EPRA International Journal of Environmental Economics, Commerce and Educational Management
Journal DOI: 10.36713/epra0414 |ISI I.F Value: 0.815|SJIF Impact Factor (2024): 8.481 ISSN: 2348 – 814X
Volume: 11 | Issue:6 |June 2024

UTILIZATION OF PERFORMANCE-BASED ASSESSMENT IN MATHEMATICS: BASIS FOR NUMERACY REMEDIATION PROGRAM FOR GRADE FOUR LEARNERS

Donnah Hill A. Libre[1]
[1] *Student, Graduate School, The Rizal Memorial Colleges, Inc.*

Article DOI: https://doi.org/10.36713/epra17457
DOI No: 10.36713/epra17457

ABSTRACT

This study aimed at determining the utilization of performance-based assessment as the basis in developing the numeracy intervention program for grade four learners. This study employed the non-experimental descriptive-correlation research design in investigating the research problem. It is descriptive because the data are presented in quantitative descriptions on the "Utilization of Performance-based Assessment in Mathematics: Basis for Numeracy Remediation Program for Grade Four Learners. According to Good (2005), this method of research shows merely description of tasks presenting the conditions regarding the nature of the group of persons or class of events that involved procedure of analysis, classification, and measurement. It involves varied information regarding the current or present condition (Deauna, 2005).

This study was conducted in all public elementary schools in Binugao district, Davao City. The respondents of this study were the 5 grade four teachers to assess the 250 grade four learner in the research locale who were the subjects of this study and whose numeracy was assessed using performance-based assessment. Moreover, simple random sampling procedure was used considering the enormous number of the grade four learners in the district while at the same time simple sampling procedure was used in determining the number of teacher who will participate in the study. This study revealed that teachers most of the time used performance-based assessment in assessing learning outcomes in mathematics of the grade four learners. This also means that teachers are confident in using performance-based assessment as it monitors academic progress of the child in mathematics subject.

KEYWORDS: *utilization of performance-based assessment, mathematics, basis for numeracy remediation program, grade four learners*

INTRODUCTION

Performance assessment is a summative assessment tool that is used as a substitute for high-stakes testing. It's intended to focus more on practical or applied skills. It is more on do you know how to use your knowledge than tell me what you know. Other common terms include authentic assessment or performance-based assessment. A performance-based assessment can be an individual or group project, a portfolio with potentially one or more pieces foregrounded or an open-ended response exercise. The creation process of the work is then graded according to a set of pre-agreed criteria or a checklist, shared with the student in advance.

As the school year progresses, students and teacher can work together to identify especially significant or important artifacts and processes to be captured in the performance-based assessment. Additionally, they can work collaboratively to determine grades or scores to be assigned. Rubrics, rules, and scoring keys can be designed for a variety of portfolio components. In addition, letter grades might also be assigned, where appropriate. Finally, some form of oral discussion or investigation should be included as part of the summative evaluation process. This component should involve the student, teacher, and if possible, a panel of reviewers in a thoughtful exploration of the

EPRA International Journal of Environmental Economics, Commerce and Educational Management
Journal DOI: 10.36713/epra0414 |ISI I.F Value: 0.815|SJIF Impact Factor (2024): 8.481 ISSN: 2348 – 814X
Volume: 11 | Issue:6 |June 2024

performance-based assessment components, students' decision-making and evaluation processes related to artifact selection, and other relevant issues (Anderson, 2024).

In the classroom setting, it is important that a teacher should have monitored the progress of the child in the academe so as create an intervention program that will address his/her weaknesses. One best practice to diagnose the performance of the learners is through performance-based assessment. Performance-based assessment is a term with many meanings, and it is a process that can serve a variety of purposes. A performance-based assessment is a collection of student work that can exhibit a student's efforts, progress, and achievements in various areas of the curriculum. It can be an examination of student-selected samples of work experiences and documents related to outcomes being assessed, and it can address and support progress toward achieving academic goals, including student efficacy (Beattie, 2024)

Steers (2020) said that performance-based assessments have been used for large-scale assessment and accountability purposes (e.g., the Vermont and Kentucky state-wide assessment systems), for purposes of school-to-work transitions, and for purposes of certification. For example, performance-based assessments are used as part of the National Board for Professional Teaching Standards assessment of expert teachers.

According to Black (2022) performance-based assessment grew in popularity in the United States in the 1990s as part of a widespread interest in alternative assessment. Because of high-stakes accountability, the 1980s saw an increase in norm-referenced, multiple-choice tests designed to measure academic achievement. By the end of the decade, however, there were increased criticisms over the reliance on these tests, which opponents believed assessed only a very limited range of knowledge and encouraged a "drill and kill" multiple-choice curriculum. Advocates of alternative assessment argued that teachers and schools modelled their curriculum to match the limited norm-referenced tests to try to assure that their students did well, "teaching to the test" rather than teaching content relevant to the subject matter. Therefore, it was important that assessments were worth teaching to and modelled the types of significant teaching and learning activities that were worthwhile educational experiences and would prepare students for future, real-world success.

Venn as cited by Mangaron (2021) said that a student performance-based assessment is a systematic collection of student work and related material that depicts a student's activities, accomplishments, and achievements in one or more school subjects. The collection should include evidence of student reflection and self-evaluation, guidelines and criteria for judging the quality of the work. The goal is to help students illustrate their talents, represent their mathematical capabilities, and tell their stories of school achievement.

Blaikie (2020) cited that a performance-based assessment is not a random collection of observations or student products; it is systematic in that the observations that are noted and the student products that are included relate to major instructional goals. For example, book logs that are kept by students over the year can serve as a reflection of the degree to which students are building positive attitudes and habits with respect to reading. A series of comprehension measures will reflect the extent to which a student can construct meaning from text. Developing positive attitudes and habits and increasing the ability to construct meaning are often seen as major goals for a numeracy program.

From the standpoint of Lim (2023) he imparted that the researcher as a numeracy teacher has an ardent objective to explore on how performance-based assessment affects the academic efficacy of a child. Hopefully, valuable recommendations will e offered so that mathematics teachers may able to track the progress of the learners in the academe.

Boughton (2020) unveiled that it is in this premise that the researcher is motivated to conduct a study to explore and get familiar further with the problem hoping to offer valuable solutions. The researcher believes that the result of this study can enlighten and gives direction to every mathematics teacher and other beneficiaries in order that quality education will take place inside the classroom.

EPRA International Journal of Environmental Economics, Commerce and Educational Management
Journal DOI: 10.36713/epra0414 |ISI I.F Value: 0.815|SJIF Impact Factor (2024): 8.481 ISSN: 2348 – 814X
Volume: 11 | Issue:6 |June 2024

In the division of Davao City particularly in Binugao District, students in the primary grades have underdeveloped numeracy skills. They have not mastered the four fundamentals on mathematics which is vital in solving problems in the higher mathematical operations. The researcher being a grade four teacher would like to explore the existing academic dilemma hoping to find answers to help learners solve simple mathematical problems.

This study aims at determining the level of utilization or performance-based assessment which will be the basis for numeracy intervention program. Specifically, it seeks to determine the answers of the following problems:

1. What is the extent of utilization of the performance-based assessment in mathematics to grade four in terms of the following:

1.1 Application of knowledge,
12 Skills Development
1.3 Work Habits

2. Based on the findings generated from this study, what numeracy intervention program can be designed and proposed?

METHODOLOGY

Research Design

This study employed the non-experimental descriptive-correlation research design in investigating the research problem. It was descriptive because the data were presented in quantitative descriptions on the "Utilization of Performance-based Assessment in Mathematics: Basis for Numeracy Remediation Program for Grade Four Learners. According to Good (2005), this method of research showed merely description of tasks presenting the conditions regarding the nature of the group of persons or class of events that involved procedure of analysis, classification, and measurement. It involved varied information regarding the current or present condition (Deauna, 2005).

Respondents and Sampling

This study was conducted in all public elementary schools in Binugao district, Davao City. The respondents of this study were the 5 grade four teachers to assess the 250 grade four learner in the research locale who were the subjects of this study and whose numeracy was assessed using performance-based assessment. Moreover, simple random sampling procedure was used considering the enormous number of the grade four learners in the district at the same time simple random sampling procedure was used in determining the number of teachers who will participate in the study.

Table 1. Distribution of Respondents

School	No. of Teacher- Respondents	No. of Grade four Learners
Binugao Central Elementary School	1	50
NRDP Elementary School	1	50
Rizal Elementary School	1	50
Tagurano Elementary School	1	50
Baracatan Elementary School	1	50
TOTAL	5	250

Research Instruments

This researcher in this study used a researcher-made questionnaire which focused on the utilization of the performance-based assessment in grade four Mathematics. The questionnaire was validated by the experts and was pilot tested to a school and learners that are not part of the research locale.

To determine the level of utilization of performance-based assessment, the following continuum will be used.

Interval	Level	Criteria
4.20 – 5.0	VERY HIGH	When the utilization of performance-based assessment in mathematics is manifested all the time
2.40 – 3.19	HIGH	When the utilization of performance-based assessment in mathematics is oftentimes manifested

EPRA International Journal of Environmental Economics, Commerce and Educational Management
Journal DOI: 10.36713/epra0414 |ISI I.F Value: 0.815|SJIF Impact Factor (2024): 8.481 ISSN: 2348 – 814X
Volume: 11 | Issue:6 |June 2024

1.60 – 2.39	MODERATE	When the utilization of performance-based assessment in mathematics is manifested sometimes only
80 – 1.59	LOW	When the utilization of performance-based assessment in mathematics is seldom manifested
0 - 79	VERY LOW	When the utilization of performance-based assessment in mathematics is never manifested

Data Gathering Procedure

At the outset of data gathering procedure, the researcher drafted a letter seeking for permission that this research study be conducted. The letter was sent to Dr. Reynante A. Solitario, CESO V, the Schools Division Superintendent in the division of Davao City and to the Elementary School Principals of the elementary schools in Binugao district.

While letters seeking for permission were delivered to the DepEd Schools Division Superintendent and principals concerned, the researcher constructed a questionnaire and have it validated by the experts and have it pilot tested using cron bach alpha.

After permission had been granted that this study be conducted in the research locale and after the research questionnaire had been thoroughly examined by the expert validators and pilot tested, the researchers launched the questionnaire into the field and retrieved them from the respondents personally after few days.

Finally, the raw scores were submitted to the statistician for statistical computation after which the researcher subjected it to analysis and interpretation.

Data Analysis

The following statistical tool was used in the analysis and interpretation of the responses in this study.
Mean was used to determine the extent of performance-based assessment done by the teachers to determine the numeracy skills of the grade four learners so that necessary intervention can be designed and implemented. It allows the researcher to summarize and understand the average value of a set of data points. The mean is calculated by summing all the values in a dataset and dividing by the total number of values.

RESULTS AND DISCUSSION

This chapter displayed the summary of the findings, conclusions and recommendations drawn out by the researcher after the analysis and interpretation of the findings had been made.

This study aimed at determining the utilization of performance-based assessment as the basis in developing the numeracy intervention program for grade four learners.

This study employed the non-experimental descriptive-correlation research design in investigating the research problem. It is descriptive because the data are presented in quantitative descriptions on the "Utilization of Performance-based Assessment in Mathematics: Basis for Numeracy Remediation Program for Grade Four Learners. According to Good (2005), this method of research shows merely description of tasks presenting the conditions regarding the nature of the group of persons or class of events that involved procedure of analysis, classification, and measurement. It involves varied information regarding the current or present condition (Deauna, 2005).

This study was conducted in all public elementary schools in Binugao district, Davao City. The respondents of this study were the 5 grade four teachers to assess the 250 grade four learner in the research locale who were the subjects of this study and whose numeracy was assessed using performance-based assessment. Moreover, simple random sampling procedure was used considering the enormous number of the grade four learners in the district while at the same time simple sampling procedure was used in determining the number of teacher who will participate in the study.

EPRA International Journal of Environmental Economics, Commerce and Educational Management
Journal DOI: 10.36713/epra0414 |ISI I.F Value: 0.815|SJIF Impact Factor (2024): 8.481 ISSN: 2348 – 814X
Volume: 11 | Issue:6 |June 2024

This study revealed that teachers most of the time used performance-based assessment in assessing learning outcomes in mathematics of the grade four learners. This also means that teachers are confident in using performance-based assessment as it monitors academic progress of the child in mathematics subject.

Conclusions

Based on the collective findings on this study, the following conclusions are drawn:
The performance-based assessment in terms of the following: application of knowledge is High, Skills Development is Very High and Work habit is Very High. Along this vein, a numeracy enhancement program will be designed and proposed to sustain the numerical proficiency of the learners focusing on the areas that need to be strengthened.

The theory of Hall (2006) which stated that to be mathematically capable, students must have a facility with the basic techniques of mathematics. There are necessary skills and knowledge that students must routinely exercise without hesitation. Mathematics is the language of the sciences, and thus fluency in this language is a basic skill. Elementary mathematics classes require that students bring with them an ease with the standard skills of mathematics that allows them to focus on the ideas and not become lost in the details. However, this level of internalization of mathematical skills should not be mistaken for the only objective of primary mathematics education.

This is supported by Wallace (2006) who complimented that student understanding of mathematics is the goal. In developing a skill, students first must develop an understanding. Then as they use the skill in different contexts, they gradually wean themselves from thinking about it deeply each time, until its application becomes routine. But their understanding of the mathematics is the map they use whenever they become disoriented in this process. The process of applying skills in varying and increasingly complex applications is one of the ways that students not only sharpen their skills, but also reinforce and strengthen their understanding. Thus, in the best of mathematical environments, there is no dichotomy between gaining skills and gaining understanding.

A range of studies have explored the effectiveness of various enhancement programs in mathematics. Padernos (2024) found that teacher-made learning activity sheets were effective in improving numeracy skills. Lee (2022) found that a professional development program for mathematics teachers led to improvements in self-efficacy, epistemological beliefs, and pedagogical knowledge, as well as enhanced teaching practice. Fitriawan (2021) focused on enhancing visual abilities in solving mathematics problems, particularly in the context of geometry thinking. These studies collectively underscore the potential of enhancement programs in improving various aspects of mathematics education.

A range of theories and approaches have been explored in the field of numeracy programs. Performance-based assessment is a pedagogical approach that emphasizes the evaluation of students' ability to apply their knowledge and skills in authentic, real-world situations effectively (Shavelson et al., 2019). This is underpinned by theories of performance management, including social cognitive theory, goal theory, and control theory, which emphasize the role of goal setting, self-confidence, and feedback in enhancing organizational performance (Panday, 2015).

The proposed numeracy enhancement program draws on the principles of cognitive science and gamification to create an engaging and effective learning experience (Numeracy Ninjas – A numeracy-boosting programme, 2023). The application of mathematical knowledge in various fields, such as class management, technical education, and learning processes, has been explored in several studies. Wang (2024) and Li (2023) both emphasize the importance of real-world application and meaningful learning in mathematics education. Pugacheva (2020) focuses on the formation of mathematical knowledge among technical students, highlighting its role in engineering activities and the need for basic mathematical knowledge in assessing computer solutions.

The development of mathematical skills is a complex process influenced by various factors. Thus, this study collectively suggest that a multi-faceted approach, including targeted interventions, quality teaching, and a focus on foundational skills, is crucial for the development of mathematical skills. This study collectively underscore the significance of work habits in mathematics, suggesting that they can be fostered further through effective teaching practices and can significantly impact students' performance and attitudes towards the subject.

Recommendations

In the light of the findings drawn out by the researcher in this study, the following recommendations are offered:
It is recommended that DepEd officials should draft policy for enhancement programs that will be downloaded to school. There are students who showed proficiency in mathematics and they need to sustain what they knew. So aside from intervention programs which are the focus of the people in the academe, enhancement program should also be given attention.

The school heads should have designed and implemented a school-based enhancement program in mathematics to address those who are performing well in mathematics so that they feel they are given attention when teachers focus their time to those struggling in numbers. In order to support teachers in teaching numeracy skills, school heads should: monitor remedial session conduct and offer technical assistance for improving its implementation; monitor teachers' teaching-learning processes; maximize time spent providing appropriate technical assistance based on teachers' needs; and support and offer technical assistance for the creation of innovations and research based on the intervention provided to improve students' performance.

Math teachers should provide remedial exercises to meet the requirements of their students and help them perform better. In order to produce and construct learning resource materials for the remedial sessions that will be conducted with students, teachers are required to attend training sessions, also known as LAC sessions. Teachers need to participate in training on numeracy teaching methodologies and techniques, and ought to review the policies and instruments used to evaluate students' numeracy proficiency.

Students should be aware and have better understanding of how important performance-based assessment is in Mathematics and to be empowered and motivated to do well in numeracy assessments within the parameters set by teachers.

Parents should continue play their role in their child's numeracy development for their involvement in early numeracy at home improves children's numeracy abilities, enhances the quality of research in a variety of fields, and maximizes their experiences and expertise in early childhood education.

For future researchers, it is strongly recommended that a relative study on performance-based assessment in other subject areas will be conducted.

REFERENCES

1. *Aguilar, M. G. W. (2021). Academic dishonesty in the Philippines: The case of 21st century learners and teachers: International journal of management, technology, and social sciences, 6(1), 306–313.*
2. *Allal, L. (2023). Teachers' professional judgement in assessment: A cognitive act and a socially situated practice. Assessment in Education: Principles, Policy & Practice, 20(1), 20–34.*
3. *Almlund, M., Duckworth, A. L., Heckman, J. J., & Kautz, T. D. (2021). Personality psychology and economics (No. w16822). National Bureau of Economic Research.*
4. *Al-Otaibi, S. (2022). Training needs for teaching staff members, effective teaching skills, faculty of Science, Princess Noura University. International Educational Journal, 12(6), 170-186.*
5. *Arnaiz, P. (2020) Schools that promote the improvement of academic performance and the success of all students. DOI:10.3389/fpsyg.2019.02920.*
6. *Asmahan M. Altaher (2020). "The effect of knowledge characteristics in student's performances: An empirical case study". Association for Supervision and Curriculum Development. The learning compact redefined: A call to action.*
7. *Babad, E. Y., Inbar, J., & Rosenthal, R. (2022). Teachers' judgment of students'*
8. *potential as a function of teachers' susceptibility to biasing information. Journal of Personality and Social Psychology, 42(3), 541–547.*
9. *Bandy, J. (2023). Learning to apply knowledge and skills to benefit others or serve the public good.*
10. *Bass, K. M. (2022). Reality's limits. Measurement: Interdisciplinary research and perspectives, 3(2), 84–88.*
11. *Baumeister, R. F., & Vohs, K. D. (2020). Self-regulation, ego depletion, and motivation. Social and Personality Psychology Compass, 1(1), 115–128.*

12. *Bernardin, H. J. (2021). Effects of rater training on leniency and halo errors in student ratings of instructors. Journal of Applied Psychology, 63(3), 301–308.*
13. *Bol, L., Stephenson, P. L., O'connell, A. A., & Nunnery, J. A. (2020). Influence of experience, grade level, and subject area on teachers' assessment practices. The Journal of Educational Research, 91(6), 323–330.*
14. *Bottge, B. A., Rueda, E., Serlin, R. C., Hung, Y.-H., & Kwon, J. M. (2022). Shrinking achievement differences with anchored math problems: Challenges and possibilities. Journal of Special Education, 41(1), 31-49.*
15. *Buseri, J. C., &Dorgu, T. E. (2021). The relevance of instructional materials for effective curriculum delivery in Nigeria. Journal of Issues in Professional Teacher Education (JTIPTE), 2(2), 9.*
16. *Butnaru, G.,et.al. (2021). The effectiveness of online education during Covid 19 pandemic – A comparative analysis between the perceptions of academic students and high school students from Romania.*
17. *Cahapay, M. (2020). Reshaping assessment practices in a Philippine teacher education institution during the Coronavirus Disease 2019 crisis. Pedagogical Research (5(4), em0079).*
18. *Carson, L., Edwards, H., Smith, B., & Webb, G. (2021). Teaching power. Lecturing. Case studies, experience and practice. Kogan Page Limited.*
19. *Catrambone, R. (2020). The subgoal learning model: Creating better examples so that students can solve novel problems. Journal of Experimental Psychology: General, 127(4), 355-376.*
20. *Catrambone, R. (2021). Generalizing solution procedures learned from examples. Journal of Experimental Psychology: Learning, Memory, and Cognition, 22(4), 1020-1031.*
21. *Charitaki, G. et.al. (2021). A meta-analytic synthesis of early numeracy interventions for low-performing young children.*
22. *Day, S. B., & Goldstone, R. L. (2022). The import of knowledge export: Connecting findings and theories of transfer of learning. Educational Psychologist, 47(3), 153-176.*
23. *Deans for Impact (2021). The Science of Learning. Austin, TX: Deans for Impact.*
24. *DepEd-DOH (2021). Operational guidelines on the implementation of limited face to face learning modality. Joint Memorandum Circular Number 1, series of 2021.*
25. *Department of Education (2021). Additional guidelines on the implementation of DepEd order no. 10, s. 2016.*
26. *Dorgu, T. E. (2021). Different teaching methods: A panacea for effective curriculum implementation in the classroom. International Journal of Secondary Education,3(6), 77-87.*
27. *Eggen, P., & Kauchak, D. (2022). Strategic and models for teachers: teaching content and teaching skills. Pearson Education, Inc.*
28. *Evans, D. & Field, A. (2020). Maths attitudes, school affect and teacher characteristics as predictors of maths attainment trajectories in primary and secondary education.*
29. *Fagell, P. (2020). Career confidential: Teacher wonders how to help students during coronavirus shutdown. DOI:10.1177/0031721720923799.*
30. *Farah, N., & Ayoubi, Z. (2020). Enhancing the critical thinking skills of grade 8 chemistry students using an inquiry and reflection teaching method. Journal of Education in Science Environment and Health, 6(3), 207-219.*
31. *Gallemard, J. (2023). The basics of knowledge transfer: A beginner's guide.*
32. *Gentner, D., et.al. (2023). Rapid learning in a children's museum via analogical comparison. Cognitive Science, 40 (1), 224-40.*
33. *Geurin, D. (2020) Knowing vs. Understanding vs. Applying*
34. *Gilbert, J. K., Bulte, A. W., & Pilot, A. (2021). Concept development and transfer in context-based science education. International Journal of Science Education, 33(6), 817-837.*
35. *Hanafi, M. (2021). Implementation of knowledge management in different industries. IJIIS: International Journal of Informatics and Information Systems*
36. *Jungst, S., Licklider, B., & Wiersema, J. (2023). Providing support for faculty who wish to shift to a learning-centered paradigm in their higher education classrooms. The Journal of Scholarship of Teaching and Learning, 3, 69-81.*
37. *Kiker, K., Eversman, S., Kruggel, H., & Volkmann, C. (2020). Pioneering orientation using multiple teaching methods and low-fidelity simulation for unlicensed care providers. Journal for Nurses in Professional Development, 36(4), 213-220.*
38. *Mohd Hafiz Yusoff (2023). Knowledge development through constructionism game-based learning application: An evaluation of students' performance.*
39. *Pedersen, A. et.al. (2022) Improving numeracy skills in first graders with low performance in early numeracy: A randomized controlled trial.*

40. *Pendidikan, J. (2022) Suppporting strategies of the recovery for students' literacy and numeracy in elementary school environment.*
41. *Peters, E. (2020). Training Numeracy. Innumeracy in the Wild*
42. *Petryshyn, N. (2021). Features of application of knowledge management to ensure competitiveness of the enterprise.*
43. *Ribbel, A. (2020). Application of Knowledge.*
44. *Ryosuke Fujinuma and Laura Wendling (2022). Repeating knowledge application practice to improve student performance in a large, introductory science course. International Journal of Science Education*
45. *Sintema, E. J. (2020). Effect of COVID-19 on the performance of grade 12 students: Implications for STEM education. Eurasia Journal of Mathematics, Science and Technology Education, 16, 1-6.*
46. *UNICEF Philippines. (2021). Reopening schools safely in the Philippines | UNICEF Philippines.*
47. *Viner, R. et.al (2020). School closure and management practices during coronavirus outbreaks including COVID-19: a rapid systematic review.*
48. *Wahyuni, S. (2020). Analysis of student learning styles in the 4th grade primary school.*
49. *Wu, L. et.al.(2022). A review of intelligent application of educational knowledge graph from the perspective of artificial intelligence. International Symposium on Electronics and Telecommunications*