Available online at **globets.org/journal**
International Journal of Education, Technology and Science
3(2) (2023) 125–135

IJETS
International Journal of Education Technology and Science

PEER TUTORING ON ENHANCEMENT OF MATHEMATICS PERFORMANCE OF SELECTED GRADE 6 STUDENTS AT GREGORIO HERRADURA ELEMENTARY SCHOOL, VICTORIA, LAGUNA, PHILIPPINES

Philip Cyrill Candelaria

[a] *Department of Education,Victoria,Laguna 4011, Philippines*

Received: 11.10.2022 Revised version received: 22.12.2022 Accepted: 25.12.2022

Abstract

Peer tutoring is a learning method that entails student partnerships that pair good students with lower achievers or pupils with comparable achievement for systematic reading and math study times. The main purpose of this study is to determine the problems of selected grade 6 students in mathematics that would help the students enhance their academic performance in the subject. The data gathering will be done by selecting grade 6 students, both female and male, with separate results from the conducted pretest and posttest questionnaires. Other students who do not fall into the category are not included in the collection of information. The only purpose of this study is to achieve its goal, and it won't investigate anything else. After using dependent T test at the scores of the students after pretest and posttest, we got a computed value (T Value) of -5.6803. With a critical value of -2.0195, we can reject the null hypothesis and conclude that peer tutoring can bring a significant difference to the combined result of critical thinking and problem-solving test. The finding suggests that school heads and classroom teachers may use "peer tutoring" as a learning method for helping the learners improve their performance in mathematics. The school and the classroom teachers may use peer tutoring as a learning method that entails student partnerships that pair good students with lower achievers or pupils with comparable achievement for systematic reading and math study times

Keywords: peer, tutorial, mathematics performance,skills,DepEd

1. Introduction

Peer learning is an all-encompassing learning technique. It contains a variety of activities in which students learn through various approaches. Giving them the opportunity to practice the methods and approaches they will need to utilize will help them gain the abilities they will need in life. As a result, education will become increasingly vital. Mathematics includes teaching students how to apply what they already know, as well as employing logic and reasoning to solve problems they have never seen before. A good foundation in mathematics is essential for success in school and in everyday life. Many kids, on the other hand, are terrified of mathematics, which is known as "mathematics anxiety".

Tutoring was the most used remedy to their academic problems. It is the process by which a tutor or someone more capable of performing something guides the individual or group. Tutoring's goal is to help students help themselves, or to aid or guide them to the point where they become independent learners and no longer require a tutor. Tutoring is an excellent way for tutors to broaden their knowledge. The more they teach, the better they will understand a particular topic or subject area. Tutoring not only helps students or children become brighter, but it also helps them get along with their peers. Implementing peer-tutoring to deal with academic obstacles, particularly in mathematics, allows students to support one another. Giving them a partner to assist them in resolving a difficult challenge. Giving them the engagement, they need to increase their confidence and academic success.

Ulep (2014) emphasized that critical thinking and problem-solving abilities are the main objectives of mathematics in grades k–12. To accomplish these goals, it is necessary to assess teachers' readiness for the task at hand as well as their level of perception of the subject matter, instructional strategies, and teaching methods. Critical thinking and problem-solving abilities are the main objectives of mathematics in grades k–12. To accomplish these goals, it is necessary to assess teachers' readiness for the task at hand. This study will help teaching institutions determine how prepared teachers are to use the spiral approach to teach math.

According to Nunez-Peña et al. (2019), mathematics anxiety has a significantly negative impact on students' achievement in mathematics. This is attributed to students with high levels of mathematics anxiety and a lack of social skills provided through cooperative learning strategies such as peer tutoring. Peer tutoring is an active teaching method that fosters pupil inclusion while enabling students to study from the knowledge of each other. When students tutored each other on the same math problems that they later worked on, the tutored math sessions were associated with higher accuracy and rates of performance. Understanding the world through mathematics also helps them develop mental discipline. Mathematics fosters logical reasoning, critical analysis, inventiveness, abstract or spatial thinking, problem-solving aptitude, and even good communication abilities (The Scientific World, 2018).

The researchers conducted this study since mathematics is one of the most important disciplines to learn. The study's purpose is to teach young people how to get along with others so that they can do better in school and tackle the problem of underperforming learners.

Peer tutoring influences pupils' academic progress. It is one of the most effective teaching instructions since it provides positive feedback on students' motivation, social skills, and, most importantly, learning. Because of its collaborative character, peer education encourages pupils to enhance their creativity and problem-solving skills. Peer teaching also helps tutors comprehend the tutees' mental level and concept of the issue (Ullah et al., 2018).

Learning with critical thinking is the method of mastering knowledge and skill processes to improve the learning process (Pane, 2017). Musanna (2017) stated that the development of a student's

characteristics, character, and quality morals through an educational process can be carried out with the existence of national education so that students have the potential to become human beings who have good character, are civilized, ethical, and devout. When someone can think critically, it can help them improve the quality of their thinking when solving a problem (Marzuki et al., 2022). Effective learning that involves students in the learning process will develop critical thinking processes in students as young as elementary school (Mujib et al., 2017). Anggraeni et al. (2018) say that "active students will affect their learning, which will make their learning better." Every student's thinking process skills differ when it comes to using logical reasoning as well as reasoning in the solution of mathematical problems (Rahayuningsih et al., 2018; Ridwan et al, 2022). Komariyah and Laili (2018) stated that critical thinking skills have a significant impact on mathematics learning outcomes. Moreover, applying students' critical thinking skills to learning can improve learning activities (Styers et al., 2018). Hu et al. (2016) said, "With knowledge, thinking abilities can be formed by teaching thinking methods and training in thinking." This means that students can improve their reasoning skills by learning how to think and being taught how to think.

A student may perform poorly in mathematics because they are nervous about it rather than because they are performing poorly as a result of math anxiety. Numerous aspects of learning that are crucial for learning, such as attention, memory, and processing speed, can be impacted by worry, according to decades of research. Math anxiety can significantly impair memory, a crucial neurodevelopmental process required for math. This is due to the brain's increased focus on managing stress rather than processing information, which lowers the amount of active working memory available for mathematical tasks (Gearty, 2022) . The aspect of mathematics anxiety that can result in subpar performance on mathematical activities. According to research, students can remove or lessen the detrimental effects of their mathematics anxiety symptoms on their performance and learning by using emotion regulation techniques to control such symptoms (Ramirez et.al., 2018). In order to remove anxiety as a barrier to learning mathematics, it is important to help pupils develop their ability to manage their emotions. By implementing instructional strategies that encourage a growth attitude, confront misconceptions about mathematics, and provide students the chance to achieve personally in the subject of mathematics, it is possible to address the root reasons of mathematics anxiety (education.vic.gov au, 2018) Mathematics anxiety is far more than just a dislike of the topic; it is a serious issue for kids that interferes with working memory and sets off a vicious cycle of avoidance, underperformance, and worry. The onset of this type of anxiety begins in kindergarten, and it affects roughly half of primary school students. The signs and symptoms of math anxiety are avoidance, lack of response, tears or anger, negative self-talk, and low achievement. (Picha, 2018).

Peer tutoring can assist teachers deal with a diverse class of pupils that require more specialized attention. Before introducing a program like this in their classrooms, teachers should think about the many advantages and difficulties of peer tutoring. (Cook, 2022). Peer tutoring is one of the intervention methods that can be beneficial for both tutors and their tutees. For the tutors they deepen their understanding of the subject and impart their self-confidence. And for the tutees peer tutoring can improve their attitudes towards learning, foster more personalized learning experience, engage

students in collaborative learning and most especially peer tutoring can lead to higher academic achievement (Fink 2020).

Learning happens in social contexts (Vygotsky, 1978 as cited by Klerlein, J.et al 2020). Through the solving of issues and social contact with others in these activities, students create understanding. Students believe that they may take risks, try out new tactics, and provide and receive feedback as a result of these social interactions. As people share a variety of viewpoints or talk about potential solutions to an issue, they collaborate to learn. Children build knowledge and use the vocabulary to make sense of experiences by talking about issues and debating their theories.Instead of being taught something directly, students learn mathematics and hone their problem-solving abilities through working through problems (Hiebert1997 as cited by Klerlein, J.et al 2020). It is the responsibility of the instructor to provide scenarios and issues that allow for problem-solving.

There is a statistically significant difference between the pretest and the posttest score of students in mathematics learning anxiety, and moderate effect sizes will be reported. The purpose of this study is to gain insights from the prior problem and implement peer tutoring to improve the mathematics performance of grade 6 students at Gregorio Herradura Elementary School. Freiberg and others (2009) made use of a program which emphasized preventing classroom indiscipline prior to developing and improving student behavior. From their study they concluded that it is most important to have consistency in classroom management styles and cooperative discipline with an understanding of teacher- student participation in the class.

2. Method

2.1. Research design

The descriptive technique was utilized by the researcher to address the problem and achieve the aims stated in this work. Descriptive research describes and interprets what is concerned with the current state of relationships, prevalent behaviors, beliefs processes, impacts that are felt, or trends that are forming (Villena 2008). This descriptive approach research procedure entails more than just acquiring and tabulating data; it also includes an element for interpreting the meaning and importance of what is described. Thus, description is frequently integrated for comparison and contrast involving measurement, classification, interpretation, and assessment. It is used to describe characteristics of a population or phenomenon under study and usually comes before explanation. Thus, the researcher attempted to examine the influence of teacher managing styles on child social behavior in the current study. A questionnaire checklist was employed to supplement data collection.

The researchers used a pretest-posttest design. Choueiry (2022) stated that pretest-posttest design is a type of quasi-experiment that measures two times to get the outcome of interest. In connection with this, the researchers utilize the Pretest-Posttest Design, in which the dependent variable is measured once before the treatment is implemented and once after it is implemented. The purpose of this research is to ascertain the influence of peer tutoring on the mathematics performance of selected

grade 6 students. The researcher could measure the performance of students at a particular elementary school during one week, implement the peer tutoring program during the next week, and finally, measure their performance again the following week. The pretest-posttest design is much like a within-subjects experiment in which each student is tutored first and then under the learning tutorial condition. It is unlike a within-subjects experiment, however, in that the order of conditions is not counterbalanced because it is typically not possible for a participant to be tested in the treatment condition first and then in an "untreated" condition. If the average posttest score is better than the average pretest score, then it makes sense to conclude that the treatment might be responsible for the improvement. Unfortunately, one often cannot conclude this with a high degree of certainty because there may be other explanations for why the posttest scores are better.

2.2. Participants

The respondents of this are students of Gregorio Herradura Elementary School who are enrolled in the school year of 2022-2023. The respondents are from grade 6th students, specifically sections are Matipid and Mapagkumbaba. The respondent identified through the use of simple random sampling.

According to Lauren Thomas (2022), a subset of a population is chosen at random in a basic random sampling. Each person in the population has an exact equal probability of getting chosen using this sampling technique. The total of our respondents is 61. All of these students took the pretest, after that slovin's formula was used. It is a device used in statistical analysis to figure out the sample size of a population required for a particular study.

2.3. Data collection tools

The researchers attained a deeper analysis on what complications they have encountered during the data gathering and brainstorming. To gather information needed in this study, the proponents used the following methods:

Data Gathering. In utilizing this research instrument, the proponents were able to determine the conceivable challenges the proposed study may undergo. The researcher formulates a request letter to ask permission to collect data in Gregorio Herradura Elementary School. The proponents determine the possible problems of the affected grade 6 students at Gregorio Herradura Elementary School. The proponents will conduct the interview with the grade 6 teacher; First is using the most embraced social media application, Facebook Messenger, and lastly is through face-to-face or personal in-touch. Through this data collection method, the proponents also determined the response and the suggestion of the potential users.

Brainstorming is a technique used to identify a list of ideas by holding a group discussion. During brainstorming, the researchers gave their own idea they have analyzed on the conducted interview with the grade 6 teacher. The information collected resulted in the development of a solution, which assisted them in establishing a strategy called peer-tutoring. The researchers shared ideas, techniques by which effort generates thoughts to have a smooth and excellent outcome of the study.

Consultation. The researchers consulted their adviser, statistician for the study so that they can take any advice or ideas on how to establish better research strategy that will help to achieve the objective of the study.

2.4. Data analysis

The data gathered will be treated statistically through the use of slovin's formula and t-test.
Slovin's formula: n = sample size N = population size e = margin of error
T-test formula: $t = m-\mu\ s/\sqrt{n}$

t = student's t-test
m = mean
μ = theoretical value
s = standard deviation
n = variable set size

3. Results

Table 1: Learner's Mathematics Performance level using Pretest in terms of Critical Thinking and Problem Solving

PRETEST		
	AVERAGE	**ST DEV**
Critical Thinking	**1.6964**	**1.0255**
Problem Solving	**6.3571**	**1.778**
Total	**8.0536**	**2.1525**

In the table, at pretest, 61 students have an average score of 1.6964 out of 4 questions in critical thinking with a standard deviation of 1.0255. By this, we can conclude that most of the students are below average when it comes to critical thinking. With an average score of 6.3571 out of 16 questions with a standard deviation of 1.7728, we can also conclude that most of the students are average or slightly above it when it comes to problem solving. With a total of 20 questions, the average score of the students is 8.0536 with a standard deviation of 2.1525, by this we can conclude that most of the students are average.

Students require special help in schools concerning their academic problems especially in mathematics. And one of the intervention models for this is peer tutoring. That has been found to be an effective and inexpensive technique to increase the student's academic achievement (Henson, 2012). One of the instructional strategies that involve each student to help one another is peer tutoring. It is an effective intervention where they can learn through repetition of key concepts regardless of their age, grade level, ability, and disability status (Bowman et al.,).

Table 2: Learner's Mathematics Performance level using Posttest in terms of Critical Thinking and Problem Solving

Posttest		
Critical Thinking	2.6667	1.3077
Problem Solving	7.3659	2.6434
Total	9.6316	2.9630

At posttest after applying slovin's formula, the remaining 42 students who have been tutored got an average score of 2.6667 out of 4 questions in critical thinking with a standard deviation of 1.3077. By this, we can conclude that most of the students are now slightly above average when it comes to critical thinking. With an average score of 7.3659 out of 16 questions with a standard deviation of 2.6434, we can also conclude that most of the students are above average when it comes to problem solving. With a total of 20 questions, the average score of the students is 9.6316 with a standard deviation of 2.9630, by this we can conclude that most of the students are above average.

Peer tutoring strategy brought a positive change in the academic performance of students in mathematics. It is fruitful in increasing the academic achievement of those students who are having difficulties in mathematics. And it is also suggested to use peer tutoring as one of the strategies to secure better results in academics (Annaz,2017).

Table 3: Learner's Mathematics Performance level in terms of Critical Thinking

Critical Thinking		
T -Value	**Crit Value**	**Remarks**
-4.0441	-2.0195	Significant

After using dependent T test at the scores of the students after pretest and posttest, we got a computed value (T Value) of -0.0441. With a critical value of -2.0195, we can reject the null hypothesis and conclude that the peer tutoring can bring a significant different when it comes to critical thinking.

These findings reveal statistically significant variations in the mean critical thinking scores, according to the outcomes of cognitive ability tests. The study's findings have ramifications for primary school teachers who help students learn to think critically by using various learning experiences. Teachers might continue by thinking about how learning experiences fluctuate depending on the subject matter covered, the order in which students are taught certain abilities, and the variety of learning activities available to foster critical thinking. (Sekar, et.al.,2022)

Table 4: Learner's Mathematics Performance level in terms of Problem Solving

Problem Solving		
T Value	**Crit Value**	**Remarks**
-3.7617	-2.0195	Significant

After using dependent T test at the scores of the students after pretest and posttest, we got a computed value (T Value) of -3.7617. With a critical value of -2.0195, we can reject the null hypothesis and conclude that the peer tutoring can bring a significant different when it comes to problem solving.

Instructional strategies that promote students' learning in the domain of mathematical problem-solving, is a crucial component of mathematics instruction. By examining the impact of a cooperative learning instructional style on students' mathematics problem-solving, where kids with special needs are taught alongside their peers, their study intends to advance prior studies. The intervention combines a cooperative learning approach with teaching in problem-solving techniques, including geometric, proportional, and mathematical models of multiplication and division. The intervention had a significant impact on students' performance in both general problem-solving and geometry-specific problem-solving, according to the results. On the chosen tests of mathematical problem-solving, the children who scored higher on social acceptance and

friendships for the pre-test also scored higher. The cooperative learning approach may therefore result in improvements in mathematical problem-solving, Lang, N. et.al.,2019)

Table 5: The Result of Peer Tutoring on Enhancement of Mathematics Performance of Grade 6 Students

Total		
T Value	**Crit Value**	**Remarks**
-5.6803	-2.0195	Significant

After using dependent T test at the scores of the students after pretest and posttest, we got a computed value (T Value) of -5.6803. With a critical value of -2.0195, we can reject the null hypothesis and conclude that the peer tutoring can bring a significant different to the combined result of critical thinking and problem-solving test.

Peer tutoring has an impact on the academic achievement of the students. It is one of the effective instructions for teaching that gives positive feedback on students' motivation, social skills and especially in learning. Peer teaching allows students to develop their creativity and problem-solving skills because of its interactive nature. And for the tutor peer-teaching helps them to understand the tutees' mental level and concept about the topic (Ullah et al., 2018)

Discussion and Conclusions

The researchers chose the Grade 6 Elementary students at Gregorio Herradura Elementary School, located at Victoria, Laguna. Pretest and Posttest were used to gather the necessary information for the research. It was developed to determine if peer tutoring influences enhancing the mathematics performance of the students. The mathematics performance of the students was based on their Mean, Percentage, Score in their Diagnostic Test and Periodical Examination in the First Quarter. For a total of 20 questions, students have a mean score of 8. 0536 with a standard deviation of 2. 1525, so we can conclude that most students are average. On the posttest, after applying Slovin`s formula, the remaining 42 students received a mean score of 2. 6667 from the four critical thinking questions with a standard deviation of 1. 3077. With a total of 15 questions, the student's average score is 9.6316 with a standard deviation of 2. 9630. On computed value (t score) -0.0441 was obtained after applying for a t-test based on the student's pretest and posttest results. The critical value is -2. 0195, you can reject the null hypothesis and conclude that one-on-one tutoring can make a big difference in critical thinking. A calculated value (t score) of -3.7617 was obtained after using a t-test that relied on the students' pretest and posttest scores. With a critical value of - 2.0195, we can reject the null hypothesis and conclude that pairwise tutoring can make a big difference in problem solving. A calculated value (t score) of -5.6803 was obtained after using a t-test that relied on the student's pretest and posttest scores. With a critical score of -2.0195, we can reject the null hypothesis and conclude that peer tutoring can make a significant difference to the combined critical thinking and problem- solving test scores.

Based on the findings of the study, the following conclusions were drawn: The researchers found out that after using T-tests in pretest and posttest scores, there is a relationship between the two, and in terms of critical thinking and problem solving, it can be inferred that there is a significant

effect between the two. There is a significant relationship between the pretest and posttest scores in the mathematics performance of the grade 6 students in Gregorio Herradura Elementary.School. Based on the conclusion made, the following recommendations are being constructed: It was recommended that peer tutoring should continue to achieve good performance in mathematics by building an active and cooperative learning environment to increase participation, motivation, and student engagement. Tutors must continue to have a good relationship with their tutees for good mathematics performance. The next research can add information using other types of peer tutoring that can be recommended for their future studies.

Acknowledgements

This work is dedicated to the following people who inspired the researcher and helped make this study possible: God Almighty, who gave him strength and guidance, his parents, Ms. Jovita F. Candelaria, his brothers, Nasser and Joric, his sister, Monica Beatrice; his grandparents, Mr. Rogelio and Zerapia Candelaria, his cousins and relatives.

Declaration of Conflicting Interest and Ethics

The author declares no conflict of interest.

References

AbdulRaheem, Y.; Yusuf, H. T. & Odutayo, A. O., (2017). Effect of peer tutoring on students' academic performance in economics in Ilorin South, Nigeria, *Journal of Peer Learning, 10,* 95-102.

Available at:http://ro.uow.edu.au/ajpl/vol10/iss1/7Alkan, V. (2013). Reducing mathematics anxiety: the ways implemented by teachers at primary schools. *International Journal of Social Sciences and Education, 3*(3),795- 807

Choueiry, G. (2022). Quantifying health. QUANTIFYING HEALTH. Retrieved from; https://quantifyinghealth.com/one-group- pretest-posttest-design/ on September 29, 2022.

Cullata, R. (2022). Social Development Theory (Lev Vygotsky). Instructional Design.org. Retrieved from; https://www.instructionaldesign.org/theories/social-development/ on September 23, 2022.

Dela Cruz, J. K. B. & Lapinid, M. R. C. (2014, March). Students' Difficulties in Translating Problems into Mathematical Symbols. DLSU Research Congress 2014.

Delgado, K. D.D., & Kassim, S. R. (2019). Mathematics anxiety among young Filipino learners: Investigating the influence of gender and socio-economic status. *Sci.Int.(Lahore), 31*(3), 575-579.

Hinchliffe, L. J., Saunders, L., & Wong, M. A. (2020). Learning theories: Understanding how people learn. Illinois Open Publishing Network. Retrieved from; https://iopn.library.illinois.edu/pressbooks/instructioninlibraries/chapter/learning-theories-understanding-how-people-learn/ on September 23, 2022,

Klang, N., Karlsson, N., Kilborn, W., Eriksson, P., & Karlberg, M. (2021). Mathematical problem-solving through cooperative learning- The importance of peer acceptance and friendships. *Frontiers in Education. 6,* | https://doi.org/10.3389/feduc.2021.710296

Lee – Chua, Q. N. (2012). Even scientists suffer from math anxiety. Philippine Daily Inquirer (August 26).

Mrelementarymath.com (2022). Math problem solving 101. Retrieved from; https://mrelementarymath.com/math-problem-solving-101/ on September 28, 2022,

Picha, G. (2018). Recognizing and alleviating math anxiety. Edutopia

Ramirez, G., Shaw, S. T., & Maloney, E. A. (2018). Math anxiety: Past research, promising interventions, and a new interpretation framework. *Educational Psychologist, 53*(3), 145

Reyes, J. D. (2019). Mathematics anxiety and self-efficacy: A phenomenological dimension. *Journal of Humanities and Education Development (JHED), 1*(1), 22-34.

Ridwan, M. Rais; Retnawati, Heri; Hadi, Samsul; Jailani (2022). Teachers' perceptions in applying mathematics critical thinking skills for middle school students: A case of phenomenology. *Anatolian Journal of Education, 7*(1), 1-16.

Santos, M. L. K. P., Diaz, R. V., & Belecina, R. R. (2015). Mathematical modeling: effects on problem solving performance and math anxiety of students. International *Letters of Social and Humanistic Sciences, 65*, 103-115.

Thompson, P. (2019). Social theories of learning. Foundations of Educational Technology. Retrieved from; https://open.library.okstate.edu/foundationsofeducationaltechnology/ 0n September 23, 2022

Topping K, Duran D, Van Keer H. (2015). Using peer tutoring to improve reading skills: a practical guide for teachers. Routledge, DOI: 10.4324/9781315731032

Ullah, I., Tabassum, R., & Kaleem, M. (2018). Effects of peer tutoring on the academic achievement of students in the subject of biology at secondary level. *Education Sciences*, *8*(3), 112. MDPI AG.

Yuniarto, E., Damayanti, N., & Khayati, U. (2022). Development of mathematical learning tools in the new normal era for mts students to practice critical thinking skills. *Journal of Education and Learning Mathematics Research (JELMaR)*,*3*(1), 93-102.
