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Students' skills in mathematical word problems and their reading comprehension level: Basis for intervention program (June 2023)

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Abstract

This study aims to investigate the relationship between reading comprehension and solving mathematical word problems. Mathematics can be enjoyable yet challenging for many students. Solving word problems is a common struggle. To solve these problems, students must have strong reading comprehension skills to fully understand the mathematical information presented in text form. The researchers were motivated to conduct the study to ascertain the level of the students' reading comprehension and its impact on their performance in problem-solving.

The researchers used a quantitative method in the study. The respondents were Grade 11 Senior High School students in Don Manuel Rivera Memorial Integrated National School, Pila, Laguna. The researchers calculated the sample size using Slovin's Formula which has a 5% margin of error. As a result, the researchers obtained a sample size of 118 Grade 11 students from HUMSS and STEM strand. The researchers used an adapted test questionnaire from the Project Reach Program of DepEd to measure the reading comprehension level of the respondents. On the other hand, the researchers created test questions to measure the skills of the students in solving mathematical word problems.

After the data was collected, tallied, and analyzed, results revealed a significant correlation between students' reading comprehension and problem-solving skills at Don Manuel Rivera Memorial Integrated National High School. The majority of the respondents were categorized as "instructional" and "beginner," with a mean of 18.88 and 10.48. Pearson r correlation analysis revealed that pupils' reading comprehension level is significantly correlated with their problem-solving skills. It means that students who belong to the independent level tend to have higher proficiency in solving mathematical word problems.

The researchers created an intervention program in order to improve students' reading comprehension level and problem-solving skills. The researchers came up with the "CompreMath" intervention program. The "CompreMath" intervention program provides a rationale for integrating reading comprehension strategies into mathematics instruction, enabling students to develop a deeper understanding of mathematical concepts, enhance their problem-solving abilities, and make meaningful connections between mathematics and the real world.

Keywords: Mathematical word problems; Reading comprehension level; Intervention program; Researchers

1. Introduction

The study of mathematics was interesting and fun. However, many students struggle greatly, and it can sometimes be confusing for them to solve mathematical problems. One of the most challenging types of issues encountered by math students was solving mathematical word problems. Students must completely comprehend these tasks, which convey

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mathematical knowledge as text, for them to be able to answer the problems. This shows the basic importance of reading comprehension as a process of making sense and having comprehensive knowledge of what is stated in the text.

Reading comprehension is the ability to comprehend and analyze written text. It is an essential skill for students to solve mathematical word problems, as students must be able to comprehend those problems. Despite the importance of reading comprehension, many students struggle with this skill, which can have a significant impact on their academic performance as well.

In this paper, the researchers will thoroughly examine the relationship between reading comprehension in solving mathematical word problems, which will be used to propose or design an intervention for improving these skills in students.

Objectives of the study

This study aims to;

- Determine the reading comprehension level of the respondents in terms of frustration level, instructional level, and independent level,
- Determine the respondents' performance in terms of solving mathematical word problems in terms of beginner level, intermediate level, and advanced level,
- Identify if there is a significant relationship between students' reading comprehension level and their ability to solve mathematical word problems, and
- Design an intervention program based on the findings of the study.

2. Materials and methods

2.1. Design

The researchers used a correlational quantitative method to conduct this study. The researchers attempted to find solutions to the problem as well as justify and satisfy the study's objectives.

Quantitative research focuses on objective measurements and the statistical, mathematical, or numerical analysis of data gathered through polls, questionnaires, and surveys, as well as by manipulating pre-existing statistical data using computational techniques. Quantitative research is concerned with gathering numerical data and generalizing it across populations or explaining a specific phenomenon (Labree, n.d.).

2.2. Participants

The respondent of this study is from the Grade 11 Senior High School in Don Manuel Rivera Memorial Integrated National School, Pila, Laguna. It has a total population of 167 composed of 117 HUMSS and 50 STEM strands. The participants were selected through random sampling among Grade 11 students. With this sampling technique, every person in the population has the potential to be included in the sample. The researchers calculated the sample size using the Slovin's Formula, which has a 5% margin of error. And as a result, the researchers obtained a sample size of 118 Grade 11 students both HUMSS and in the STEM strand.

Table 1 Distribution of Respondents

Strand	Grade 11 population	Sample
HUMSS	117	83
STEM	50	35
Total	167	118

2.3. Data Collection and Analysis

In this study, the researchers used an adapted test questionnaire from the Project Reach Program of DepEd to measure the reading comprehension level of the respondents. On the other hand, the researchers created test questions to measure the skills of the students in solving mathematical word problems. The questionnaires contain 30 questions

each and were distributed to the respondents which are Grade 11 STEM and HUMSS students at Don Manuel Rivera Memorial Integrated National High School. The researchers personally administered the reading comprehension test and the mathematical word problem-solving test to the target pupils. The researchers then explained the procedures of the research to the respondents and asked for their help to cooperate on the given task. The researchers explained the purpose of the study to the respondents, the data were then evaluated afterward.

Table 2 Reading Comprehension Level

Range of Scores	Average	Performance Level
24-30	80-100%	Independent Level
18-23	59-79%	Instructional Level
17 below	58% below	Frustration Level

Table 3 Performance Level in Mathematical Word Problem Solving

Range of Scores	Average	Performance Level
24-30	80-100%	Advance Level
18-23	59-79%	Intermediate Level
17 below	58% below	Beginner Level

3. Results and discussion

3.1. The Reading Comprehension Level of the Respondents

Table 4 Reading Comprehension Level of the Respondents

Range of scores	Frequency	Percent	Weighted Mean	Reading Comprehension Level
24-30	5	4.24	24	Independent Level
18-23	36	30.51	19.92	Instructional Level
17 Below	77	65.25	12.71	Frustration Level
Total	118	100	56.63	
Overall Weighted Mean			18.88	Instructional Level

Frequency, percentage, and mean were used to present the students' reading comprehension level in table 4. The majority of them were in the "instructional level" with an overall weighted mean of 18.88 when they are classified according to their reading comprehension level.

This finding implies that the respondents' Reading Comprehension Level was Instructional. It means that a reader is not independent but has adequate background knowledge for a topic and can access text quickly and with no or few errors.

In the study of Legaspi (2020), reading comprehension is an important skill for everyone. It focuses on comprehending and understanding instead of merely reading a text. Nowadays, students cannot understand what they are reading and tend to be clueless about what they read if they cannot fully comprehend the text in many forms.

3.2. The Performance Level of the Respondents in Solving Mathematical Word Problem

Frequency, percentage, and mean were used to present the students' skills in solving mathematical word problems on table 5. The majority of them were in the "beginner level" with an overall weighted mean of 10.48 when they are classified according to their skills in solving mathematical word problems.

Table 5 Performance Level in Solving Mathematical Word Problem

Range of scores	Frequency	Percent	Weighted Mean	Reading Comprehension Level
24-30	0	0	0	Advance Level
18-23	32	30.51	19.63	Intermediate Level
17 Below	86	65.25	11.81	Beginner Level
Total	118	100	31.44	
Overall Weighted Mean			10.48	Beginner Level

This particular finding implies that the respondents' performance level in Solving Mathematical Word Problems was Beginner. This means that at this level, the students can only solve the simplest word problems. Students at the Beginner level of mathematical word problems are only able to solve a set of relatively easy problems that require basic math skills, such as addition, subtraction, multiplication, and division.

According to Simamora et al. (2018), mathematical problem-solving ability itself is not only a goal in mathematics learning, but also something that is very meaningful in daily life. Being a problem-solver can provide more benefits; therefore, learning should be developed to educate students to be able to realize and solve the problems that they face.

3.3. The Significant Relationship between a Students' Reading Comprehension Level and Their Ability to Solve Mathematical Word Problem

Table 6 The Significant Relationship between a Students' Reading Comprehension Level and Their Ability to Solve Mathematical Word Problem

Statement	Degree of Freedom df)	Computed r-value	Computed t-score	p-value	Interpretation
Relationship between a Student's Reading Comprehension Level and Their Ability to Solve Mathematical Word Problems	116	0.68	9.99	0.000	Significant

Table 6 illustrates the significant relationship between a Students' Reading Comprehension Level and Their Ability to Solve Mathematical Word Problems. The computed r-value is 0.68 with a computed t-score of 9.99. It further shows that the p-value of 0.000 is less than the 0.05 level of significance. Pearson r correlation analysis revealed that pupils' reading comprehension level is significantly correlated with their problem-solving skills.

This finding implies that there is a significant relationship between a student's reading comprehension level and their ability to solve mathematical word problems. It means that students who belong to the independent level tend to have higher proficiency in solving mathematical word problems.

The study of Ngeno et al. (2019) revealed that students had difficulties in comprehending mathematical word problems. It was concluded that poor comprehension of word problems led to student difficulties in solving word problems in mathematics.

3.4. Intervention Program

After reflecting, researchers created an intervention program in order to improve students' reading comprehension level and problem-solving skills.

Title

"CompreMath: Empowering Students' Reading Comprehension and Mathematical Word Problem Skills"

3.5. Rationale

Students were really having difficulty dealing with mathematical word problems at Don Manuel Rivera Memorial Integrated National High School based on the conducted interview by the researchers. Basically, reading comprehension

was involved for them to completely comprehend and be able to answer the word problems. The researchers gathered data to determine and justify the students' skill in problem-solving in relation to their reading comprehension level. As a result, reading comprehension levels are at a instructional level. Similarly, their problem-solving skills are at a beginner's level. The researchers came up with the "CompreMath" intervention program. The "CompreMath" intervention program provides a rationale for integrating reading comprehension strategies into mathematics instruction, enabling students to develop a deeper understanding of mathematical concepts, enhance their problem-solving abilities, and make meaningful connections between mathematics and the real world.

Objectives

By the end of the "CompreMath" intervention program, students will be able to:

- Demonstrate enhanced reading comprehension skills.
- Develop their ability to interpret mathematical word problem statements.
- Enhance students' proficiency in solving mathematical word problems; and
- Foster critical thinking and problem-solving skills to analyze complex mathematical word problems.

Table 7 Intervention Program

Objectives	Activity	Expected Outcomes	Respon-sible	Time-line	Success Indicator
To improve the reading comprehension level of the students.	Repeated Readings - Students read a text multiple times at a given period of time once a week.	Majority of the students improved their reading comprehension level.	Students Teachers	August-October 2023 Every Friday of the week	Students can fluently and accurately understand the text; and extend their vocabulary words. Improved students' level of reading comprehension.
To improve the reading comprehension level of the students.	Literacy Centers - Literacy centers are designated areas in the classroom where students can work on their reading comprehension skills. This center allows students to read books at their level and work on comprehension questions or activities.	Majority of the students improved their reading comprehension level.	Students Teachers	August-October 2023 Twice a week	Give learners individual support where they have time devoted for their learning and reading. Increasing student satisfaction with the school.

To enhance students' mathematical word problem solving skills through social communicatio n.	Peer tutoring - Students will be paired up and have them teach each other. Students can help each other with their problem-solving skills as well as with homework and studying for tests.	Majority of the students enhanced their skills in solving mathematic al word problems.	Students Teachers	August-October 2023 Twice a week	Increa-sing student motiva-tion to study Students can imple-ment/de-velop strategies to solve the problems
To enhance students' mathematical word problem solving skills through social communicatio n.	Guided Solving - the teacher works with a small group of students to help them improve their problem-solving skills. The teacher provides support and instruction as the students read and answer some problems that are at their level of difficulty.	Majority of the students enhanced their skills in solving mathematic al word problems.	Students Teachers	August-October 2023 Once a week	Develo-ping effective activities that is related to students' interest to motivate their learning Changing their working methods and teaching/L earning practices

4. Conclusion

From the data yielded from the instruments, the researchers summarized the following findings: (1) Most of the Grade 11 HUMSS and STEM students in Don Manuel Rivera Memorial Integrated National High School were in the "instructional level" with an overall weighted mean of 18.88 when they are classified according to their reading comprehension level., (2) Majority of the Grade 11 HUMSS and STEM in Don Manuel Rivera Memorial Integrated National High School students were in the "beginner level" with an overall weighted mean of 10.48 when they are classified according to their skills in solving mathematical word problems., and (3) Pearson r correlation analysis revealed that pupils' reading comprehension level is significantly correlated with their problem-solving skills. Students who belong to independent level tend to have higher proficiency in solving mathematical word problems. Therefore, there is a significant relationship between a student's reading comprehension level and their ability to solve mathematical word problem.

Recommendation

Based on the foregoing findings and conclusion of the study the following recommendations are offered:

- Encourage students to read a variety of reading materials that can enhance more their thinking and comprehension skills. By exposing students to a variety of texts, they will be able to broaden their vocabulary, improve their comprehension abilities, and develop critical thinking skills, all of which will help them improve their overall reading proficiency.,

- The researcher suggests that teachers prioritize the development of students' foundational mathematical knowledge and understanding. Design instructional activities and resources that emphasize building a strong grasp of fundamental mathematical concepts., and
- Incorporate targeted drills on word meaning and reading comprehension as a regular component of mathematics instruction, focusing on developing students' ability to understand and solve mathematical word problems effectively, thereby improving their vocabulary skills and reading comprehension levels in the context of mathematics.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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