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Reading Comprehension and Problem-solving Skills: A Correlational Study

Moniña Magno[1], Jenny Cartagena[1], Niel Christian Etabag[1], Rose Ann Sarad[1], Ethel Palagtiosa[1], Remus S. Magbanua[1], Nikko Paolo R. Calumpiano[1]

[1] College of Education, University of Negros Occidental-Recoletos, Incorporated, Bacolod City, Philippines

ABSTRACT

There have been several studies on the relationship between English and Mathematics. As one of the several mentioned, this study aimed to know whether English reading comprehension is a factor in successfully solving Mathematical word problems by utilizing descriptive correlational design to gather and process data. This study used the Department of Education Philippine Informal Reading Inventory for the reading comprehension test and a researcher-made questionnaire for the word problem-solving test. Results showed that the performance of fifth-graders from a private school in Bacolod City in reading comprehension and word problem-solving were contradictory and had no significant relationship with each other. The interpretation of the mean scale of reading comprehension was at an Instructional Level, while that of word problem-solving was at a Frustration Level. Furthermore, there was no significant difference between reading comprehension and problem-solving in terms of sex. It is recommended that teachers and parents alike should develop the students' mathematical numeracy skills along with English literacy skills. Peer tutorials with the modular approach are proposed to enhance the learning and teaching of Mathematics.

Keywords

word problem-solving, reading comprehension, correlation, cognitive development theory, language subjects, gender gap

INTRODUCTION

Language is the basis of all human interactions. It is essential to communicate with each other successfully. We need to start communicating effectively during the early stages of our lives. In school, English and Mathematics are considered language subjects of utmost importance in the recent century (Kharde, 2016).

English is an internationally known, spoken or written language that bridges civilizations in harmoniously communicating with each other. On the other hand, Mathematics is a symbolic language (Kharde, 2016) with a system of its own (Corpuz & Salandanan, 2015). It is used to comprehend and interpret the silent voice of nature.

Reading comprehension and word problem-solving are skills of great value which require a thorough

understanding of the relationship between English and Mathematics. These are cognitive skills that need to be developed in early childhood. Although there have been a handful of studies on English learning and Mathematics learning individually, few studies have related the two disciplines.

This study observed and analyzed the cognitive abilities of learners in the fifth grade, specifically their reading comprehension and word problem-solving abilities, and the relationship between the two.

This study was guided by the null hypothesis that there is no significant relationship between reading comprehension and word problem-solving. It was anchored on John Piaget's Cognitive Development Theory, which focuses on the growth of children's cognitive aspects from birth to adolescence (0-15 years). The Cognitive Development Theory explains how knowledge acquisition, construction, and use vary as an individual grows (Lefa, 2014). Children in intermediate levels, fourth, fifth, and sixth grade, transition from the concrete operational stage to the formal operational stage (Schunk, 2012; Simatwa, 2010).

Having effective reading skills is essential for comprehending a language. Between the ages of five and six, kids grasp the phonetic sounds of the alphabet to better comprehend word formation. As children age, they move on to the next stage, learning about phonemes and other language components, developing a more comprehensive knowledge of language and word structures.

Reading is an interactive process between the reader and the text. It is the bridge between the author and the reader. The academe relies mostly on the instruction of various written texts which puts reading as significant for young minds to learn, gain knowledge, and hone new skills (Olivar et al., 2014).

Comprehension is one of the essential skills in reading. It is more than just making meaning of what one reads. Reading comprehension is necessary for success in human endeavors (Imam et al., 2013). It is a skill that must be practiced and taught repeatedly. Tanzickne (2017) named some factors that adversely affect reading comprehension, such as the person's phonological and morphological awareness, language fluency, learning disabilities, experiences, and interests.

Reading comprehension separates passive unskilled readers from active skilled readers. Skilled readers try to predict outcomes using context clues provided in the text. They come up with questions about the plot of the story or the main idea. They monitor their understanding and attempt to clarify a confusing part of the text. They can connect the story's context to their prior knowledge or experiences.

Problem-solving is another vital skill in everyday living. It trains individuals to be organized, rational, and critical thinkers. Individuals differ in problem-solving tactics as they tap into their different cognitive skills (Bradshaw & Hazell, 2017).

Problems pose challenges to our daily lives. Solving these problems requires critical thinking. In school, we are approached by problem-solving activities to further stimulate our critical thinking. Most of the time, we are given word problems. Word problem-solving creates anxiety as it tends to complicate the text structure (Guita & Tan, 2018). Problem-solving in the classroom improves the learners' logic and creativity in tackling and connecting the elements laid out by the problems.

Problem-solving in a narrative context necessitates both reading comprehension and arithmetic skills. Word problem-solving is a double-edged sword that requires reading and computing (Özsoy et al., 2015). Solving a mathematical word problem includes the ability of learners to translate the concrete to the abstract and the abstract to the concrete (Ahmad et al., 2010). Creating coherent mental representations of all possible relevant solutions can lead to a deeper understanding of the text. These

mental representations will help construct different problem-solution strategies and perform the correct mathematical operations (Boonen et al., 2016).

According to Barton & Neville-Barton (2005), Mathematics is not a free language. It has its syntax and terminologies (Auzar, 2017). Mathematical learning is comparable to learning a foreign language. The study of Mathematics requires a lot of the learner's cognitive skills. These include efficient visual and verbal learning and quick learning retention and retrieval of information from mathematical concepts. Mathematical concepts are hierarchical and spiral in structure (Perna & Loughan, 2014).

Solving word problems differ distinctly from problems with direct calculations because they are presented linguistically. Successful problem-solving is not solely dependent on finding its correct answer. Some students may be able to have the right answer but their solving process was incorrect (Schumacher, 2010). It is like solving the correct mathematical calculations but with incorrect representations.

Word problem instruction should include vocabulary related to mathematical concepts. Teaching mathematical concepts through word problems should consist of different semantic structures and situations. The more complex semantic structure text features are used in secondary school subjects like physics and chemistry (Boonen et al., 2016). An enriched mathematical vocabulary increases the chance to solve word problems successfully. Teaching how to solve the word problem is analogous to teaching a second language. Second-language teaching increases students' mental capacity or cognitive ability (Kharde, 2016). Second language teaching also employs reciprocal teaching. The teacher serves as a model, and the student tends to mimic. Reciprocal teaching is a good strategy, especially when dealing with struggling problem-solvers. The teacher presents a problem and then shows the solution process. The solution process includes text comprehension, mental representation, real-world analogies, and mathematical statement formulation. Peer learning is also encouraged to help them learn Math concepts. Presenting word problems in a real-world situation aids them in creating mental imagery of the situation. The common topic for word problems in primary school is money matters (Department of Education K-12 Math Curriculum Guide 2016).

Mathematical learning is spiral in nature. Complex concepts require the mastery of the primary and foundational concepts such as number and number sense and the basic operations – addition, subtraction, multiplication, and division. Numerical complexity and number properties add to the difficulty in problem-solving as well (Daroczy et al., 2015).

Studying and understanding the mathematical language is tough. Mathematics uses some English words but holds a different meaning in a different context. Herbel-Eisenmann (2002) stated that gaining mathematical understanding means mastering the language of mathematics (Auzar, 2017).

With these concepts and ideas in mind, this study aimed to understand learners' abilities with reading comprehension and word problem-solving abilities in a fifth-grade setting and that there is no significant relationship between the two abilities.

METHODOLOGY

This study employed a descriptive correlational research design with a test technique to gather data. This method was appropriate for the study as it attempts to find the relationship between reading comprehension skills and problem-solving abilities of fifth-graders from a private school in Bacolod City as the test respondents. It reported the current levels of both English reading comprehension and Mathematical worded problem-solving abilities of the test respondents, comprised of a class of 41

students with 24 boys and 17 girls between the ages of 11 and 12 years.

The instruments used in the study were assessment tools for reading comprehension from the Department of Education called Phil-IRI (Philippine Informal Reading Inventory) for the school year 2018-2019 and a researcher-made questionnaire for word problem-solving. The tests were validated by experts in English and Mathematics using the research instrument validation by Good and Scates.

The Phil-IRI was a reading tool to assess the reading abilities of grade-schoolers. It was developed by experts in the field headed by consultants from the University of the Philippines.

The Phil-IRI Reading Scale was used to determine the level of reading comprehension for both the English and Math tests. A comprehension score in the percentage of 80 percent to 100 percent will have an interpretation of an Independent Level. An Independent Level is a level a student can read without the aid of the teacher. A comprehension score of 59 percent to 79 percent will have an interpretation of an Instructional Level. An Instructional Level is a level where the student can read with the guidance of a teacher and make progress in reading. A comprehension score of 58 percent and below will have an interpretation of a Frustration Level. A Frustration level is where the child cannot read or understand the written text on his own. This scale was used to determine the kind of materials appropriate for each student.

Validations of the measures were done by experts in English and Mathematics. Verbal interpretation of the validity test for the researcher-made questionnaire was "excellent" (4.33). The verbal interpretation of the Phil-IRI was "very good" (4.17). Reliability testing for the researcher-made questionnaire was done. The reliability test was administered to two sections of fifth-graders. The internal consistency of this test was acceptable (Cronbach's $\alpha = 0.718$).

The tests were given in separate schedules on the same day. The 20-item reading comprehension test was administered first with a duration of 15 minutes. The 10-item word problem-solving test was given next with the same duration of 15 minutes. The data obtained were examined to compare the problems of this study. The value of statistical tools such as the mean, standard deviation, and correlation coefficient was obtained.

RESULTS, DISCUSSION, AND IMPLICATIONS

The reading test which consisted of 20 items measured the levels of comprehension which are Literal, Inferential, and Critical. Emphasis was given more to the Inferential Level.

The results showed that the test respondents had a mean scale of 0.74 with a standard deviation of 0.18, equal to 74 percent of the reading comprehension skills. Class comprehension was interpreted at an Instructional Level for the mean result. It was also found that males have a mean scale of 0.71 with a standard deviation of 0.20 and are equal to 71 percent of the reading comprehension skills. Male students had an overall result of Instructional Level for the mean result. Females had a mean scale of 0.77 with a standard deviation of 0.15 and are equal to 77 percent of the reading comprehension skills. Female students had an overall result of Instructional Level for the mean result.

The findings indicated that the reading comprehension level, when grouped as a whole and even when grouped according to sex, was at an Instructional Level. At the Instructional Level, the students can progress in their reading with the aid of a teacher giving appropriate reading materials to enhance their skills.

The reading comprehension level of both sexes was interpreted to be at the same level, but the female results demonstrated a lesser spread and a higher

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mean. This could mean that females have a higher level of comprehension in reading. This agrees with the findings of Devolli & Brestovci (2014), which state that the female population understands more written text than males of the same group. Oda & Abdul-Kadhim (2017) posit the same even at the college level, though the difference is not that significant. Several studies stress girls love and frequent reading more than boys.

This behavior of girls was frequenting and loving reading, which can be accounted to the fact that, in their early years, girls are more read to by their parents, especially during bedtime. An essential factor of early literacy is being read to. As confirmed by international reading surveys at primary and secondary school levels, boys perform less in reading. Boys of the same age as girls are more accustomed to playing. It cannot also be helped that in the early stages, reading is associated more with the feminine gender. This gap in the early years disappears in adulthood (Mullis et al., 2012).

The results of the word problem-solving test further showed that the test respondents had a mean scale of 0.24 with a standard deviation of 0.12 and are equal to 24 percent of problem-solving abilities. The test respondents showed a general Frustration Level for the mean result. The same test showed that the males had a mean scale of 0.24 with a standard deviation of 0.13 and were equal to 24 percent of problem-solving abilities. Males showed a Frustration Level for the mean result. Females had a mean scale of 0.24 with a standard deviation of 0.10 and are equal to 24 percent of problem-solving abilities. Females also showed a Frustration Level for the mean result.

The findings indicated that word problem-solving skills, when grouped as a whole and even when grouped according to sex, had interpreted a Frustration Level. The word problem-solving skills of both sexes were interpreted to be of the same level. However, the female results also demonstrated a lesser spread.

The outcomes agree with Cheryan (2012), who reported that Engineering and other related fields have an increase in the number of female enrollees. These findings are supported by Kane and Mertz (2012) and Guiso et al. (2008), who stated that gender equity can eliminate the gender gap in Mathematics.

Niederle and Vesterlund (2010) stated that the gender gap in Mathematics can be attributed to their competitiveness. At the tertiary level, the male gender tends to choose math-inclined programs such as engineering, even for those with lesser mathematical skills. This was attributed to the cultural orientation of individuals (Awofala, 2011).

Pearson's correlation coefficient (r) was used to determine the significant relationship between the test respondents' English reading comprehension and Mathematical word problem–solving skills. Pearson's r-value of 0.4289 indicated a moderately significant relationship (Cohen, 1988). The p-value of 0.005142 showed a significant relationship between English reading comprehension and mathematical word problem-solving skills. This result rejected the null hypothesis.

Reading comprehension and word problem-solving skills had a direct relationship through the results, which were contrasting. This meant that the students' problem-solving abilities depended on their reading skills. The contrasting individual results of the variables further showed that the group was not familiar with mathematically worded problems.

This suggests that Mathematics teaching could be patterned to language teaching. Students should familiarize themselves with worded problems in their early years. Mathematics language in a classroom is becoming a recent trend of academic instruction. Studies reveal that when Mathematics and reading and writing are integrated, an increase in Math achievement can be observed (Barton, 2008).

Moreover, this study's findings tell us that there are

other factors that exist, other than reading, that can be associated with their achievement. It is apparent that reading skills contribute to the acquisition of problem-solving skill but it is not sufficient. Care and emphasis should be given when teaching students problem-solving skills.

CONCLUSION AND RECOMMENDATIONS

The results of this study have proven that there is no gender gap in reading comprehension and word problem-solving. Results for the respondents' reading comprehension and problem-solving showed that they have a direct relationship with each other, which rejected the null hypothesis. The performance in reading comprehension was interpreted at an Instructional Level but the performance with problem-solving skills was interpreted at a Frustration Level. Reading comprehension is an important factor in problem-solving but the results of the study showed that it is not enough to successfully solve word problems.

Given the findings and conclusions, several recommendations are extended to students, teachers, higher educational institutions, parents, and future researchers.

Mathematics should be taught as a language in the classroom in earlier stages to allow students to familiarize themselves with their vocabulary. Word problem-solving must be given emphasis. The construction of word problems should be appropriate for the child's reading comprehension in mathematical language.

Teachers and parents alike are encouraged in aiding young minds in early numeracy. Early Mathematics learning should be taught as fun, interesting but of vital importance in daily life activities.

A peer tutorial with a modular approach is proposed to enhance Math learning and teaching for grade school pupils and pre-service teachers under the guidance of in-service Math teachers.

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