READING Performance and Math Anxiety as Determinants of Mathematics Achievement among Grade 5 Public School LEARNERS

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ABSTRACT

This quantitative study determined the influence of reading performance and math anxiety on mathematics achievement among Grade 5 public school learners. A descriptive correlational design was utilized where a survey questionnaire that contained tests on reading comprehension and math anxiety were administered and were then computed against the learners' quarterly math scores. Mean, standard deviation, Pearson product-moment correlation coefficient and regression analysis were utilized as the statistical tools. Based on the findings, it was revealed that the level of reading performance of Grade 5 learners for both oral and silent reading were in the instructional level while the listening comprehension was in the frustration level. On the other hand, their levels of math anxiety in three categories of everyday math anxiety, math learning anxiety and math test anxiety were rated moderate. Notably, the overall level of mathematics achievement of Grade 5 learners was very good. Furthermore, a positive and significant relationship between reading performance and mathematics achievement was established while math anxiety did not significantly influence the learners' mathematics achievement.

KEYWORDS: *Education, mathematics, reading performance, math anxiety, mathematics, achievement, descriptive correlational, Philippines*

INTRODUCTION

Mathematics achievement is the proficiency demonstrated by students in performing various mathematical operations from the lessons they have learned formally in school (Summer, 2020). As cited by Pandey (2019) mathematics

achievement is usually measured through achievement tests that serve as benchmark to those who have achieved and those who have not. Mathematics achievement is one of the important factors that determines students' success in academic learning. As it promotes logical thinking and mental rigor, students' cogent ability in carrying out mathematical operations and solving mathematical problems pose significance to the development of other academic abilities such as reading, physics, social studies or even music and art (Ozdemir, 2020).

In America, learners who start out the school year with very low scores on math do not grow at a fast pace enough to catch up their peers with high scores (Scammaca et al., 2020). Similarly in Fiji, poor achievement in mathematics is an issue of great concern since students there generally have negative attitude towards mathematics, which affect their interest in learning the subject (Chand et al., 2021). In a UNESCO report, about 90 percent of Indian students aged 10 to 16 years old have been found to lack mathematical skills (Benu, 2022). This consequently affects their math achievement as they are projected to come lower than their neighboring countries of Pakistan, Nepal, and Bangladesh when it comes to math tests. In Indonesia, mathematics is one of the compulsory subjects that determines the passing of their national examination. But the current condition is that the mathematics achievement of Indonesian students is still very far from what was expected (Maamin et al., 2021).

The Philippines is one of the countries having poor achievement in mathematics. In fact, the results of the 2018 Programme for International Student Assessment (PISA) showed the Philippines ranked second to the last in terms of mathematics achievement based on each country's means (Department of Education, 2019). This clearly reveals that more Filipino learners fall below the international standards when it comes to the competency in mathematics that signify their apparent lack of skills. Likewise, Bernardo et al., (2021) expressed that this is especially true among students enrolled in the public school system.

While this has been the current situation of mathematics proficiency in the country, the Department of Education Division of Davao City also posed similar concern. In the press statement released in 2009, the mathematics achievement of students in Davao City has been recorded to be extremely low. In fact, based on the ranking in the division of Region XI, Davao City is considered low performing when it comes to math (DepEd Advisory, 2011). In a study of Galago et al., (2018), they found that the readiness of freshmen university

students when it comes to mathematics was very poor. They discovered that freshmen students taking Grade 6 level math test performed very low in the test.

In their investigation, Peng et al. (2020) discovered that reading fluency has a positive association towards math skills, which indicates cross-linguistic connection between reading and math. This suggests that learners who are proficient readers tend to perform better in mathematics. Similarly, Kasarani et al., (2022) mentioned that strong literacy skills support mathematical learning in the same note that reading comprehension is essential for understanding word problems in math such that being able to read fluently help students process mathematical information more efficiently (Stephany, 2021).

The main objective of this study is to investigate if reading performance and math anxiety are determinants of low or high mathematics achievement among Grade 5 pupils in certain elementary schools in the Third District of Davao City. Given Davao City's historical underperformance in mathematics within the region (DepEd Advisory, 2011), it is essential to identify the root cause of this problem.

Thus, to further verify claims regarding the influence of reading comprehension and math anxiety towards math performance, this present study intends to determine if these effects also hold true among the learners in Davao City. If confirmed, this research could contribute to developing interventions specifically in enhancing reading abilities and reducing math anxiety of the learners, which would benefit both the schools and the government. At the outset, the researcher intends to disseminate the results of this research in sessions such as the Learning Action Cell (LAC) as well as in local and international research forums, and conferences. The researcher also plans to publish the study in an appropriate journal for wider dissemination of knowledge.

Theoretical Framework

This study was anchored on Theory of Comprehension (Kintsch's 1988) and Deficit Theory (Eller, 1989). The theory of comprehension which emphasizes that a representational format must be able to handle both knowledge and experience, as both play a role in the creation of mental representations of texts. Knowledge and experience are essentials tools in comprehension, and their mechanisms are further regulated by the relationship between the top down and bottom-up processes. The core language processing

or the advanced degree of knowledge integration are examples of the top-down and bottom-up processes that define the nature of mental representations formed during comprehension, as explained by the construction integration paradigm.

The theory of comprehension provides a valuable framework for understanding how individuals comprehend and make sense of written text. According to this theory, comprehension is a constructive process that involves integrating new information with existing knowledge structures, or schemas, in the mind. These schemas serve as mental frameworks that help individuals interpret and organize information, allowing them to extract meaning from text. Kintsch's theory emphasizes the importance of both bottom-up processes, such as decoding words and analyzing sentences, and top-down processes, such as using background knowledge and context to aid comprehension.

In the context of this study, the theory of comprehension is used to explain that when learners proficiently read learning materials such as the ones given in math problems, they can then develop an insight as to how they are going to solve the problem. This means that when learners are equipped with good readings skills, they can understand better what is being read, and in the case of math subject, math problems and math operations will be performed effectively. This then results to better math performance.

Another theory is the deficit theory. It suggests that certain individuals or groups of people are disadvantaged or have deficits in their abilities, skills, or knowledge, which result in their inability to succeed in society. This theory is often applied to explain the academic achievement gap between students from different socioeconomic, racial, and cultural backgrounds.

In this present study, the deficit theory is used against the backdrop of the public school system where stereotypically, students studying in public schools are those who are economically and socially disadvantaged. Thus, the theory suggests that when students are at the disadvantage such as being in low social and cultural status or having poor economic backgrounds, they are more likely to face challenges in learning. This is because the scarcity of learning materials such as books and the inaccessibility towards technologies such as the internet impede them in attaining better academic training. This then leads to low academic performance, which may include the lack of reading proficiency and poor mathematics achievement.

METHODS

Research Design

The study utilized quantitative research specifically descriptive correlational design. Quantitative research is viewed as values breadth, statistical descriptions, and generalizability (Patricia, 2022). Quantitative research emphasizes objectivity, control, and precise measurement, with data collected and coded in numerical form (Williams et al., 2022). Descriptive correlational research is effective for examining the characteristics of a population or group and exploring the relationship among variables without implying causation, as it investigates correlations and the degree of association between variables, enabling informed predictions (Dewi et a., 2023; Bhandari, 2021). This design examines the intensity and direction of relationships, whether positive or negative, without manipulating variables. Furthermore, descriptive correlational statistics identify the basic properties of collected data. Providing summaries and critical information about study samples and measurements (Fowler, 2013). These statistics are categorized into measures of central tendency and spread (Kothari, 2004), which reveal patterns that allow researchers to evaluate and interpret findings, with the results serving as valuable inputs for future research or as independent conclusions, especially in studies requiring large sample sizes and complex data analysis.

Respondents

The respondents of this study were the 423 Grade 5 learners currently enrolled. Stratified random sampling was utilized to determine the sample size. They were chosen as the study's respondents because they met the criteria as they have gone through English language training since Grade 2. This is crucial in the study since these current Grade 5 students were the last ones to attend the face-to-face classes before classes were brought online during the pandemic.

Statistical Tools

The data were treated using the Mean, Standard Deviation, Pearson Product Moment Correlation Coefficient, and Regression Analysis. Mean was used to determine the level of the two variables, namely reading performance, math anxiety and mathematical achievement of the learners. Standard Deviation was used to determine the variation between each data point relative to the mean. Pearson Product Moment Correlation Coefficient or Pearson r was used to test the relationship of the independent and dependent variables. Regression Analysis used to predict the influence of the independent variables based on the dependent variable.

RESULTS

Level of Reading Performance of Grade 5 Learners

Table 1
Reading Performance of Grade 5 Learners

Indicator	Mean	SD	Description
Oral Reading	4.51	1.70	Instructional
Silent Reading	4.79	1.77	Instructional
Listening Comprehension	3.16	1.63	Frustration

Table 1 reveals the level of reading performance of Grade 5 learners. Three indicators of reading performance are presented on the table with corresponding mean and standard deviation; these indicators include oral reading, silent reading and listening comprehension. Results show that the mean for oral reading is 4.51 and for silent reading is 4.79 which is both described as instructional level while the listening comprehension has the mean of 3.16 which described as frustration level. This denotes that oral reading facilitates better comprehension since saying out loud readable texts allows students to retain spoken word easily and in silent reading, learners possess ample time to appreciate information in their mind, and could take time out understanding the words, terms or phrases and translate them to the language or mental forms that they could understand easily. While in the listening comprehension, this level signifies that listening to reading materials spoken out loud by others such as by teachers may deter understanding among the students since it is not within their control. The standard deviation ranges from at 1.63 to 1.77 indicating that more than oral reading and silent reading, there should also be an emphasis on how to make learners understand spoken works in order to aid them in their listening comprehension.

Oral reading means that the pupils can read with some assistance, can decode words, and understand the text, but may require some support to fully comprehend or read fluently. This finding supports the contentions of Gedik and Akyol (2022) and Xin and Yunus (2020), who stated that oral reading improves reading comprehension as speed and accuracy in word recognition aids in retaining and understanding information in the mind. For silent reading, means that learners can read and understand a text independently but may still need occasional support. At this level, the student can decode most words and

comprehend the main ideas and details of the text, though they might require some assistance with more complex vocabulary or concepts. This resonates with what Sanders (2020) and Caraig and Quimbo (2022) claimed that silent reading helps in developing reading abilities as it concentrates towards comprehension rather than on pronunciation or stresses of words. Whereas listening comprehension, obtains the lowest score since it demonstrates the difficulty of acquiring understanding of the learning materials when spoken by others (Shen & Chiu, 2019). Listening is basically obtaining information from others without the chance for students to review or slow it down in their mind, thus certain information may be lost, missed, or not understood at all. This is also illustrated by Afshar and Asakereh (2016), who stressed that the main challenge encountered by students in reading is their lack of comprehension in speaking in class. This is clouded by various distractions such as noise, word pronunciation, and word meaning or spelling or even the speaker himself, which makes understanding difficult to achieve (Shen & Chiu, 2019).

Level of Math Anxiety of Grade 5 Learners

Table 2
Level of Math Anxiety of Grade 5 Learners

Indicator	Mean	SD	Description
Everyday Life's Math Anxiety	2.51	0.59	Moderate
Math Learning Anxiety	2.72	0.70	Moderate
Math Test Anxiety	2.89	0.75	Moderate
Overall Mean	**2.71**	**0.57**	**Moderate**

Table 2 shows the level of math anxiety of Grade 5 learners. The overall mean of math anxiety is 2.71, which is described as moderate. This can clarify the general level of discomfort or apprehension the learners might feel when faced with mathematical tasks or situations. In other words, learners experienced a moderate level of stress or nervousness when engaging in math related activities. This level of anxiety is noticeable but not overwhelming, affecting performance to some extent. This finding supports the study of Eston Anto and Dio (2019) who claimed that mathematics anxiety impacts to the learner tremendously especially his reading performance, mastery of learning competencies and skills in mathematics. However, mathematics anxiety is manifested as a fear or apprehension of mathematical activities and is one of many factors related to the development of mathematical competencies (Moore

& Geary, 2024).

The indicator with the highest mean is math test anxiety. The means of this indicator ranges from 2.56 to 3.32. The category mean is 2.89 described as moderate which means that taking math test brings about certain level of uneasiness and doubt among learners. The findings indicate that while learners experience a moderate level of math anxiety, the intensity varies depending on the task. Tasks that involve immediate performance, such as solving exercises, appear to cause more anxiety compared to tasks that allow for more preparation and control, such as studying for a test. Understanding these differences can help teachers develop strategies to alleviate math anxiety and support students in managing their stress levels more effectively. This finding supports the study of Mnguni (2022), which suggested that anxiety towards math tests occupy the working memory, which subsequently affect performance in math tasks and tests. As learning math apparently create certain level of anxiety, taking the math test is more tedious as students have certain expectations as to the nature and tone of the questions asked, the formula to remember, the operational techniques and other elements that come along in taking math test, not to mention the difficulty in understanding the question (Genc & Sanli, 2023).

Along with these expectations, math exam brings about stress when it comes to the result as it is always dreadful to fail in math test (Jerrim, 2023; Luttenberger et al., 2018). Meanwhile, the indicator with the lowest mean is everyday life's math anxiety. The mean scores of the items range from 2.19 to 2.81. The category mean is 2.51 described as moderate which indicates that students have a normal take on everyday mathematics tasks; they do not find it difficult yet not that easy. The data highlights that learners experience moderate math anxiety, with the degree of anxiety varying depending on the specific math task. These insights can help teachers identify which areas to focus on when developing strategies to reduce math anxiety. This finding is in congruence with the view of Jansen (2016) that everyday life's math activities have become habitual, thus using their math skills have become routinary making it not too difficult to handle. The result is somehow contradictory to what Field et al. (2019) claimed that people with math anxiety have the tendency to avoid situations that relate to math. Since every day is a mathematics day, every day life's math anxiety has become handy.

Level of Mathematics Achievement of Grade 5 Learners
Table 3

Level of Mathematics Achievement of Grade 5 Learners

Score Range	Frequency (*f*)	Percentage	Description
25-30	162	38.3	Excellent
20-24	126	29.8	Very Good
15-19	51	12.1	Good
10-14	59	13.9	Satisfactory
5-9	24	5.7	Unsatisfactory
0-4	1	0.2	Poor
Overall Mean: 21.08			
SD: 6.36			
Overall Description: Very Good			

Table 3 presents the level of math achievement of Grade 5 learners. Results show that the overall mean of 21.08 which is described as very good. This indicates that Grade 5 learners performed well in their math achievement test since almost 70% obtained the score within the 20- 24 and 25-30 bracket. This good performance could have been due to the fact that the test was only a periodical test for the third quarter of the school year, thus, the test only contains questions related to lessons discussed and learned during that period (Hamid & Kamarudin, 2021). When lessons are too specific and in minimum number, the facility of retention and understanding is higher than multiple lessons that are to be learned in one time (Colman, 2024). Moreover, the familiarity of the students with the learning environment and test mechanics could have given the edge in answering the math test much more efficiently (Salazar & Basierto, 2021). This supports the contention of Bibon (2022) that school-based factors such as the learning material, learning instruction and learning environment facilitates math achievement as they predict performance in math (Chen et al., 2018).

It is important to note that the quality of learning material, such as textbooks, worksheets, and digital resources, can significantly change students' understanding and mastery of mathematical concepts. Well-designed learning materials that are engaging, relevant, and aligned with curriculum standards can enhance students' learning experiences and contribute to their math achievement. Similarly, the quality of learning instruction is crucial. Effective teaching strategies, such as clear explanations, guided practice, and opportunities for student collaboration and discussion, can help students develop a deep understanding of mathematical concepts and improve their critical thinking

skills. Teachers who create a positive and supportive learning environment can also contribute to students' motivation and engagement in math, which can positively impact their achievement.

Significance of the Relationship between Reading Performance, Math Anxiety and Mathematics Achievement of Grade 5 Learners

Table 4
Significance of the Relationship Between Reading Performance, Math Anxiety and Mathematics Achievement of Grade 5 Learners

Variable X	Variable Y	r-value	p-value
Reading Performance	Mathematics Achievement	.164	Significant
Math Anxiety	Mathematics Achievement	.003	Not Significant

Table 4 shows the significance of the relationship between reading performance, math anxiety and mathematics achievement of Grade 5 Learners. When it comes to the significance of the relationship between reading performance, math anxiety and mathematics achievement shows that reading performance is positively and significantly related with math achievement as opposed to math anxiety and math achievement, which showed no significant relationship. Reading performance has the r-value of .164 and p-value of .001, which indicates a significant relationship towards mathematics achievement.

These results indicate that reading performance matters significantly in achieving better understanding of math problems as item statements that are sufficiently understood are also operationally performed well by students. This statement suggests that there is a statistically significant, although modest, positive relationship between reading performance and mathematics achievement. While the correlation coefficient indicates that the relationship is not extremely strong, the low p-value provides strong evidence that the observed relationship is not due to chance.

This finding emphasizes the importance of reading performance in predicting mathematics achievement as postulated by Valencia et al. (2023). According to the findings of Gomez et al. (2021), students who demonstrate stronger reading skills are more likely to perform better in mathematics.

Educators and policymakers can use this information to design interventions and instructional strategies that promote literacy development to improve overall academic achievement, including in mathematics (Cardino & Cruz, 2020).

Meanwhile, math anxiety has the r-value of .003 and p-value of .947, which indicates a not significant relationship towards the mathematics achievement. This statement suggests that there is a very weak correlation of .003 r-value between math anxiety and mathematics achievement yet it is not as statistically significant as reflected by the p-value of .947. This could possibly imply that the observed relationship between math anxiety and mathematics achievement is likely due to random chance rather than a true association. Expanding on this, it can be concluded that based on the given statistical values, there is no significant relationship between math anxiety and mathematics achievement, which means that math anxiety does not have substantial impact on students' performance in mathematics.

This finding validates with Kintsch's Theory of Comprehension (Kintsch, 1988), which emphasizes the role of language proficiency and vocabulary knowledge in reading comprehension. Along with this, readers use their existing knowledge and reading skills to construct a mental representation of the text, known as the text base. This representation allows the learners to understand the text and make connections with their prior knowledge. Therefore, students with strong language abilities, including vocabulary knowledge, are better able to comprehend text, which can positively impact their performance in various academic areas, including mathematics.

Additionally, this supports the claim of Li (2021) and Qunayeer (2021) who contended that students who have a strong ability in language specifically in its use and acquisition are better in reading comprehension, which translates to other academic abilities such as math performance. Also, this finding confirms with the statement of Trakulphadetkrai et al. (2020), which stressed that students who know a lot of vocabulary can easily learn everyday math operations as it is an everyday experience. Without comprehension, students cannot successfully complete class assignments nor become critical thinkers (Eze et al., 2022). Reading skills are vital in comprehending text in mathematical word problems (Gomez et al., 2021).

On the contrary, math anxiety has been found by this study to have no significant relationship with math achievement. This simply indicates that

having a certain degree of worry about math does not deter the performance of the students in answering math tests well. This could have been because students are trained in math tests through the lessons taught in class, the problem-solving activities and quizzes that provided them with the mechanism on how to solve math problems. Perhaps, the anxiety may be present, but it does not significantly affect the intention of students to pass the math subject. This result is contrary to what has been generally and traditionally believed that math anxiety is negatively correlated with math achievement (Ober et al., 2021).

According to many studies, the fear of failing math subjects always disrupts students' working memory resources, which eventually leads to lower confidence in performing math test (Buckley, 2020). However, the studies of Passolunghi et al., (2020) and Szczygiel (2020) support the result of this present study since they have presented that math anxiety does not have any significant direct effect towards math achievement.

According to these authors, the said variables only have certain effects if they are mediated by some factors such as grade, gender, and types of anxiety. As explained by Brewster and Miller (2023), students who have positive attitude towards math perform sufficiently well in the subject.

Significance of the Influence of Reading Performance and Math Anxiety to Mathematics Achievement

Table 5
Significance of the Influence of Reading Performance and Math Anxiety to Mathematics Achievement

Predictors	Beta Coefficient	t	p-value	Remarks
Reading Performance	.743	3.378	.001	Significant
Math Anxiety	.088	.165	.869	Not Significant

F=5.707; p-value=.004;R=.163

Table 5 shows that reading performance has significant, positive influence towards math achievement as shown in its beta coefficient score of .743; t=3.378; p-value=.001. This indicates that the better reading performance level the learners have, the better performance they have in mathematics. This further means that when the learners are proficient in reading, they have the

higher ability to comprehend reading materials, and in the case of math subject, they can better understand math problems and math operations. This provides an insight that reading should be developed intensively among school learners as this can help in achieving better performance in other academic subjects such as math. This also calls for a better and more creative approach in teaching reading in the classroom so that learners develop their love towards reading, which will eventually aid them in their attaining better academic achievement.

In the same table, it shows that math anxiety does not have a positive, significant influence towards math achievement as it is shown in the beta coefficient score of .088; t=.165 and p value=.869, which is not significant. This could imply that that anxiety in math does not hinder students to perform well in their mathematics test. This is most probably because in this study, only the quarterly math test was used to gauge students' math achievement and taking quarterly test could have been easy for the students as they only have to remember lessons that are taught within that period. However, this finding still calls for the importance of addressing anxiety-related challenges in education and promoting mental well-being to support academic success. This means that building student confidence in math operations is a crucial first step toward enhancing math achievement. Students who approach math problems with confidence are better equipped to manage any anxiety they may feel, leading to improved performance in math tasks.

This highlights the importance for educators and the education department to focus on fostering stronger confidence among students. By doing so, students are better prepared to navigate challenges, including successfully passing math subjects. This aligns with the deficit theory, which suggests that students who lack confidence in their abilities may struggle academically. Explained by Brewster and Miller (2023) that the significance of positive attitudes toward math, noting that such attitudes are associated with higher performance levels in mathematics. Therefore, efforts to enhance student confidence in math can have a profound impact on their academic success.

CONCLUSION

Based on the findings presented the following conclusions were drawn: The level of reading performance of Grade 5 learners proved to be in instructional level for both oral and silent reading while listening comprehension is labeled in the frustration level. Instructional level in oral and silent reading refers to the degree of difficulty of text that a student can read with

teacher support. It is a level where the student is challenged but can still understand and learn from the text with some assistance. While the frustration level in listening comprehension refers to a level of difficulty in auditory materials where the student finds it very challenging to understand without significant help.

The level of math anxiety of Grade 5 learners has a moderate level of anxiety. This means that anxiety is sometimes manifested in the life of Grade 5 learners. Math anxiety is felt among the learners especially when it comes to learning math and taking math tests. However, learners' daily math anxiety was not very overwhelming, as they could still handle their daily tasks using math.

The level of mathematics achievement of Grade 5 learners was rated very good as indicated by their overall high score. The learners displayed a good level of mathematical achievement, scoring well on the quarterly periodical test.

There was a significant relationship between reading performance and mathematics achievement among Grade 5 learners, which implies that reading ability comes first in helping learners become successful in their math subject. However, the relationship of math anxiety and mathematics achievement was not significant. This can be noted that learners' existing math anxiety has been managed well and can still get an honorable grade in mathematics.

Reading performance significantly influences mathematics achievement among Grade 5 learners, which implies that learners have a good practice in reading to be able to comprehend well in math test items especially word problems. However, math anxiety did not have any significant influence towards students' math achievement, which simply means that anxiety, as it always occur in any academic pursuits, may have been handled well by the students and did not have any effect towards their math performance.

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