IMPROVING THE ACADEMIC PERFORMANCE OF GRADE 7 STUDENTS IN CHEMISTRY USING THE PEER TUTORING STRATEGY

JAYBIE S. ARZAGA
https://orcid.org/0000-0002-2805-3521
jaybiearzaga@gmail.com
Palawan State University, Puerto Princesa City, Palawan, Philippines

ABSTRACT

The 21st century teachers look forward to the future and continue to look for novel strategies and interventions to accommodate the diverse needs of the learners. One of these strategies is peer tutoring. So, the researcher assessed the effectiveness of the peer tutoring on student academic performance to address the critical issue of students' declining performance in Science. The experimental method was employed through a pretest and posttest control group design. It involved thirty-four (34) Grade 7 learners of Bahile National High School from School Year 2019-2020. Seventeen of them were assigned to the control group and the other seventeen to the experimental group. The experimental group was taught using a peer tutoring strategy, whereas the control group was taught using a traditional method. The two groups were given a pretest before the experiment and a posttest after the investigation. Using the software SPSS 14.0, the findings were analyzed using the mean, standard deviation, and T-test. Finding revealed that the two groups were found to be significantly different. Also, peer tutoring has been found to boost students' academic performance in the classroom; thus, teachers, especially those teaching Science, might consider utilize it for an effective teaching-learning process.

Keywords: Academic performance, Chemistry, Experimental study, Peer tutoring, Philippines

INTRODUCTION

The National Achievement Test (NAT) is a standardized set of exams administered to students in Grades 6, 10, and 12. The purpose of the test is to identify their academic levels, as well as their strengths and limitations. This test determines the skills that are not well-understood. Its goal is to give observational data on pupil or student accomplishment levels to serve as guidance for school administrators and teachers in their individual courses of action. According to Education Secretary Leonor Briones, the performance of Filipino children in large-scale exams such as the National Achievement Test (NAT) "gravitates toward low proficiency levels," particularly in Science, Math, and English (Gonzales, 2019). Grade 6 pupils' performance on the National Achievement Test (NAT) has been progressively falling over the last three years, putting them in the Department of Education's "low mastery" descriptive level. The national average mean percentage score (MPS) in the Grade 6 2018 NAT continued its decreasing trend for the third year in a row, falling to 37.44, the lowest performance in the history of the DepEd's standardized examination. Meanwhile, the Grade 10 MPS score of 44.59 was up 0.51 points from the previous year's 44.08 mark. According to the results, Grade 6 test-takers got less than four correct answers out of ten items in the 2018 NAT, while Grade 10 test-takers got more than four correct answers out of ten items on average. However, both scores fall into the NAT's "poor mastery" category (Albano, 2019).

Aside from the NAT results, the Department of Education also released the most recent results of the Organisation for Economic

Co-operation and Development's (OECD) Programme for International Student Assessment (PISA), which revealed that Filipino students ranked last out of 79 countries and were near the bottom in Science and Math. PISA is triennial worldwide testing that evaluates the Reading, Science, and Mathematics skills of a representative sample of 15-year-old children. Briones stated that the results of the 2018 PISA "put in even sharper focus our need to address quality in basic education" (Gonzales, 2019).

This sobering fact about Science education highlights the need to investigate alternative teaching strategies and methodologies that could improve and facilitate comprehension and acquisition of scientific concepts. The goal of the Science curriculum is to produce scientifically, technologically, and ecologically literate Filipinos who are critical problem solvers, environmental stewards, ingenious and creative citizens, well-informed decision-makers, and effective communicators. Improving one's teaching-learning strategy may help in the attainment of the goals of the Science curriculum. It may help our learners improve their performance in the NAT and PISA, which are local and international assessments on students' performance. Engaging in novel interventions can significantly aid in the transmission of high-quality education to students.

Teachers are constantly on the lookout for strategies and interventions that will meet the different needs of their students, mainly when teaching the subject of Science. The utilization of peer tutoring is one of these strategies. When we talk about peer tutoring, we're talking about a teaching method in which one student takes on the role of tutor, and the other takes on the part of the tutee. It frequently entails the pairing of high-performing students with those who are low-performing. Peer tutoring is a flexible teaching method in which half of the students act as academic tutors and the other half as academic tutees (Topping et al., 2015). In this strategy, a higher-achieving student (tutor) assists a lower-achieving student with academic subjects (tutee). Several advantages for both tutors and tutees have been identified in the literature during peer tutoring experiences. From an academic standpoint, the bulk of studies show that children's academic scores have improved significantly with the use of peer tutoring (Alegre-Ansuategui & Moliner, 2017). Peer tutoring also has social benefits as it promotes student inclusion (Malone et al., 2019) and improves the classroom atmosphere (Jean-Francois, 2017). Academics, social behavior, discipline, peer relationships, self-esteem, subject attitudes, and school attendance are other advantages of peer tutoring for both the tutor and the tutee.

Based on the mentioned studies, this research focused on peer tutoring in Grade 7 Science with topics such as solutions, substances and mixtures, elements and compounds, and acids and bases as an intervention strategy during Chemistry class. In the peer tutoring strategy, learners were divided into pairs, in which one served as a tutor and the other as the tutee. The tutors were the top-performing students, while the least performing ones were the tutees, which were determined through the previous Chemistry grades of the students. During class, the tutor and his/her tutee sat together so the former could be able to guide and motivate the latter that might help in improving the latter's performance. The tutor must see to it that his/her tutee was always present in class and that s/he understood the topics tackled in the class. Each pair might use their extra time in school to collaborate and enhance the learning, especially for the tutee. At the end of each week, "Tutors of the Week" or the top-performing tutors and "Best Tutees of the Week" or the most improved tutees were declared, and their names were posted on the bulletin board. The ranking was based on the results of written works and performance tasks and the students' attendance. They were given tokens of appreciation for them to be more motivated.

More so, this study may aid teachers to enhance teachers' scientific instruction with a peer tutoring strategy, which is an essential step toward improving overall outcomes and providing a high-quality education to all students. Previous studies have shown the value of peer tutoring strategy and its contribution to education; thus, this action research aimed to see how peer tutoring as a Chemistry teaching strategy affected Bahile National High School's Grade 7 students' academic performance. Participants were chosen

from two distinct sections of Grade 7, which focused primarily on teaching first-quarter of the Grade 7 Science, that focused on Chemistry.

OBJECTIVES OF THE STUDY

The study determined how effective peer tutoring in teaching Chemistry to Grade 7 students at Bahile National High School from School Year 2019-2020. Specifically, it sought to: (1) Determine the level of performance of the Grade 7 students in Chemistry in terms of the pretest and posttest in the control group (without Peer Tutoring); 2) Examine the level of performance of the Grade 7 students in Chemistry in terms of the pretest and posttest in the experimental group (with Peer Tutoring); 3) Test the significant difference between pre-and posttest scores of the Grade 7 students in the control group (without Peer Tutoring); 4) Test the significant difference between pre-and posttest scores of the Grade 7 students in the experimental group (with Peer Tutoring), and 5) Determine the significant difference between the posttest performances taught in Chemistry of the Grade 7 students in the control and experimental groups.

METHODOLOGY

This study used experimental method, specifically a pretest and posttest control group design. The respondents of this study were the selected Grade 7 students of Bahile National High School in the Schools Division of Puerto Princesa City enrolled in the School Year 2019-2020. Thirty-four (34) low-performing students determined through their Chemistry grades in Grade 6 were divided to control and experimental groups, where these two groups belong to separate sections. Furthermore, the researcher chose seventeen (17) top-performing students who belong in the section of the experimental group based on their Grade 6 Chemistry grades to be the tutor of the students in the experimental group. The school principal was written by the researcher a letter requesting permission to perform the study. After receiving approval from the authority, these two heterogeneous intact classes were given a pretest to determine their academic performance level before the experiment and ensure no significant difference between the two groups' performances before integrating the peer tutoring strategy. The experimental group was exposed to the use of peer tutoring as a teaching strategy while the control group was employed with the traditional way of teaching. The two groups were taught Chemistry with the same teacher, the same length of time, the same lesson, the same written works, and exact performance tasks. The topics covered were the solutions, substances and mixtures, elements and compounds, and acids and bases included in the Quarter 1 (Diversity of Materials in the Environment) of the Grade 7 Science. The two groups took a posttest by the end of the experiment to assess their academic performance. The pretest and posttest each consists of 40 multiple-choice questions with four choices each. Ten (10) items were for the solutions, ten (10) for the substances and mixtures, ten (10) for elements and compounds, and another ten (10) for acids and bases. The mean, standard deviation, and T-test for Correlated Means were used to make the findings of this study more accurate. Using the software Statistical Package for the Social Sciences Program (SPSS) 14, the garnered data were calculated. Mean and standard deviation were used to calculate the students' pretest and posttest results without the use of peer tutoring. They were also used to decide how well students do on pre- and posttest in chemistry classes employing peer tutoring as a teaching strategy. The significant difference between the two groups' pretest and posttest performances was determined using the Paired T-test for Correlated Means, and the significant difference between the two groups' posttest performances was determined using the independent T-test.

RESULTS AND DISCUSSION

1. Control group's pretest and posttest performances taught in Chemistry without employing the peer tutoring strategy

The control group's average pretest and posttest scores were 10.35 and 19.06, respectively, with a standard deviation of 6.174

and 5.105 for the pretest and posttest, respectively.

Table 1
Control group's pretest and posttest performances taught in Chemistry without employing the peer tutoring strategy

		Mean	N	Standard Deviation	Standard Error Mean
Pair 1	Pretest 1	10.35	17	6.174	1.497
	Posttest 1	19.06	17	5.105	1.238

Even though both standard deviations were almost identical, showing that most students' scores were close to the average mean, the control group's posttest score improved even when the peer tutoring strategy was not used.

2. Experimental group's pretest and posttest performances taught in Chemistry employing the peer tutoring strategy

Table 2
Experimental group's pretest and posttest performances taught in Chemistry employing the peer tutoring strategy

		Mean	N	Standard Deviation	Standard Error Mean
Pair 1	Pretest 2	10.88	17	6.123	1.485
	Posttest 2	31.53	17	3.502	0.849

The experimental group's results on the Chemistry pretest and posttest using the peer tutoring strategy are shown in Table 2. The experimental group's pretest and posttest averages were 10.88 and 31.53, respectively. Their posttest scores had a standard deviation of 3.502, indicating that the majority of their outcomes were similar to the average mean. On both tests, it was obvious that using the peer tutoring technique resulted in higher scores, suggesting that the more students were exposed to the mentioned teaching strategy, the better they performed in class. Peer tutoring improves both the tutor's and tutee's academic and social growth by improving student engagement, time on task, and self-confidence and self-efficacy (Hott & Walker 2012).

3. Difference in the control group's pretest and posttest performances taught in Chemistry without employing the peer tutoring strategy

3.1. Paired Samples correlations of the control group's pretest and posttest performances taught in Chemistry without employing the peer tutoring strategy

Table 3
Paired Samples correlations of the control group's pretest and posttest performances taught in Chemistry without employing the peer tutoring strategy

		N	*Correlation*	*Sig.*
Pair 1	Pretest 1 & Posttest 1	17	.356	.160

Table 3 shows the paired samples correlations of the control group's pretest and posttest results. Both measurements were found to be significant at the 0.160 level, with a moderately positive correlation value of 0.356, showing that, despite the fact that the posttest score was higher, some of the scores were still closely linked to the pretest scores.

3.2. Paired Differences of the control group's pretest and posttest performances taught in Chemistry without employing the peer tutoring strategy

Table 4
Paired Differences of the control group's pretest and posttest performances taught in Chemistry without employing the peer tutoring strategy

		Paired differences							
		Mean	Standard Deviation	Standard Error mean	Difference's 95% confidence interval		t	Df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Pretest 1 – Posttest 1	-8.71	6.459	1.567	-12.027	-5.385	-5.557	16	.000

Table 4 exhibits the Paired Differences between the control group's pretest and posttest results. This estimated t-test value was -5.557, with a 0.000 p-value. Both studies were significantly different from one another since the p-value was less than the alpha value of 0.05. Furthermore, the mean difference between the two measurements was 8.71, and the confidence interval's lower level was -12.027, the upper level

was -5.385, and it did not cross to 0, showing that there was a difference.

4. Difference in the experimental group's pretest and posttest taught in Chemistry employing the peer tutoring strategy

4.1. Paired Samples correlations of the experimental group's pretest and posttest performances taught in Chemistry employing the peer tutoring strategy

Table 5
Paired Samples correlations of the experimental group's pretest and posttest performances taught in Chemistry employing the peer tutoring strategy

		N	Correlation	Sig.
Pair 1	Pretest 2 & Posttest 2	17	.038	.885

Table 5 shows the correlation between experimental group's pretest and posttest performances. Both tests were determined to be significant at the 0.885 level, with a trivial positive correlation value of 0.038, showing that their average mean scores are not similar. When compared to their pretest scores, the majority of learners improved their posttest scores.

4.2. Paired Differences of the experimental group's pretest and posttest performances taught in taught in Chemistry employing the peer tutoring strategy

Table 6
Paired Differences of the experimental group's pretest and posttest performances taught in taught in Chemistry employing the peer tutoring strategy

Paired differences									
		Mean	Standard Deviation	Standard Error mean	Difference's 95% confidence interval		t	Df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Pretest 2 – Posttest 2	-20.65	6.9367	1.6824	-24.2136	-17.0805	-12.272	16	.000

The difference in pretest and posttest scores in Chemistry taught to the experimental group using the peer tutoring strategy is seen in Table 6. The computed t-value was -12.272, with a 0.000 p-value. Both tests were significantly different from one another since the p-value was less than the alpha value of 0.05. Also, the mean difference between the two measurements was 20.65, with the lower level of the confidence interval being -24.2136 and the higher level being -17.0805, with the confidence interval not crossing zero, showing that there was a difference. This could also mean that students who were exposed to the peer tutoring strategy in the classroom while learning Chemistry improved their grades and performances more than those who were not. Peer tutoring is beneficial to the learners since it allows for dialogue, which leads to learning in a friendly environment. Additionally, it boosts introvert learners' confidence and improves their cognitive abilities by giving them confidence (Bombardelli, 2016). Moreover, peer tutoring aids in the development of student's abilities to organize and plan learning experiences, collaborate, give and receive feedback on their actions, and evaluate their own learning (Ullah, et al., 2018)

5. Difference of the control and experimental groups' posttest performances taught in Chemistry

5.1. Group Statistics of the control and experimental groups' posttest performances taught in Chemistry

Table 7
Group Statistics of the control and experimental groups' posttest performances taught in Chemistry

	Posttests	N	Mean	Standard Deviation	Standard Error mean
Scores	Altruism	17	19.06	5.105	1.238
	Benevolence	17	31.53	3.502	0.849

Table 7 illustrates the Group Statistics for both the control and experimental groups' posttest results. The experimental group had an average mean score of 31.53, while the control group had an average mean score of 19.06. The experimental group's standard deviation was 3.502, compared to 5.105 for the control group,

which explains why many of their scores were near to the overall mean. The use of the peer tutoring technique has also been proven to have a substantial impact on students' learning and success. Peer tutoring is one of the regarded as an effective technique of instruction for helping students improve their academic performance when compared to a group of regular classroom contexts (O'shea & O'shea, 2010). It is supported by Ullah, et al. (2018) who mentioned that slow learners' academic performance may be enhanced if they were involved in collaborative work or peer tutoring.

5.2. Independent Samples Test of the control and experimental group's posttest performances taught in Chemistry

Table 8
Independent Samples Test of the control and experimental group's posttest performances taught in Chemistry

		Equality of Variances (Levene Test)		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Standard Error Difference	Difference's 95% confidence interval	
									Lower	Upper
Scores	Equal variances assumed	1.268	.269	-8.306	32	.000	-12.471	1.501	-15.529	-9.412
	Equal variances not assumed			-8.306	28.330	.000	-12.471	1.501	-15.545	-9.397

Table 8 highlights the independent samples of both the control and experimental groups' posttest results. The estimated t-value was -8.306 in assumed equal variances, and the p-value for this t-test was 0.000. Because the p-value was less than the alpha value of 0.05, both posttests were significantly different from each other. The experimental group's posttest average mean score was clearly 12.47 points higher than the control groups. The lower level of the confidence interval was -15.529, and the higher level was -9.412, and it did not cross to 0, indicating that there was a difference. Students learning with their peers removes feelings of intimidation, hesitation, and reluctance, making it easier for them to clarify and qualify knowledge without fear of being criticized or feeling unworthy which results to an improved academic performance (Dowd, 2018). Dowd also said that advantages of peer teaching include gains in academic achievement and stronger peer relationships.

CONCLUSIONS

The following statements are based on the results of the study:

1. Both groups of students, one taught in Chemistry without utilizing the peer tutoring technique (control group) and the other taught in Chemistry with the peer tutoring strategy (experimental group), did moderately on the pretest. The experimental group outperformed the control group by a small margin.
2. Initially, the results of the pre-test were utilized to compare the two groups. This suggests that the two groups were heterogeneous at the start of the trial but had identical overall performance.
3. The post-test scores for the control group of Chemistry students who were not taught with the peer tutoring technique were better than the pretest results.
4. The experimental group's posttest results improved considerably after using the peer tutoring strategy to teach Chemistry to Grade 7 learners.
5. The post-test results in Grade 7 were significantly different between the control and experimental groups. Students who were taught using a peer tutoring strategy outperformed those who were not.

RECOMMENDATIONS

Because the use of peer tutoring was shown to be effective in teaching Chemistry to Grade 7 students at Bahile National High School in the school year 2019-2020, as evidenced by the above-mentioned results, the following suggestions were made:

1. Science teachers may consider using a peer tutoring strategy when teaching the Chemistry domain because it increased

student attention, motivation, and attitude toward Chemistry classes.

2. Administrators may conduct seminars or workshops to train teachers how to incorporate the peer tutoring strategy into their classes for use in Science education.
3. Future researchers may perform additional research on the use of peer tutoring strategies with a larger sample size, other grade levels, and different domains of Science in order to corroborate the findings of this study.

REFERENCES

Albano, E. (2019, September 25). *Grade 6 NAT scores at 'low mastery' level*. The Manila Times. https://www.manilatimes.net/2019/09/26/campus-press/grade-6-nat-scores-at-low-mastery-level/621772

Alegre Ansuategui, F. J., & Moliner Miravet, L. (2017). Emotional and cognitive effects of peer tutoring among secondary school mathematics students. *International Journal of Mathematical Education in Science and Technology*, *48*(8), 1185-1205. https://doi.org/10.1080/0020739x.2017.1342284

Bombardelli. O. (2016). Effective teaching practice: Peer tutoring in education for active citizenship. https://doi.org/10.15405/epsbs.2016.11.36

Dowd, M. (2018, July 23). *What are some advantages and disadvantages of peer tutoring?* https://classroom.synonym.com/advantages-disadvantages-peer-tutoring-8385009.html

Gonzales, E. (2019, December 29). *YEAR-END REPORT: DepEd in 2019: The quest for quality education continues*. Manila Bulletin. https://mb.com.ph/2019/12/29/year-end-report-deped-in-2019-the-quest-for-quality-education-continues/

Hott, B., Walker, J., Mason, G. (2012), University; Jasneen Sahni, Marymount University. https://council-for-learning-disabilities.org/peer-tutoring-flexible-peer-mediated-strategy-that-involves-students-serving-as-academic-tutors/

Jean-Francois, E. (2017). Exploring the perceptions of campus climate and integration strategies used by international students in a US university campus. *Studies in Higher Education*, *44*(6), 1069-1085. https://doi.org/10.1080/03075079.2017.1416461

Malone, K. W., Fodor, J. A., & Hollingshead, A. (2019). Peer tutoring to support inclusion of students with the most significant cognitive disabilities at the secondary level. *Inclusion*, *7*(1), 1-11. https://doi.org/10.1352/2326-6988-7.1.1

O'Shea, L., & O'Shea, D. (2010). Peer-tutoring. *International Encyclopedia of Education*, 802-807. https://doi.org/10.1016/b978-0-08-044894-7.01139-8

Peer tutoring. (2015, June 22). Council for learning disabilities | The Council for learning disabilities (CLD) is an international organization that promotes evidence-based teaching, collaboration, research, leadership, and advocacy. https://council-for-learning-disabilities.org/peer-tutoring-flexible-peer-mediated-strategy-that-involves-students-serving-as-academic-tutors/

Topping, K., Duran, D., & Van Keer, H. (2015). Using peer tutoring to improve reading skills. https://doi.org/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. https://doi.org/10.3390/educsci8030112

AUTHOR'S PROFILE

Jaybie S. Arzaga was a science teacher at Bahile National High School in the Schools Division of Puerto Princesa City from 2015-2019. He graduated with his bachelor's degree in Secondary Education major in Biological Sciences at Palawan State University, Puerto Princesa City, Philippines, in 2014, as a government and an *Erasmus Mundus* scholar. He took his Master of Arts in Teaching major in Biology Education at the same university where he graduated in 2018. In the same university, he is also currently teaching

college and graduate students. This 27-year-old bachelor is presently doing his dissertation for his Doctor of Education (EdD) major in Educational Management degree.

COPYRIGHTS