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The Gap Between Comprehension Level and Problem-Solving Skills in Learning Mathematics

Maximo V. Hijada Jr., *Hilongos South Central School, SDO Leyte, Philippines*[*]
Melodina L. Dela Cruz, *Saint Joseph College, Maasin City, Philippines*

*Corresponding email: maximo.hijada@deped.gov.ph

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ABSTRACT

This study was conducted to determine the degree of relationship that exists between learners' level of comprehension and solving skills on mathematical word problems of grades four to six learners in Kang–iras Elementary School. It attempted to establish a relationship between the learners' level of comprehension and solving skills. This research study employed the correlational method of research. This research design is appropriate for this research because its primary purpose is to determine the degree of the relationship between the learners' level of comprehension and solving skills of the word problems. Lomax and Li (2009) stressed that correlational research investigates a range of factors, including the nature of the relationship between two or more variables and the theoretical model that might be developed and tested to explain these resultant correlations. From the gathered data, the following findings are, the comprehension level of the learners in Kang-iras Elementary School being studied is at Frustration Level. For each specific skill, only in the literal interpretation skill the learners had been classified at instructional level while for the other two skills, the learners are at frustration level. Majority of the learners are at a frustration level. The level of word problem solving skills in mathematics of the respondents is classified as non-proficient. All three skills indicators used revealed that the respondents are non-proficient. The learners have not mastered word problem-solving. Comprehension skills could not predict the mathematical word problem-solving skills of the learners. There is weak correlation between the variables and the relationship between the two variables is insignificant. There are other factors affecting word problem skills among learners. Some are identified as follows: instructional strategies and methods, learners' motivation and concentration, learner's arithmetic ability, learning facilities or instructional materials, curriculum and teacher's competency. From the findings of the study, it was established that comprehension level is not an indicator of the learners' solving skills and there are other factors that could affect solving mathematical word problems. Solving skill is independent of comprehension skills and the variables studied are not related. Thus, it can be concluded that comprehension is not the only factor that could affect word problem-solving skills but there are more other factors and these factors may be assessed and taken into consideration.

Keywords: comprehension level, problem-solving, mathematics, learning

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INTRODUCTION

Problem solving is one of major aspects in mathematics curriculum which required learners to apply and to integrate many mathematical concepts and skills as well as making decision. It is a skill being developed in every country. However, learners were reported to have difficulties in solving mathematical word problems. Results during quarterly assessment showed that the least learned skills in mathematics are in solving mathematical word problems. It showed that learners lacked in many mathematical skills such as number-fact, visual-spatial and information skills. Information skill is the most critical. The deficiency of these mathematical skills and also of cognitive abilities in learning inhibits the mathematical word problem solving. This understanding on how the deficits influenced the problem-solving is expected to give effective guide lines in preparing diagnostic instruments and learning modules in order to develop the mathematical skills.

The learner's solving skill is the ability to solve the mathematical word problems successfully using the literal, inferential and critical interpretation of the text. Mastery of these skills which equate to comprehension level has become a must being the main factors in solving mathematical word problems.

Conversely, the current status of the learners' level of mathematical skills suggests otherwise. The National Council of Teachers of Mathematics (NCTM 2000) stated that the learners must learn Mathematics with understanding especially in solving mathematical word problems. It requires that the learners should have a thorough understanding of any given problem. But the fact is, there is difficulty on the part of the learner in trying to grasp what is being implied because of poor comprehension. With weak or low comprehension skills, there is a greater percentage that solving a mathematical word-problem imposes a great dilemma on the learners and consequently will have difficulty in solving it.

Word problems in mathematics often pose a challenge because they require that learners to comprehend the text of the mathematical word problems. Identifying a question that needs to be answered, and finally create and solve a numerical equation (Krick-Morales, 2006). Therefore, the task of comprehending word problems is critical and represents the threshold to successful solutions (Valentin & Sam, 2004).

Several other studies such as the one conducted on mathematical problem solving, showed that students performed poorly on solving word problems because of the inadequacy of comprehension specifically on the text of the word problem. It is evidently crucial because it is not only a means of conveying information; rather it is used to interpret the events and phenomenon in a way that provokes students' thinking.

Murcia (2011) stressed that problem solving in mathematics and reading with comprehension go hand in hand. Solving Mathematics problems entails the students to apply two skills at the same time: reading with comprehension and computing. In the same study, it was found out that only very few could successfully solve word problems with or without help from the teacher. The rest needed to be guided to understand the problem. Approximately a good number of learners find it hard to picture out the situation indicated by the problem they are trying to solve. The slow learners would even ask the meaning of a certain word in the problem. When they have understood it, it is only then that they fully grasp the event and situation pictured in the problem. Obviously, the bane of these pupils is the understanding of the contents of the Mathematics problems correctly and connecting the ideas expressed in it. This leads educators to find means in order to help students to solve word-problems.

Based on the aforementioned observations, the researcher found out that the same situations are evident in his school. Most learners who belong to the frustration level had very low score in solving mathematical word problems. The relationship between the learners' comprehension level and the mathematical solving skills in word problems in Mathematics is therefore plausible but this has not been in most teaching resources due to the idea that language in the natural setting and numbers occupy opposing sides of the brain. Thus, the focus of this study is to determine the relationship that exists between the learner's level of comprehension and solving skill on mathematical word problems. Moreover, it tackles to discuss the major mathematical solving skills and cognitive abilities in learning that caused the difficulties in mathematics problem-solving among learners.

Research Questions

This study was conducted to determine the degree of relationship that exists of learner's level of comprehension and solving skill on mathematical word problems of grades four to six learners in Kang–iras Elementary School for the school year 2019 – 2020. It attempted to establish a relationship between the learners' level of comprehension and solving skill.

Specifically, this study sought to answer the following specific questions:

1. What is the profile of the comprehension level of grades four to six learners in Kang – iras Elementary School?
2. What is the level of the solving skills on mathematical word problems of Grades IV to VI learners in Kang – iras Elementary School terms of;
   - 2.1 Literal interpretation of details?
   - 2.2 Inferential interpretation of details
   - 2.3 Critical interpretation of Details
3. Is there a significant relationship between the level of learner's comprehension and their level of solving skill on the mathematical word problems?
4. What other factors affecting the learners' skills in solving mathematical word – problems?
5. What strategy can be proposed to bridge the gap between comprehension level and problem solving skills based on the result of the study?

RESEARCH METHOD

Research Design

This research study employed the correlational method of research. This research design is appropriate for this research because its primary purpose is to determine the degree of the relationship between the learners' level of comprehension and solving skills of the word problems.

Lomax and Li (2009) stressed that correlational research investigates a range of factors, including the nature of the relationship between two or more variables and the theoretical model that might be developed and tested to explain these resultant correlations.

Participants

The research respondents of this study were the grades four to six learners who are officially enrolled in Kang – iras Elementary School, Hilongos South District, Hilongos, Leyte. The table below shows the total number of learners. The researcher used purposive sampling. It is a sampling technique in which the researcher relies on his own judgment when choosing members of population to participate in the study.

Data Analysis

The following statistical tools are used in the analysis of data:

- Mean Percentage Score (MPS). This measure is used to determine the learner's level of comprehension and solving skill on the mathematical word problems of Grades four to six learners in Kang–iras Elementary School for the school year 2019 – 2020.
- Pearson Product Moment Correlation Coefficient. This is used to establish relationship between the learners' comprehension level and solving skill on the mathematical word problems.
- t - Test. This tool is used to determine the significance of the relationship between the learner's comprehension level and solving skill on the mathematical word problem.

FINDINGS AND DISCUSSION

Results

This chapter presents, analyzes and interprets the data gathered by the researcher. The presentation is as follows: Comprehension Level of the Learners, Level of Solving Skills on Mathematical Word Problems, Relationships between the Learners' Comprehension and their Solving Skills on mathematical Word Problems and other factors affecting word problem skills among learners. The arrangement of the presentation would be: the tabulated data, discussion of the data, implication and insights of the results.

The Comprehension Level of the Learners

The comprehension level of the respondents was gauged using a 20 –item multiple choice – test. Seven (7) items of the test were used to check the literal comprehension, another seven (7) items for inferential comprehension and six (6) items for critical comprehension. Table 1 discusses the comprehension level against the area of comprehension.

Table 1. The Comprehension Level of the Learners

Comprehension Level	Respondents		AREAS						TOTAL	
			Literal		Inferential		Critical			
	N	%	Mean	MPS	Mean	MPS	Mean	MPS	Mean	MPS
Independent	6	9.38	5.80	83.33	5.80	83.33	5.00	83.33	16.67	83.33
Instructional	18	28.13	5.44	77.78	4.39	62.70	3.39	56.48	12.50	62.50
Frustration	40	62.50	3.35	47.86	2.73	38.93	1.93	32.08	8.00	40.00
TOTAL	64	100	4.86	69.66	4.31	61.65	3.44	57.30	12.39	61.94

Legend:

80 – 100%	Independent
59 – 79%	Instructional
58 and Below	Frustration

The learners are in the instructional level in their literal interpretation while in their inferential and critical interpretation of details they are in frustration level. Only 9.38% of the total population belongs to the independent, 28.14% are in instructional and 62.50% are in frustration level. This means that majority of the learners can answer the lower level of questions on the text on the other hand only few can interpret the details on the higher level such as the HOTS questions. The concept concentrates on understanding in learning process based on their methods.

Majority of the learners are at frustration level indicating that they have poor comprehension level. Only few of the respondents can comprehend well mathematically. The standard deviations indicated wide disparity of the level of comprehension among the respondents. This result has shown similarity to the results of Bender (2012) that in problem solving it requires reading comprehension and the use of mathematical operations. Accordingly, reading level and the problem solving skills of the students should be handled together and instructional activities should focus on the concurrent teaching of these two skills (Ozsoy, Gokhan 2015).

Moreover, this outcome conforms with the results of the study of the study of Haylock and Cockburn (2014) which established that students' success in a problem solving is affected by cognitive, affective and experience factors. The results imply that the learners have poor comprehension and that interventions must be done to improve their skills. Moreover, this indicates that learners vary greatly in their ways or techniques to comprehend mathematically.

The Learner's Mathematical Solving Skills on Word Problems

The level of Solving Skills on Mathematical Word Problems of the respondents was determined using a twenty-item (20) multiple choice test. Seven (7) items were to gauge the literal skills, another seven (7) for the inferential skills and six (6) items for the critical thinking skills. The tests were simultaneously conducted to the respondents by their respective math teachers. Answers of the respondents were checked and results were tabulated, accordingly.

Table 2. The Learners' Level of Mathematical Solving Skills

Learner's Mathematical Solving Skill	Respondents		AREAS						TOTAL	
			Literal		Inferential		Critical			
	N	%	Mean	MPS	Mean	MPS	Mean	MPS	Mean	MPS
Highly Proficient	7	10.94	5.43	77.55	6.43	91.84	4.86	80.95	16.71	83.57
Moderately Proficient	18	28.13	4.67	66.67	4.33	61.90	4.28	71.30	13.28	66.62
Non - Proficient	39	60.94	3.03	43.22	2.79	39.93	2.28	38.03	8.10	40.39
TOTAL	64	100	4.38	62.48	4.52	64.56	3.81	63.43	12.70	63.53

Legend:

Rating	Description
80 - 100 %	Highly Proficient
59 - 79 %	Moderately Proficient
58% and Below	Non - Proficient

There are 10.94% of learners who belong to highly proficient in solving mathematical word problems, 28.13% of learners who belong to moderately proficient and 60.94% of learners who are in non – proficient in solving mathematical word problems. The results illustrated that solving mathematical word problems is often hindered by the learner's failure to comprehend (Garderen, 2004). Majority of the learners have difficulty in understanding the mathematical word problems because they lack of comprehension. The learners are required to understand the context of the problem, to properly conceptualized the problem in their minds based on the information given within the problem, design and follow and make the calculations required by the solution process of the problem (Desoete, Roeyers, & De Clercg, 2003).

Overall, the learners' barely cross the fifty -percent level of mean percentage score but were all less than fifty-eight (58%) with quite bigger standard deviation. Thus, for each skill, the learners were classified at the *non–proficient level* on their problem solving skills. This outcome is in consonant to the results of Soylu (2006) that disclosed that when student arrived to a correct solution of a problem it does not necessarily mean that he/she has the necessary problem solving skill. Though some students may have found the correct answers, they may have followed the wrong approach to a solution; other students might develop the correct solution strategies but nonetheless reach the wrong solution due to simple calculation errors. Overall, it is indicative that the learners are not talented on their word problem solving. Their problem solving skills need enhancement hence, teachers must be innovative to develop these skills.

The Relationship Between the Learners' Comprehension Level and their Mathematical Solving Skill on Word Problems

A 20 – item test was given to the learners to measure their comprehension level and another 20 – item test for their mathematical solving skills. The tests were given in separate time schedule and to be answered within 40 – minute to measure the relationship between learners' level of comprehension and the mathematical solving skill of the learners. The Table 3 shows the correlation of the learners' comprehension level to their mathematical solving skills in mathematics.

Table 3. Coefficient of Correlation of All Learners' Level of Comprehension and their Level of Solving Skills in Mathematical Word Problems

Comprehension Level	Mathematical Solving Skill	Pearson, r	Strength of Relationship	p – value	Decision
Independent	Highly Proficient	0.103	Weak Positive	0.418	Not Significant
Instructional	Moderately Proficient	0.033	Very Weak Positive	0.798	Not Significant
Frustration	Non - Proficient	0.130	Weak Positive	0.304	Not Significant
Overall		0.166	Weak Positive	0.189	Not Significant

The correlation was weak positive between the comprehension and mathematical word problem solving skills of the learners. The p-value directs failure to reject the null hypothesis. This weak positive correlation was not significant. There is no relationship between two variables. The same were true for each component of the skills. The relationships were either weak positive or very weak positive. The p values failed to reject the null hypothesis. The correlations were not significant. This result reveals that that one variable is related to the other, i. e., comprehension level could not be used to predict the mathematical word problem skills among the learners. This conforms to what had been established by Ozoy, Gokhan (2015), in his study that reading level and the problem solving skills of the students should be handled together and instructional activities should focus on the concurrent teaching of these two skills.

On the other hand, Riodin and O' Donoghue (2008) argued that performance on mathematical word problem is related to language proficiency. Thus, the results imply that successful mathematical problem solving depends upon many factors and skills to different characteristics and not relying the learners' comprehension alone.

The Other Factors that can Affect in Solving Mathematical Word Problems

A checklist of identified factors and an open ended question was added to be answered by 64 respondents. This is to identify the other possible factors that could affect the learners' performance in solving mathematical word problems. The respondents were asked to answer the following questions based on their opinion.

Table 4. Identified Factors Affecting Learners' Performance in Solving Mathematical Word Problems

No.	Factor	Frequency	Percentage
1	Instructional Strategies and Methods	21	32.81
2	Learner's Motivation or Concentration	16	25.00
3	Learner's Arithmetic Ability	12	18.75
4	Learning Facilities or Instructional Materials	8	12.50
5	Curriculum	4	6.25
6	Teachers' Competency	3	4.69
TOTAL		64	100%

Table 4 reveals that of the respondents find achievement in solving mathematical word problems of the intermediate learners is influenced by range of other factors aside from the comprehension level and mathematical solving skills.

Based on the collected data instructional strategies and methods is in the highest rank among the factors that could affect learner's performance. This is affirmed by some of the respondents who answered, *"dili kaau ko ka relate sa mga exam ni sir about word problems sa math kay during discussion limited ra man ang examples"*. This clearly shows that the pupils would prefer to have more exercises so as to apply what they have learned.

On the other hand, learner's motivation and concentration is in the second ranked factors that can affect the learners solving skill in mathematics and some of the respondents answered, *"dili man gud ko kaau ganahan ug math kay lisod, ug dili masulod sa ako mind, mao deli ko maminaw usahay"*. Motivation is the most important factor to achieve something (Caprara et.al, 2008). Achievement in solving word problems depends on the learners' interest and motivation. If the learners are more motivated, the learners are eager to listen and participate during discussion.

Arithmetic ability of learners is one of the factors in solving mathematical word problems. The respondents answer *"makasabot ko sa gi mean sa problem pero ma wrong ako solution kay maglibog ko inig compute."* In addition, the curriculum is one of the factors affecting on math problems this affirmed by some of the respondents who answered, *"dili ko ganahan mo answer sa mga exercises sa libro labi na problem solving kay dagko kaau ug numero kapuyan ko ug solve."* This implies that in designing mathematics curriculum, the instruction should be in harmony with instructional design that can support students' learning and eventually will promote achievement in mathematics. Lastly, the teachers' competency is in the lowest rank, which is the ability of the teacher to deliver the lesson understandably to their learners.

The respondents stressed out that, *"maayu man mutodlo si sir, pero mahadlok lamang me ug kulbaan kay isog man''*. From the learners' answer the teacher must take every opportunity to improve on his own professional practice in order to provide quality learning. Teacher's competency should be enhanced by an objective feed-backing by their assigned master teacher for technical assistance. Likewise, enriching himself with information on strategies and techniques of teaching that can easily be obtained from experts through print or non-print materials.

From the outcome, it can be inferred that learners are aware that in solving math problems there are several factors that are contributory to their difficulty of understanding or perception. For this effect, it necessitates the employment of various strategies that must be employed by the teacher to be able to enhance student's learning and at the same sees the need for the provisions of adequate and appropriate facilities necessary for learning to take place.

Discussions

From the gathered data, the following findings are summarized.

1. The comprehension level of the learners in Kang-iras Elementary School being studied is at Frustration Level. For each specific skill, only in the literal interpretation skill the learners had been classified at instructional level while for the other two skills, the learners are at frustration level. Majority of the learners are at frustration level.
2. The r level of word problem solving skills in mathematics of the respondents is classified at Non-proficient. All three skills indicators used revealed that the respondents are non-proficient. The learners have not mastered word problem solving.
3. Comprehension skills could not predict the mathematical word problem solving skills of the learners. There is weak correlation between the variables and the relationship between the two variables is insignificant.
4. There are other factors affecting word problem skills among learners. Some are identified as follows: instructional strategies and methods, learners' motivation and concentration, learner's arithmetic ability, learning facilities or instructional materials, curriculum and teacher's competency.

CONCLUSIONS AND RECOMMENDATIONS

From the findings of the study, it is established that comprehension level is not an indicator of the learners' solving skill and there are other factors that could affect in solving mathematical word problems. Solving skill is independent on the comprehension skills and the variables studied are not related. Thus, it can be concluded that comprehension is not the only factor that could affect the word problem solving skills but there are more other factors and that these other factors may be assessed and taken into consideration.

Recommendations

Based on the findings of the study, the following recommendations are drawn:

1. The teacher may impose strong implementation of activities like word of the day, let's have a drill and practice exercises to improve the comprehension level.
2. The teacher may implement fully and with strict monitoring peer tutorial and remedial classes to improve comprehension and word problem skills among learners.
3. The researcher may craft an innovative strategy to address the learners' difficulty in solving mathematical word problem and propose it to the principal for the implementation.
4. For future researchers, they may conduct other researches focusing on the identified other factors that had affected the word problem solving skills of the learners.

REFERENCES

Anderson, U. (2007). The contribution of working memory to children's mathematical word problem solving. Applied Cognitive Psychology.

Bautista, D., Mitchelmore, M. & Mulligan, J. (2009). Factors influencing Filipino children's solutions to addition and subtraction word problems. Educational Psychology.

Bender, W., N. (2012). Öğrenme güçlüğü olan bireyler ve eğitimleri. (Tr.Ed.: H akan Sarı). Ankara: Nobel.

Bernardo, A. B. (2002). Language and mathematical problem solving among bilinguals. Journal of Psychology,

Cárnio, M. S., Vosgrau, J. S & Soares, A.J. C (2017). The Role of Phonological Awareness in Reading Comprehension.

Dendane, A. (2009). Skills needed for mathematical problem solving, Annual Research Conference – UAE.

Desoete, A., Roeyers, H., & De Clercq, A. (2003). Can offline metacognition enhance mathematical problem solving? Journal of Educational Psychology

Duffy, G., G. (2009). Explaining reading: A resource for teaching concepts, skills, and strategies. (2th. ed). Newyork: The Guilford Press.

Fischer-Baum S, Dickson DS, Federmeier KD (2014). Frequency and regularity effects in reading are task dependent: Evidence from ERPs. Lang Cogn Neurosci

Garderen, D. V. (2004). Focus on inclusion reciprocal teaching as a comprehension: Strategy for understanding mathematical word problems. Reading & Writing Quarterly

Gula, L.P. & Nunez, J. L. (2022). A Collaborative Auto- Ethnographical Study on the Emerging Phenomena of the 21st Century Practice- Teaching Journey. Partners Universal International Research Journal, 1(2), 80–91. https://doi.org/10.5281/zenodo.6727056

Gula, L. P. (2022). Challenges Encountered by Teachers Handling Oral Speech Communication Courses in the Era of Covid-19 Pandemic. JOLLT Journal of Languages and Language Teaching. 10(2), pp.

Jordan, N.C., Hanich, L.B., & Kaplan, D. (2003). A longitudinal study of mathematical competencies in children with specific mathematics difficulties versus children with comorbid mathematics and reading difficulties. Child Development

Krick-Morales, B. (2006). Reading and understanding written math problems. Retrieved on August 03, 2012

Mercer N., & Sams, C. (2006). Teaching children how to use language to solve maths problems, Language and Education

Muncer SJ, Knight D, Adams JW (2014). Bigram frequency, number of syllables and morphemes and their effects on lexical decision and word naming. J Psycholinguist

Núñez, J. (2021). Going Online! Teachers' Encountered Personal Challenges in Teaching in the New Normal: A Qualitative Inquiry. *Journal Of Teacher Education and Research*, 16(02), 11-14. Available at https://jter.in/index.php/JTER/article/view/178

Panah, K. (2000). Teaching and learning primary school Science through the medium of English in Pakistan. Unpublished master's thesis, Institute for Educational Development, Aga Khan University, Karachi, Pakistan.

Polya, G. (1981). Mathematical discovery: On understanding, learning and teaching problem solving (Combined ed.). New York: John Wiley and Sons.

Riordain, M. N. & O'Donoghue, J. (2008). The relationship between performances on mathematical word problems and language proficiency f or students learning through the medium of Irish. Educational Studies in Mathematics.

Rouibah A., Taft M., Albert F. (2000). "French sublexical unit priming in pronunciation and lexical decision tasks," in Proceeding of the 41th Annual Meeting of the Psychonomic Society, Abstracts of the Psychonomic Society, New-Orleans, LA.

Samsul Hadi, et al (2018). Students' difficulties in solving mathematical problems. International Journal of Education Science and Research

Valentin, J. D. & Sam, J. D. (December 2004). Roles of semantic structure of arithmetic word problems on pupils' ability to identify the correct operation. Journal for Mathematics Teaching and Learning.

Yeo, Kai Kow Joseph. Secondary 2 Students' Difficulties in Solving Non-Routine Problems. National Institute of Education, Nanyang Technological University Nanyang Walk, Singapore/

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