

Improving the Performance of Grade 5 Learners in Mathematics Using Problem-Based Learning Approach

Rhudhane F. Astrero

Bongar Elementary School, Schools Division Office 1 Pangasinan

ABSTRACT

The implementation of the different learning modalities put in place a mechanism by which instruction and assessment practices are carried out. With the thrust of Mathematics education in the country focused on developing the students' critical thinking and problem solving skills, the new learning setup called to task the teachers to devise ways by which such learning competencies can be developed or enhance across the different learning modalities using different platforms. Utilizing the results of the pre- and posttest in Mathematics after using problem-based lessons as a strategy, this study looked into the effectiveness of the said strategy in the learning of Mathematics of the Grade 5 learners at Bongar Elementary School during the school year 2021- 2022. Results show that utilizing problem-based learning approach as an instructional technique was effective as it helped improve student outcomes among the Grade 5 learners in Mathematics. Thus, this study recommends that teachers innovate their strategies and instruction in Mathematics with problem-based learning approach. Likewise, teachers, are called to task to exploit the role of problem-based learning approach as a strategy in improving student engagement and student outcomes. Moreover, teachers are also called to bridge the gap in the learning opportunities and mode of delivery by developing alternative methods in aid of creating more effective learning formats in Mathematics for the different learning modalities in the new learning setup.

Keywords: intervention, learning modalities, Mathematics, new normal, problem-based lessons

CONTEXT AND RATIONALE

Specifically, the Mathematics Framework for Basic Education aims to design and implement mathematics curricula that shall empower students to learn to learn and consequently cause them to better understand and use mathematics in their everyday life. According to Dr. Filma Brawner (2015), Director of Science Education Institute, quality mathematics education is instrumental to the achievement of scientifically, technologically, environmentally-literate and productive individuals. Jaucian (2019) reiterated this in the wake of the dismal performance of Filipino learners in the 2018 Programme for International Student Assessment Filipino 15-year-olds fared the worst in reading and landed second to the last in math and science among students from 79 countries in a global assessment of educational achievement. Consequently, this prompted Education Secretary Leonor Briones to order a review of the country's basic education especially whether English was being taught effectively as a medium of instruction in Math and Science subjects.

Admittedly, mathematics education in our country cannot be considered as a strength as pointed out in an article by De Dios (2018) on the country's basic education. Based on 2014 statistics, the passing rate for the national achievement test (NAT) for grade six pupils is only 69.21%. While the passing rate for high school seems far worse, with a passing rate of only 46.38% from 2010 statistics. Moreover, the Philippines consistently performs badly in international surveys such as the Trends in International Mathematics and Science Study (TIMSS) in 2003, where, the country ranked only 34th out of 38 countries in HS Math, and 43rd out of the 46 participating countries in HS Science. Meanwhile, for elementary, fourth grade participants ranked 23rd out of the 25 countries in both math and science. Since then, our country has

stopped participating in the survey in 2008, perhaps after getting such lackluster scores.

Notably, the poor performance of Filipino learners in international assessments and even in the National Achievement Test has resulted with the Department of Education's search for new systems and the adjusting and updating of current methods in order to be in accordance with today's ever changing age. Analogous to this, ideologies, systems, and practices that have been implemented in the past, have been analyzed and reviewed in order to assess the quality and the appropriateness of the results. Paje (2019) underscores that there is now an important goal for educational institutes to develop and create newer systems to improve learning environment in mathematics education.

Undeniably, learning circumstances nowadays has changed due to the emergency health crisis brought about by the COVID-19. It brought into the fore the Basic Education – Learning Continuity Plan of DepEd. Specifically, the DepEd Order No. 12, s. 2020 which sets the guidelines on the Adoption of the Basic Education Learning Continuity Plan for School Year 2020 – 2021 in light of the COVID-19 Public Health Emergency clearly stipulates the continuity of education even in the midst of pandemic through K to 12 curriculum adjustments. This set the direction for the different learning modalities under the remote or distance learning. Under the new normal in education, teacher-driven discussions and lengthy lectures are no longer the norms (Stack, 2020). Thus, for teachers handling Mathematics, the challenges they have to contend in distance learning is the delivery of instruction typical of mathematics. Buensuceso (2019) highlights the active learning that corresponds to the teaching of problem solving and the formula that accompany the said activity. In this vein, Ogena (2020) points to how Mathematics teachers should devise a scheme by which the development of students' critical and analytical thinking lessons are not left out in the learning resources that shall be used by teachers in distance learning. To this end, Kyeong (2020) suggests that learning environment in mathematics instruction should be driven by problems. Specifically, Kyeong notes that learning or instruction in Math should begin with a problem to be solved and the students are instructed to interpret the problem and solve it differently or creatively.

The researcher teaches Mathematics to Grade 5 learners at Bongar Elementary School (BES) under the Malasiqui II District. The performance of the learners of BES in Mathematics have not been satisfactory as indicated in the school's National Achievement Tests for the last three school years. During the school year 2020 -2021, the learning modality implemented at BES was mainly printed modular. Taking to mind the mode of delivery of instruction under printed modular and the basic skills typical of and essential in mathematics education, the researcher utilized problem-based lessons in the teaching of Mathematics to the Grade 5 learners in Bongar Elementary School. The weekly lesson always began with a word problem to be solved and was reflected in the weekly home learning plan provided to the parents or instructional support of the students. It was in this context that this study was conducted. It looked into the effectiveness of problem-based lessons as a strategy in Mathematics learning of the Grade 5 students of Bongar Elementary School during the school year 2021 – 2022.

INNOVATION, INTERVENTION AND STRATEGY: Problem-based Learning Approach

The utilization and/or integration of problem-based lessons in teaching Mathematics was a strategy that engaged the students in the process of solving problems. Specifically, it aimed at developing if not enhancing students' critical and creative thinking skills in Mathematics. Problem-based learning approach was integrated in the lessons.

In using problem-based lessons, first, the researcher always begin the weekly lessons in Mathematics with a word problem. Second, the learners examine or study and define the problem. Third, the learners explore what they already know about underlying issues related to the word problem. Fourth, they determine

what they need to learn and the tools necessary to solve the problem. Fifth, they evaluate possible ways to solve the problem. Then, they solve the problem differently or creatively. The students either used visual, textual and numerical representation or combination of any two representations, of their answers.

The word problem was reflected in the weekly home learning plan. A separate answer sheet was provided for this activity.

ACTION RESEARCH QUESTIONS

This study sought to determine the effectiveness of problem-based learning approach as a strategy in enhancing the performance of the Grade 5 learners in Mathematics at Bongar Elementary School during the school year 2021 – 2022.

Specifically, the study sought to answer the following questions:

1. What is the level of performance of the Grade 5 learners in Mathematics before and after the intervention?
2. Is there a significant difference on the level of performance of the Grade 5 learners in Mathematics before and after exposure to problem-based learning approach?

ACTION RESEARCH METHODS

1. PARTICIPANTS AND/OR OTHER SOURCES OF DATA AND INFORMATION Data and Information:

The subjects of this study were the 38 Grade 5 learners under the advisory class of the researcher at Bongar Elementary School in Malasiqui, Pangasinan enrolled during the school year 2021-2022. The classes were heterogeneously grouped upon enrolment; no bias is assumed in terms of comparing the students in the initial set-up of the study.

The subjects were chosen on the basis of their being in one intact class or modality under the researcher in order to prevent disruption to the normal teaching routine of the other learning modalities of the school.

DATA GATHERING METHODS

The researcher obtained permission and approval to conduct the investigation from the authorities prior to the conduct of the study, specifically from the Principal of Bongar Elementary School to allow the conduct and data gathering activities among the Grade 5 learners enrolled during the school year 2021-2022 at BongarElementary School.

The 38 Grades 5 learners under the advisory of the researcher were identified to be the respondents of this study. These learners were exposed to the intervention, Problem-Based Learning Approach. Prior to the conduct of the intervention, proper orientation to the learners was done by the researcher. There was a prepared schedule on when to conduct the study.

The results of the 20-item pretest, which was duly validated by experts, served as the basis in determining the level of performance of the learners in Mathematics. The pretest was conducted during the third week of the opening of classes in September. After diagnosing the learners' reading difficulties, the researcher prepared these learners to be part of the intervention and/or strategy, Problem-Based Learning Approach in the teaching of Mathematics. After the intervention, the researcher determined the significant difference

between level of performance of the Grade 5 learners in Mathematics before and after the intervention. After which, the researcher determined the significant difference between the level of performance of the Grade 5 learners in Mathematics using appropriate statistical tools.

DISCUSSION OF RESULTS AND REFLECTION

This section presents the level of performance of the Grade 5 learners in Mathematics based on the results of the pretest and posttest. The 30- item teacher-made test in Mathematics was administered to the learners in the asynchronous learning before and after they were taught in the said subject using problem-based learning approach. The results of the level of performance of the said learners in Mathematics based on the results of the pretest and posttest and the difference between their levels of performance before and after their exposure to the intervention are presented in the foregoing tables.

Table 1 Level of Performance of the Grade 5 Learners in Mathematics Before and After the Intervention

Score	Pretest Frequency Percentage		Posttest Frequency Percentage		Descriptive Equivalent
0-6	21	55.3	3	7.9	Poor
7-13	13	34.2	15	39.5	Satisfactory
14-20	4	10.5	20	52.6	Outstanding
Total	38	100	38	100	
Mean			7.5	13.3	
Standard Deviation			4.3	3.8	

An analysis of how the Grade 5 learners at Bongar Elementary School fared in the teacher-made test reveal that majority of the said learners (21 or 55.3%) had their performance in Mathematics assessed as poor prior to the utilization of problem-based learning approach in Mathematics aimed at enhancing student outcomes. Also, the data in Table 1 reveal that there were 13 learners (34.2%) whose performance in the test was found satisfactory while there were 10 learners (10.5%) whose level of performance proved to be outstanding. Meanwhile, a comparison of how they fared in the posttest after they were taught in Mathematics using problem-based learning approach indicate a marked improvement in their level of performance. It can be noted, too, that there was none or zero (0) learners whose performance was poor while there were 15 or 39.5% whose performance were assessed as satisfactory.

It is remarkable that there was an increase in the number of learners whose performance in the posttest in Mathematics was outstanding after they were taught using problem-based learning. It can be seen from the data in Table 1 that there were 20 or 52.6% learners whose scores in the posttest translates to outstanding. An increase in the statistical data relative to the mean (7.5 to 13.3) is also evident. Consequently, the increase in the mean is reflective of an increase in the level of performance of the Grade 5 learners in the posttest.

As such, the results corroborate parallel studies on the effectiveness of problem-based learning approach as a strategy in enhancing student outcomes in Mathematics. It brings to the fore the good there is to the utilization of such in activating learning in Mathematics as upheld by Paje (2019) and Buensuceso who maintain the problem-based lessons lead to the enhancement of learners' metacognition skills.

Significance in the Performance of the Grade 5 Learners in Mathematics Before and After Exposure to Problem-Based Lessons

The Grade 5 learners' performance in Mathematics was assessed before and after their exposure to the problem-based lessons as a strategy. An assessment was made to test the hypothesis as to whether there's a

significant difference in their performance before and after the utilization of problem-based learning approach in the teaching of Mathematics. The results are organized and presented in Table 2.

Table 2 Test of Difference in the Performance of the Grade 5 Learners in Mathematics Before and After Exposure to Problem-Based Learning Approach

N	Mean	Std. Deviation	t-value	p-value (0.05)
Pretest 38	7.5	4.3	12.8565	3.109
Posttest 38	13.3	3.8		

- Significant at t -critical (0.05, 37 df) = 12.9, $p < .001$.

The data in Table 2 calculated the difference between the means, 7.4 and 13, respectively, representative of the pretest and posttest results of the Grade 5 learners in Mathematics. A significance value (P-value) and 95% Confidence Interval (CI) of the difference is shown, where, in the procedure, the P-value is the probability of obtaining the observed difference between the means if the null hypothesis was true. Specifically, the null hypothesis is the hypothesis that the difference is 0.

As shown in the tabular data, the t -value is 12.8565 while the p -value is 3.109 which made the result significant. This means that the difference between the performance of the Grade 5 learners in Mathematics before and after they were taught using problem-based learning approach is significant. Likewise, the results of the study affirm the effectiveness of problem-based learning approach in the teaching of Mathematics.

All in all, the results of the study support what Kyeong (2020) underscores on how the learning environment in mathematics instruction should be driven by problems. Moreover, the results of the study highlight what learning or instruction in Math that begins with a problem to be solved and with the students tasked to interpret the problem and solve it differently or creatively proved to be an effective strategy in Math education.

CONCLUSION

From the results of the study, it can be drawn that problem-based learning approach is a strategy that brings about active learning among the learners as it compels them to activate their learning using different approaches by which a word problem can be solved. The results of the study reveal that such a strategy proved to be useful in developing, if not enhancing the learners' critical and creative thinking skills. Based on the conclusions, teachers, are then called to task to exploit the role of problem-based lessons in order to ensure that learners are given learning opportunities that compel them to think outside of the box and become critical and creative thinkers. Likewise, it is recommended that the teachers, who are at the forefront of instruction, develop alternative methods in aid of creating more effective learning environment especially in the context of the new normal and different learning modalities.

ACKNOWLEDGMENT

The entirety of this work is not made possible without the people who are instrumental in enabling me to finish this study. It is just fitting that I give due recognition to the contribution they have extended for the successful completion of this work.

The researcher would like to express her profound thanks and grateful appreciation to all who have given their support, assistance, and efforts in the completion of this study.

_____, PSDS, for her insightful advice for the completion of this study;

The researcher would like to express her sincere gratitude to her school head, _____, who was extremely helpful and offered invaluable assistance, support, and guidance. The researcher could not have imagined having a more competent school head and mentor for her study.

Deepest gratitude also goes to the members of the faculty at Bongar Elementary, for the support, suggestions, kindness, and encouragement which motivated the researcher to complete this fruit of labor;

Her sincere thanks to all her friends. In particular, she is grateful to _____, for the support and encouragement they have extended;

This study would not be complete without mention of the support given to her by her parents, siblings, nieces and nephews;

_____, who always serves as her inspiration;

Above all, to **God Almighty**, for His divine love for making this possible and for bestowing His blessings and divine guidance while the researcher is conducting the research.

RFA

REFERENCES

1. Brawner, F. (2015). *Mathematics Framework for Philippine Basic Education*. Manila: SEI-DOST & MATHTED. ISBN 978-971-8600-48-1
2. Buensuceso, D. (2019). *Secondary Mathematics Education in the Philippines Today*. Bell, G (Ed). Asian Perspectives on Mathematics Education. The University of New England, Australia.
3. De Dios A. *The National Achievement Test in the Philippines*. [accessed 2018 Apr 3]. <http://www.philippinesbasiceducation.us/2013/07/the-national-achievement-test-in.html>.
4. Department of Education Order No. 12. (2020). Adoption of the Basic Education Learning Continuity Plan for School Year 2020-2021 in the Light of the COVID-19 Public Health Emergency
5. Jaucian, M. (2019). *Philippine Star*, 2019 December 3.
6. Kyeong, R.. *Flipping the script in K12*. District Administration Magazine, 48(10), 28-30, 32,34.
7. Ogena, E. (2020). *Formulation of National Learning Strategies in Science and Mathematics Education*. First Draft. Basic Education Reform Agenda, Department of Education
8. Paje, M.. Deped prepares for the “new normal” in education amid COVID-19 situation. *Manila Bulletin*, 2020 April 17
9. PISA 2018 results. *Business World*. [accessed 2019 Dec 5]. <https://www.bworldonline.com/pisa-2018-results/>.
10. Stack, H. (2020). *Planning and Delivering Online Instruction During COVID-19*
11. *School Closures*. K12 Digest. March 30, 2020. www.k12digest.com
12. TIMSS National Research Coordination Office. (2005).
13. Williams, H. (2012). *Quasi-experimental evaluations: Child trends*, Heile and Heinle, Washington.