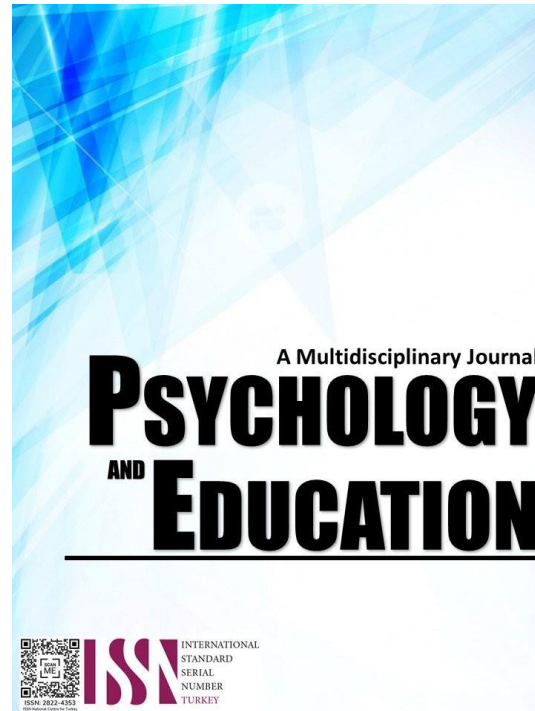


READING COMPREHENSION AND MATHEMATICAL PERFORMANCE IN SOLVING WORD PROBLEMS AMONG GRADE 4 LEARNERS



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Reading Comprehension and Mathematical Performance in Solving Word Problems Among Grade 4 Learners

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Abstract

The main purpose of this research was to assess the Comprehension and Reading ability and to determine the significant correlation between Reading Comprehension level of learners and their ability to solve Mathematical word Problems. This study employed Descriptive Quantitative Correlational Study. The respondents of the study were ninety-two (92) Grade 4 learners of Western Mindanao State University – Integrated Laboratory School enrolled in school year 2022- 2023. This study adopted the Philippine Informal Reading Inventory (Phil-IRI) assessment tool and DepEd Numeracy Assessment Tool (D-NumAT) to measure the reading comprehension and Mathematical Ability respectively. The findings indicated that majority of the Grade 4 learners in Reading Comprehension Level are classified under Frustration Level, some of the learners are classified under Instructional Level, and very few are classified under independent level. As for Mathematical Performance Level, majority of the Grade 4 learners are under non-Numerates level, and some are classified under Low level. This study revealed that the overall Reading Comprehension skill of the learners has negligible correlation to the learners Mathematical Performance in Solving Word Problems. Hence, Reading Comprehension can be a significant factor affecting students' mathematical performance specifically in solving word problems.

Keywords: *mathematical performance, reading comprehension, solving math problems, Phil-IRI, D-NumAT*

Introduction

Reading is a fundamental skill that a learner should acquire at an early age. Success in all academic subjects will be significantly aided by having a strong foundation in literacy skills. The quality of a person's life can be enhanced by the literacy level, being smart, industrious, and having a good memory is an advantage on learning everything, particularly mathematics and reading (OECD, 2008).

Reading is one of the macro-skills that are important for learners to develop at an early age. Reading is part of daily academic lives, as you read you will take in information and make meaning of it. As stated by Brandon (2021), reading comprehension is the ability of a person to recognize and understand the meaning of the text or words, reading comprehension is somehow a gateway for the learners to understand the other lesson particularly solving mathematical problems.

Based on the report of San Juan (2019) a study conducted by the Program for International Student Assessment (PISA) in 2018, they examined the student's ability and mastery in the different field of subjects, such as reading, mathematics, and science. The result appears that the Philippines ranked last place in reading, and second to the last place in science and mathematics, and this shows that lot of learners can't read and answer mathematical problems even in higher grades, this is alarming since this will bring crisis on our education system as well in the academic performance of the students. As this situation has a significant impact on the caliber of students we create, it is critical that all educational institutions should take an immediate action now since a student with weak literacy and numeracy skills is more likely to struggle in school and in their future academic endeavors.

Thus, reading is one of the most important tools in any aspects in life, including analyzing and solving problems. As stated by Calub (2019) since English is the medium of instruction for math subject, then the pupils' skills in solving word problems can be related to their level of reading comprehension, since the solutions of the word problems needs their translation to have the correct mathematical phrases, learners with good comprehension can also understand the logic behind the problem easily, in contrast learners with low comprehension can encounter difficulties in solving mathematical word problems.

Therefore, identifying the correlation between reading comprehension and solving mathematical problems is very crucial, because this can serve as the solution to improve the reading comprehension and solving mathematical word problem of the students in the Philippines, aside from that this research is served as a catalyst for the teachers in mathematics to understand and find ways to help the students improve more the students' numeracy and literacy skills. This study aimed to address the gap between reading comprehension and mathematical performance specifically in solving word problems. Acosta et.al (n.d), recommends to conduct more study on this problem, to come up with more solution and new strategies and techniques to overcome the issue 3 between reading comprehension and mathematical performance in solving words problems.

Research Questions

This study aimed to determine how reading comprehension affects the mathematical performance of the Grade 4 pupils in solving word problems. Specifically, this study sought to answer the following:

1. What is the Reading Comprehension Level of the Grade 4 learners?
2. What is the Performance Level of the Grade 4 learners in solving Mathematical Word Problem?
3. Is there a significant correlation between the Reading Comprehension Level and Performance Level in Solving Mathematical Word Problems?

Literature Review

One of the major concerns of the Department of Education (DepEd) in the Philippines is the mathematics education, it was evident in the Filipino students results of international, national, and regional mathematics assessment. (Imam, 2013). Furthermore, in the test conducted by the Programme for International Student Assessment (PISA), results show in mathematics category less than 20% of students who have minimum proficiency, while 50% and more appear to have very low proficiency (DepEd, 2019). Getting mark below the said level of proficiency in the test conducted by PISA, means the Filipino students are clearly left behind in terms of mathematics education. (Bernardo et.al, 2022).

In 2019, among 58 countries who participated the Trends in International Mathematics and Science Study, in the mathematics category only 19% of the Filipino students scored on the low benchmark, meaning these students have some basic mathematical knowledge and ability, meanwhile 81% of the students didn't reach the said level. the results show the Philippines assessment score appear to be lower than other who join in the grade 4 math and science assessment, the Philippines only got 297 in mathematics category and this score is appeared to be very low compared to 8 other countries. (Magsambol, 2020). Moreover in 2022, 36% of the grade 4 students reportedly performed above the National Assessment of Educational Progress (NAEP) proficient level in mathematics category, which evident to be lower compared to the result from 2019, meaning even in the national level the Filipino students appear to struggle when it comes to mathematics education. (NAEP, 2022)

According to Calub (2019), one of the lessons taught in mathematics is solving word problems. Knowing how to solve and understand mathematical word problem is crucial for primary grade curriculum. (Ng et.al, 2021). Additionally, as claimed by Sabine (2021), mathematical word problem solving is a mathematical activities or exercises in which the main goal is letting students solve the problems in the text format rather than mathematical symbols or notation, for example, "Ben has 5 marbles and Rose has 6 marbles. How many marbles do they have if 2 marbles from each of them lost?".

Since English is the medium of instruction for math subject, then the pupils' skills in solving word problems can be related to their level of reading comprehension, since the solutions of the word problems needs their translation to have the correct mathematical phrases (Calub, 2019). Moreover, Boonen et.al (2016) pointed out that to be successful in solving mathematical word problems the students need both reading comprehension and mental representation skills.

In addition, Sabine (2021) asserts that to be able to solve a mathematical word problem the pupils should not only know how to perform mathematical 9 process and operations, but at the same time they should have the ability to read and understand the written text, in short, one of the reasons why students struggling in solving mathematical word problems relates to reading processes.

As determined by Hadiano et.al (2021), Aside from decoding and understanding, reading also recognize printed symbols with its meaning, since mathematical problem is composed of symbols, therefore students' needs to interpret the symbols meaning to understand the given word problems, if the students will fail to decode the meaning of the printed symbols in mathematical text, the students will also fail to process basic mathematical word calculations.

From the research findings of Vilenius-Tuohimaa et.al (2008), the results shows that students with fluent reading skills have higher performance level in solving mathematical word problems, and even they control the technical reading involve, it's still appeared that mathematical word problems performance is related to the reading comprehension of the students.

Based on the research findings of Imam et.al (2013), the result also shows that the reading comprehension of the students has a strong relationship with the students' performance in mathematics. Kajamies et.al (2019) investigated on reading and text comprehension and its implications to mathematical word problem solving, the respondents were grade 4 pupils, they examine the relationship of the two variables into two phases, the first phase are the characteristics of word problem solving concerning language and numerical factors, and the end r results did not 10 show any relation between the word problem solving difficulty level on the linguistic and numerical factors, meanwhile in the second phase of the test they examine text comprehension and arithmetic ability wherein they classify the respondents into 4 category: excellent in text comprehension but poor in arithmetic; poor in reading and text comprehension but excellent arithmetic: very good in both skills: very poor in both skills, in this investigation the result appear that word problem solving performance is strongly related to reading or text comprehension, this investigation shows that to perform better on word problem solving the students need to have both reading comprehension and arithmetic skills.

What is the importance of reading and writing in math curriculum? (2003), highlight the importance of reading in solving word problems, it shows that reading comprehension can help the learners to understand, analyze, and interpret mathematical context, the said ability is crucial in evaluating the sources of information and the validation of the information itself.

However, in the study conducted by Dela Cruz and Hijada (2022), where they examine the relationship exist between the students level of comprehension and solving ability on word problems of grade 4-6 students, from the data they gathered the findings is the level of word problem solving skills in the said subject is appear to be nonproficient and it's show to have weak relation between the level of comprehension of the students and solving word problems, the study shows that there are other factors affecting the mathematical word problem skills of the students, it was established that reading comprehension level of the students is not an indicator of the students solving ability, comprehension and solving ability appear to be not related.

Reading comprehension has seen to have close relation to word problem solving, therefore it is suggested to conduct more research to determine how reading comprehension level of the students and word problem solving ability related to each other (Can, 2020).

Methodology

This study employed a Descriptive Quantitative Correlational Study, that described the correlation of Reading Comprehension and Mathematical Performance in Solving Word Problems among Grade 4 Learners. Quantitative research is the process of collecting and analyzing numerical data. It can be used to find patterns and averages, make predictions, test causal relationships, and generalize results to wider populations (Bhandari, 2020).

Participants

The respondents of the study were the one hundred thirty-five (135) Grade 4 learners consisting of three (3) sections at Western Mindanao State University-Integrated Laboratory Elementary School Department (WMSU-ILS) of school year 2022-2023.

Instruments of the Study

The instrument of this study contains Philippine Informal Reading Inventory (Phil-IRI), and this study focused on the Reading Comprehension of the learners. The instrument contains one reading selection that composed of seven (7) items comprehension check questions. Another instrument that used was the Department of Education Numeracy Assessment tool (D-NumAT), that contains five (5) items word problems. It is an assessment tool used to evaluate the learner's mathematical performance, specifically in solving word problems.

Procedure

The research instrument used in this study to measure the learners reading comprehension proficiency is the adapted Phil-IRI assessment tool. The learners were categorized into three (3) levels according to their reading comprehension ability; frustration level, instructional level, and independent level. The researchers conducted two types of assessment using the Phil- IRI, first the researchers used the reading selection to assess the respondent's ability of word recognition, it was done through one-by-one oral reading. After going through that phase, the researchers also assess the respondent's comprehension using seven (7) items comprehension check questions, through paper-and-pencil test. After assessing the reading comprehension, the researchers also assess the respondent's mathematical ability using the D-NumAT, it contains five (5) items word problem, it was given in the form of paper-and-pencil test, the respondents were given 20 minutes to answer the word problems. The statistical tool that this study utilized are the following: mean, standard deviation and Pearson R correlation. The researchers used the mean to determine the learners overall reading comprehension and mathematical performance. And to measure the correlation between the reading comprehension and mathematical performance, the researcher employs the standard deviation and Pearson R correlation.

Ethical Consideration

The researchers have come to some ethical issues in determining this study. In this study, the researchers assured that all the data and profiles collected from the learners, educators, and institution remain private. This is to safeguard their privacy and protect them from any harm.

Furthermore, the researchers took down and graphed all the figures in a correct manner. The facts, outcomes, technique, and process are gathered and managed with the absence of control. Other than that, the researchers were assured to obtain proper consent from the corresponding school officials to perform the study along with the learners. It is a must to advise the parents of the learners about the inclusion of their children in the research study.

Lastly, all the research information was enumerated to the learners in clear and comprehensible words. This was considered the learners privilege as the contributors and allow them to be informed about the goal of the study. Other than that, the researchers considered the learners rights for not obliging them to engaged in the study. The learners had a choice to refuse if they don't want to take part. They had their freedom to play a part and get involved to the study.

Results And Discussion

The first research question that this study sought to answer is: What is the Reading Comprehension Level of the Grade 4 Learners?

Table 4. *Reading Comprehension Level of Grade 4 Learners using the Phil- IRI Assessment Tool*

<i>Level of Comprehension</i>	<i>Frequency</i>	<i>Percentage</i>
Independent	5	5.4
Instructional	9	9.7
Frustration	78	84.7
Total	92	100%

Table 4 above shows the Reading Comprehension Level of the Grade 4 Learners based on the PHIL-IRI in reading Comprehension Assessment. Based on the given table there were five (5) learners or 5.4% whose level of comprehension was Independent Level. This means that learners have adequate background knowledge for the topic and can access text very quickly and with few errors. This further indicates that those learners who performed well are those who have the ability to read and comprehend well (Madrid, 2012).

Meanwhile, 9 learners or 9.7 % belong to Instructional Level, which means these students are not independent, but has adequate background knowledge for a topic, and can access text quickly and with no or few errors. Lastly, 78 out of 92 learners or 84.7% belong to Frustration Level, which means that most of the learners can read but can't comprehend. These learners do not have adequate background level for a topic and/or cannot meet criteria for instructional levels of accuracy and rate and they require extensive or even moderate assistance from an educator. The quality of learners reading comprehension can be impacted by a variety of factors that make it harder for them to comprehend what they read. (Madrid, 2012)

The findings of this study can be attributed to the study of Lynch (2020), a person's reading comprehension level is influenced by a variety of factors, including phonological awareness, vocabulary deficits, and learning disabilities. Suwanaroa (2021) further emphasized that in addition to reading difficulties, learners' attitudes, parental support, and classroom instruction and learning are also factors affecting reading comprehension. All these factors affect the level of reading comprehension of the learners which in turn make it difficult for them to comprehend especially those who belongs in frustration level. Frustration readers benefit from a rich and social atmosphere that encourages successful reading comprehension; hence English language teachers should provide an environment that supports reading comprehension teaching (Lazarus, 2020).

Meanwhile instructional readers are influence by good factors, such as wide background knowledge, good home environment, and interest level, this reader can read and understand text but still needs enhancement, this reader still needs constant practice, parents and teachers can be helpful to their development (Alicum,2018).

Furthermore, independent readers are those who can read and with good comprehension, Liu et.al, (2022) asserts that independent reader is influence by positive factors such as good family support, high reading interest and motivation, good social and cultural status, excellent school instruction, high IQ, good vocabulary skills and has a wide background knowledge and experiences, these factors are really very helpful in developing the learner's reading comprehension.

The second research question that this study sought to answer is: What is the Performance Level of the Grade 4 learners in solving Mathematical Word Problem?

Table 5. *Mathematical Performance of the Grade 4 Learners in Solving Word Problems using D- NumAT*

<i>Level of Mathematical Performance</i>	<i>Frequency</i>	<i>Percentage</i>
High	0	0
Average	0	0
Low	10	10.8
Non-numerates	82	89.1
Total	92	100%

The table 5 shows the Mathematical Performance of the Grade 4 learners based on the D-NUMAT. It can be gleaned from the table above, that from the 92 respondents, 82 of the learners or 89.1% fall under non-Numerates Level which means these learners don't have numerical comprehension at all, they can't solve and understand mathematical word problems, and 10 learners or 10.0% fall under

Low Level which means these learners had a little numerical comprehension, they can solve and comprehend to the simplest mathematical word problems, but can't answer moderate to difficult word problems, However, none of the learners reached the Average Level and High Level, it means that none of the learners have fair and good mathematical solving skill. The finding of the study agrees to the study of Acharya (2017), which asserted that there are many factors affecting the numerical level of the learners, it appeared that most of the learners struggling in mathematics because of math anxiety, prior knowledge of the students, lack of parent's support, non-conducive environment, and poor learning motivation.

Circerchia (2023), added that aside from having math anxiety, poor understanding on how to perform mathematical operations, there are also others factors that affects mathematical performance of the learners such as dyscalculia, in which the learners having difficulty on performing basic calculations and manipulating numbers, dysgraphia where learners having hard time writing symbols and equations, and lastly, learners with visual processing disorders might lack visual processing skills.

The third research question that this study sought to answer is, Is there a significant correlation between Reading Comprehension Level and Performance Level of grade 4 learners?

Table 6. *Reading Comprehension and Mathematical Performance Pearson Correlation*

<i>Variable</i>	<i>r- value</i>	<i>Interpretation</i>	<i>Decision</i>
Reading Comprehension	0.066	Weak Correlation/ Negligible Correlation	Reject the Null Hypothesis
Mathematical Performance			

Table 6 shows the correlation exists between Reading Comprehension and Mathematical Performance in Solving Math Problems. The analysis yielded a computed r-value of 0.066, which means that there is negligible correlation between the learners Reading Comprehension and Mathematical Performance in Solving Word Problems. It appeared that the learners reading comprehension directly affects the mathematical performance of the learners, specifically in solving word problems and the evidence is enough to reject the null hypothesis. This implies that the result of the study was supported by a study of Dela Cruz and Hijada's study (2022), which looked at the relationship between students' levels of comprehension and word problem-solving skills in Grades 4-6, the level of word problem-solving abilities in the subject area appeared poor, and there was only a weak correlation between students' comprehension levels and their ability to solve problems. It is evident that the pupils' ability to solve mathematical word problems and their level of reading comprehension proves that there is little relationship.

Solving bare problems relies more on students' ability to understand mathematical background knowledge and therefore is less dependent on reading proficiency (Kan et al., 2019), whereas solving word problems is more demanding on reading proficiency which enables the students to convert the linguistic components into mathematical expressions and equations (Kan et al., 2019). This means that 30 the students' reading comprehension is dependent to the students' mathematical performance and vice versa. Furthermore, Erbeli et al. (2021) moved further to examine the relation between reading comprehension and mathematics learning by considering the moderation of reading proficiency. They detected a unidirectional effect from reading to mathematical performance with academically at-risk children through their Grade 1 to Grade 4. Meanwhile, the researchers found the effect of reading on mathematics performance was less significant with low-level readers, but turned out to be significant with average- and high-level readers.

Conclusion

This study examined the correlation of the Reading Comprehension and Mathematical Performance in Solving Word Problems among Grade 4 learners. This study investigated the two variables, wherein Reading Comprehension as independent variable and Mathematical Performance as dependent variable. In addition, this study analyzed the respondents Reading Comprehension Score and Mathematical Word Problems Score to determine whether the two variables were correlated or not. This study answered the research questions based from the hypothesis: There is no significant correlation between Reading Comprehension Level and Performance Level in Solving Mathematical Word Problems. This study employed a Quantitative Correlation Research Design. The respondents of the study were the ninety- two (92) Grade 4 learners of Western Mindanao State University- Integrated Laboratory School enrolled in school year 2022-2023. Moreover, this study made use of Philippine Informal Reading Inventory (PHIL-IRI) assessment tool that contains one reading selection and composed of 7 items comprehension check questions and the Department of Education Numeracy Assessment tool (D-NumaT) that contains 5- item mathematical word problems.

The statistical tools used in this study included Mean and Standard Deviation to determine the level of reading comprehension and performance level in solving word problems of the learners. Meanwhile, to examine the correlation of reading comprehension and the mathematical performance in solving word problems, the researchers used Pearson Product Moment Coefficient Correlation.

Based on the Findings majority of the Grade 4 pupils in Western Mindanao State University Integrated Laboratory School are classified in Frustration level in Reading Comprehension. Some pupils are classified under Instructional Level and very few are classified under Independent Level. As for Numeracy, majority of the Grade 4 learners in Western Mindanao State University Integrated Laboratory School are classified under non-Numerates. Some are classified as low. It appears that none of the pupils reach the Average and High Level. Based on the results, this study revealed that the overall Reading Comprehension skill of the learners has negligible correlation to the learners Mathematical Performance in Solving Word Problems. Hence, Reading Comprehension can be a significant factor affecting students' mathematical performance specifically in solving word problems.

The Department of Education must provide math interventions to those students with poor numerical comprehension and ability to solve mathematical Problem. Also, the teacher must integrate different strategies in the classroom to aid the student's poor reading comprehension and solving skills. The teachers need to know that students' reading comprehension can be a factor that can affect the students' problem-solving skill. Hence, students with good reading comprehension have the advantage on their mathematical performance, specifically in solving word problems.

The students must spend more time on Reading for them to understand complex words and understand instructions. It may help also, for them to enhance their comprehension ability as well as their mathematical world problem.

The future Researchers, is encourage to conduct related studies in line with reading comprehension and mathematical word problemsolving skills. In addition, the researchers suggested to conduct other studies on other factors that affects the two variables, such us teaching strategies and techniques, learner's motivations, instructional materials and learning facilities.

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