work and assignment given by mathematics teacher.	2.45	D
Mathematics is abstractly taught.	2.39	D

Legend: 3.26-4.0 – Strongly Agree (Highly Positive), 2.51-3.25 – Agree (Positive), 1.76-2.50 – Slightly Agree (Slightly Positive), 1.0-1.75 – Disagree (Negative)

The table above showed the overall results of the data gathered based on the subtopics of the statement of the problem. Based on the data, respondents were positive in the concepts of connecting Mathematical concepts to real-life situations together with the strategy of giving examples to every topic for students to fully understand the topic. After all the thorough interpretation, it came up to the conclusion that students agreed that these effective strategies would lead to better performance of the students in the mathematics subject.

According to Indriani & Julie in 2017 as cited by Uyen (2021), mathematics learning was more meaningful for students if the mathematical ideas were linked to real-life situations. Students' awareness of the close connection between mathematics and practice served as both a driving force to learn the subject and a foundation for how to connect and apply it to their daily lives. In daily life, math was quite useful. Math principles were used by both teachers and students, as well as the skill that was developed by daily math problem practice. It enabled pupils to engage in numerous crucial activities or aspects of daily life.

Based on the data gathered and interpreted in the tables 2 – 9, it implied that there was a significant relationship between the students' grade and the strategies of the teachers in delivering the lessons. Data showed that the way teachers discussed the lessons, and related assignments and class works, as well as gave a set of examples, could greatly affect the performance of the students. As the results showed, students agreed that the teacher connected



mathematical concepts in real-life situations by teaching the mathematical concepts to the students and applying real-life situations and facilitating students' mathematical reasoning in the application of problem-solving in real-life situations.

Aside from this, students believed that the following were effective in enhancing the performance of the students in Mathematics. These were: (1) linking Mathematics to other subject areas, (2) providing examples and case studies, (3) dedicating quality time for practicing class exercises, (4) coordinating class works and assignments in the intended learning outcome, and (5) providing more concrete examples and explanations for students to completely understand the lessons.

Conclusion:

The study explored the effectiveness of integrating mathematical concepts into real-life situations for students' learning. It found that students performed better in math classes when teachers used various strategies and connected mathematical concepts to real-life situations. The study identified two main components: connectedness and abstraction, which predicted student interest in mathematics. Teachers' dedication to practicing class exercises during lessons was crucial for mathematics connectivity. Students perceived this as the greatest contributor to their interest development. The study also highlighted the importance of coordination between teaching and class exercises in developing student interest in mathematics. The research also reflected the RME theory, which viewed mathematics as a human activity rather than a knowledge body.

Limitations and Further Research:

The study suggested that mathematics educators should connect classroom content with real-life problems and their environment to enhance students' interest in mathematics. Teachers should have developed ways to deal with abstraction in teaching mathematics, allowing students with less interest to learn without struggle. An enhanced mathematical concept program should have been prioritized by students and school planners, ensuring quality and effective teaching and learning processes. Teachers should have adapted to changes in the educational landscape and been versatile in providing workable solutions. Students should have prioritized classroom work and created activity planners to track completion. Future research should have focused on other aspects affecting student performance and teacher strategies, and explored alternative programs or solutions to bridge learning gaps.

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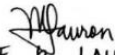
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