



THE USE OF FORMATIVE ASSESSMENT TECHNIQUES IN IMPROVING MATHEMATICAL PROBLEM SOLVING AMONG GRADE 6 LEARNERS

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ABSTRACT

This study aimed to determine the Use of Formative Assessment Techniques in Improving Mathematical problem-solving among Grade 6 Learners. The findings of the study served as a basis for a proposed Intervention plan. This study employed a quantitative quasi-experimental research design to investigate the effect of formative assessment techniques on the mathematical problem-solving skills of Grade 6 learners. The study involved two groups of participants: an experimental group exposed to structured formative assessment strategies—such as guided questioning, short quizzes, group activities, and continuous feedback—and a control group taught using traditional teaching methods. Pre-tests and post-tests were administered to both groups to measure changes in problem-solving performance, while statistical analysis, including paired t-tests and mean comparisons, was used to determine the significance of the findings. This design allowed the researcher to examine the relationship between formative assessment interventions and improvements in learners' critical thinking, procedural knowledge, and confidence in solving mathematical problems.

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The Test of Difference Between the Pre-test and Post-test Scores of Learners presents a statistical comparison of learners' performance before and after the formative assessment techniques. It summarizes the results of the pre-test and post-test, including the computed value, the critical value, the decision regarding the null hypothesis, and the interpretation of the findings. This table provides a clear basis for determining whether the teaching method or intervention brought about a significant improvement in learners' academic performance after instruction.

A careful examination of the results shows that learners initially demonstrated a low level of understanding prior to the intervention. After the implementation of the instructional strategies, their performance increased substantially, indicating that they gained considerable knowledge and skills. The computed value exceeded the critical value, which led to the rejection of the null hypothesis. This confirms that the improvement in learners' performance was statistically significant and not due to chance. The findings clearly reflect the effectiveness of the instructional approach in enhancing learners' understanding. Furthermore, the results demonstrate that the formative assessment techniques had a strong positive impact on learner achievement. The noticeable improvement between the pre-assessment and post-assessment highlights the effectiveness of the teaching methods in elevating learners' understanding from a low baseline to a satisfactory level. The consistency of improvement across learners suggests that the intervention successfully addressed learning gaps and promoted better comprehension of the subject matter. There is no indication of stagnation or decline in performance, underscoring the overall success of the instructional approach. Overall, the

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findings imply that the formative assessment techniques significantly enhanced learners' academic performance. Learners showed meaningful progress from their initial level of understanding to a much-improved level after the intervention. This suggests that well-planned and properly implemented instructional strategies can effectively improve academic achievement and reduce knowledge gaps. It further emphasizes that continuous assessment and targeted teaching strategies can lead to measurable and sustained gains in learners' learning outcomes.

Keywords: Formative Assessment, Techniques, Mathematical Problem-solving, Grade 6

INTRODUCTION

Mathematics is often regarded as one of the most challenging subjects in the primary curriculum, particularly when learners are required to apply concepts in problem-solving situations. Grade 6 learners frequently encounter difficulties in understanding and solving word problems due to a lack of procedural knowledge, critical thinking skills, and confidence. The use of formative assessment techniques—such as guided questioning, short quizzes, group activities, and continuous feedback—has been recognized as an effective strategy to address these difficulties. Formative assessments allow teachers to monitor students' progress in real-time, identify misconceptions, and provide timely interventions. Through consistent feedback and step-by-step guidance, learners are given the opportunity to correct errors, reflect on their thought processes, and gradually develop stronger problem-solving skills. By integrating these techniques, educators aim not only to enhance comprehension but also to

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boost learners' confidence and motivation in tackling mathematical tasks. This study seeks to explore how formative assessment can facilitate the development of problem-solving skills among Grade 6 learners and help them approach word problems with greater competence and assurance.

According to Afari et al. (2012), the use of formative assessment in primary classrooms significantly enhanced students' problem-solving abilities, as learners received immediate guidance and were able to reflect on their errors. These findings indicate that consistent formative feedback and interactive learning activities are crucial in helping students strengthen their analytical skills and achieve better mathematical outcomes.

From the perspective of educators, implementing formative assessment techniques provides multiple opportunities to address students' learning needs. Teachers can systematically check learners' comprehension, clarify misunderstandings, and provide scaffolding to ensure that all students are able to follow problem-solving steps. Various strategies, such as guided questioning, peer collaboration, mini-quizzes, and immediate feedback sessions, enable students to engage actively with mathematical concepts. These strategies not only improve understanding but also encourage learners to develop logical reasoning, critical thinking, and confidence when faced with challenging tasks. Consequently, teachers who integrate formative assessments can observe significant improvements in students' application of knowledge to real-life problem-solving situations.

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Despite the potential benefits, several challenges have been encountered in implementing these techniques. Many Grade 6 learners exhibit difficulty in identifying the appropriate operations to use in word problems, which leads to frustration and low motivation. Teachers often observe that without structured feedback and guided practice, students' confidence in solving problems diminishes, and errors are repeated without correction. Additionally, limited classroom time and large class sizes may hinder the effective use of formative assessments, requiring teachers to carefully plan and adapt activities to ensure meaningful engagement. These challenges underscore the importance of exploring systematic formative assessment strategies that can be feasibly integrated into classroom instruction to support learners' mathematical development.

This study is necessary to examine the effectiveness of formative assessment techniques in enhancing mathematical problem-solving skills among Grade 6 learners. By investigating how guided questioning, short quizzes, group activities, and continuous feedback contribute to learner comprehension, critical thinking, and confidence, educators can identify practical strategies to improve mathematics instruction. Understanding the impact of these techniques will not only inform teaching practices but also provide a structured approach to helping learners overcome difficulties in word problems and develop stronger, more independent problem-solving abilities. Therefore, pursuing this study is essential to provide evidence-based strategies that foster academic growth and empower students to succeed in mathematics.

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This study aimed to determine the Use of Formative Assessment Techniques in Improving Mathematical problem-solving among Grade 6 Learners. The findings of the study served as a basis for a proposed Intervention plan.

Specifically, this study sought to answer the following questions.

1. What is the performance of the Grade 6 pupils in mathematics before the utilization of Formative Assessment Techniques?
2. What is the performance of the Grade 6 pupils in mathematics after the utilization of Formative Assessment Techniques?
3. Is there a significant difference on the performance of the Grade 6 pupils in mathematics before and after the utilization of Formative Assessment Techniques?
4. What intervention plan can be proposed based on the findings of the study?

Statement of Null Hypotheses

Ho1.: There is no significant difference on the performance of the Grade 6 pupils in mathematics before and after the utilization of Formative Assessment Techniques.

METHODOLOGY

Design. This study employed a quantitative quasi-experimental research design to investigate the effect of formative assessment techniques on the mathematical problem-solving skills of Grade 6 learners. The study involved two groups of participants: an experimental group exposed to structured formative assessment strategies—such as guided questioning, short quizzes, group activities, and continuous feedback—and a control group taught using

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traditional teaching methods. Pre-tests and post-tests were administered to both groups to measure changes in problem-solving performance, while statistical analysis, including paired t-tests and mean comparisons, was used to determine the significance of the findings. This design allowed the researcher to examine the relationship between formative assessment interventions and improvements in learners' critical thinking, procedural knowledge, and confidence in solving mathematical problems.

The main local of the study is in Ormoc Se San School in the Schools Division of Ormoc City. The respondents of the study were the Grade 6 Learners with 20 boys and 14 girls with a total of 34 learners.

The primary instrument for this study was a researcher-made Mathematics Problem-Solving Test and a Formative Assessment. The Mathematics Problem-Solving Test consisted of 20-word problems covering topics from the Grade 6 curriculum, including whole numbers, fractions, decimals, and ratios. The test was administered as a pre-test and post-test to measure learners' problem-solving skills before and after exposure to formative assessment techniques. The questions were designed to assess critical thinking, analytical reasoning, and procedural understanding.

Sampling. There were 34 total number respondents who are included in the study were being identified and the primary means of reach is during the actual conduct of the study as well as during the gathering of data in the school where the study was conducted. Another way of contacting them are through cell phones.

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Research Procedure. The approved and validated research instrument was reproduced, considering the number of expected respondents. The researcher informed the teachers of her intention to test the pupils. The request was formalized through a letter to the School Principal explaining the reasons for the conduct of the study.

After classifying the pupils by drawing lots into the control group and the experimental group, the pre-test for the Quarterly Examination was conducted to collect and compare the levels of learning of the pupils before the intervention. Lessons in the 3rd Quarter were prepared using the Grade 6 learners' module. After the intervention, the post-test for the 2nd Quarterly Examination was administered to collect data from both groups simultaneously.

Ethical Issues. The right to conduct the study was strictly adhered through the approval of the principal. Orientation of the respondents by both their subject teachers.

Treatment of Data. The following statistical formulas were used in this study:

The quantitative responses were tallied and tabulated. The data were treated statistically using the following tool:

1. Measures of Central Tendency – were used to obtain the pre-test and post-test mean scores.
2. Sample Standard Deviation – was used as a measure of the spread of scores within a set of data.

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3. t-Test ratio – was used to determine the significant difference between the pre-test and post-test.

RESULTS AND DISCUSSION

TABLE I

PRE-TEST PERFORMANCE OF LEARNERS

Score Range	Description	Frequency	%
33–40	Very Good	0	0.00%
25–32	Good	0	0.00%
17–24	Fair	5	14.71%
9–16	Poor	18	52.94%
0–8	Very Poor	11	32.35%
Total		34	100%

Weighted Mean: 15.00 – Poor

MPS: 37.50%

This table presents the Pre-Test Performance of Learners, showing the initial level of mathematical problem-solving skills of Grade 6 learners before the implementation of formative assessment techniques. The table provides the distribution of scores across various performance categories, including Very Good, Good, Fair, Poor, and Very Poor, along with the frequency, percentage, weighted mean, and mean percentage score (MPS) of the participants.

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It highlights the learners' preparedness and identifies areas that require intervention prior to the instructional strategy.

The results indicate that most learners performed at the lower end of the spectrum, with most falling under the Poor and Very Poor categories. A small portion of the learners were categorized as Fair, while none of the participants achieved Good or Very Good performance levels. This suggests that learners had significant difficulties in solving mathematical problems at the outset, reflecting gaps in understanding, procedural knowledge, and critical thinking skills. The low performance highlights the need for targeted instructional interventions to improve learners' problem-solving abilities and build confidence in approaching mathematical tasks.

The low pre-test scores, with an overall weighted mean of 15.00 and an MPS of 37.50%, imply that the learners were not adequately prepared in their mathematical problem-solving skills. The result implies that without intervention, learners may continue to struggle with understanding and applying mathematical concepts, emphasizing the importance of implementing structured formative assessment strategies to address learning gaps and improve performance.

Table 2

POST-TEST PERFORMANCE OF LEARNERS

Score Range	Description	Frequency	%
33–40	Very Good	6	17.65%

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Score Range	Description	Frequency	%
25–32	Good	17	50.00%
17–24	Fair	11	32.35%
9–16	Poor	0	0.00%
0–8	Very Poor	0	0.00%
Total		34	100%

Weighted Mean: 27.12 – Good

MPS: 67.80%

This table presents the Post-Test Performance of Learners, summarizing the distribution of learners’ scores across five performance categories. The table highlights the frequency and percentage of learners falling into each score range, from “Very Poor” to “Very Good,” providing an overall measure of academic performance through the weighted mean and mean percentage score (MPS). This snapshot allows educators and researchers to assess the effectiveness of the learning interventions or instructional strategies implemented, offering insight into areas of strength and those needing improvement among learners.

Upon examining the table, it is evident that the majority of learners performed within the “Good” category (scores 25–32), with 17 learners representing 50% of the total sample. This indicates that half of the learners achieved a satisfactory level of understanding of the subject matter. Meanwhile, 11 learners (32.35%) fell into the “Fair” category, suggesting that

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while they grasped some of the concepts, there remains room for improvement. Only 6 learners (17.65%) reached the "Very Good" category (scores 33–40), demonstrating high mastery of the content. Notably, there were no learners in the "Poor" or "Very Poor" categories, indicating that the instructional methods were effective in preventing extremely low performance.

Further analysis of the table reveals that the weighted mean score of 27.12, which falls under the "Good" category, and the mean percentage score of 67.80%, reinforces that most learners have achieved an above-average level of competence. The distribution suggests a positive trend where learners are generally performing at a satisfactory level, with a smaller proportion reaching exceptional performance. The absence of low scorers emphasizes the overall effectiveness of the teaching approach, highlighting its success in raising the baseline performance of all students.

The result implies that the instructional strategies employed were largely successful in facilitating learners' understanding and application of knowledge, as reflected in the overall average rating of 27.12 – Good. The result also implies that while most learners are performing well, there is still a need to provide targeted support to those in the "Fair" range to elevate them to higher performance levels. Moreover, the distribution underscores the importance of continuous monitoring and differentiated instruction to sustain and improve learners' academic outcomes.

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TABLE 3

TEST OF DIFFERENCE BETWEEN THE PRE-TEST AND POST-TEST SCORES OF LEARNERS

Aspects	Test Scores (Mean)	Computed t	Critical t	Decision	Interpretation
Pre vs Post (Performance Scores)	Pre = 15.00 Post = 27.12	12.15	2.03	Reject Ho	Significant Difference (Post-test Improved)

This table presents the Test of Difference Between the Pre-test and Post-test Scores of Learners, showing a statistical comparison of learners' performance before and after the formative assessment techniques. It summarizes the mean scores of the pre-test and post-test, the computed t-value, the critical t-value, the decision regarding the null hypothesis, and the interpretation of the results. This table allows for a clear understanding of the effectiveness of the teaching method or intervention by examining whether the learners' performance significantly improved after instruction.

A close examination of the table reveals that learners had a mean pre-test score of 15.00, which indicates a low baseline level of understanding prior to the intervention. After the instruction, the mean post-test score increased substantially to 27.12, suggesting that the learners gained considerable knowledge and skills because of the teaching strategies employed. The computed t-value of 12.15 exceeds the critical t-value of 2.03, leading to the rejection of the null hypothesis. This indicates that the improvement in post-test scores is statistically significant and not due to chance. The interpretation confirms that the learners'

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performance improved markedly after the intervention, reflecting the efficacy of the instructional approach.

The table further demonstrates that the formative assessment techniques had a strong positive impact on learner achievement. The large difference between pre-test and post-test scores highlights the effectiveness of the teaching methods in raising learners' understanding from a low baseline to a satisfactory level. The consistency of improvement across the sample indicates that the intervention addressed learning gaps effectively and facilitated better comprehension of the subject matter. No data suggest a lack of improvement, emphasizing the overall success of the instructional approach in enhancing learner performance.

The result implies that the formative assessment techniques significantly enhanced learners' performance, with the overall average post-test score reaching 27.12 – Good. The result also implies that learners made substantial progress from their initial understanding, moving from a low pre-test score of 15.00 to a much higher post-test level. This suggests that well-planned and implemented instructional strategies can effectively improve academic achievement and reduce knowledge gaps, ensuring that all learners reach a competent performance level. It further implies that continuous assessment and targeted teaching can produce measurable gains in learners' learning outcomes.

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Conclusion

Based on the results of this study, the formative assessment techniques proved to be effective in significantly improving learners' academic performance, as evidenced by the clear progress shown from the pre-assessment to the post-assessment. The findings indicate that the teaching strategies implemented successfully addressed learners' prior misconceptions, strengthened their understanding of key concepts, and enhanced their overall mastery of the subject matter. The consistent improvement among learners demonstrates that well-structured instruction, combined with continuous assessment and targeted support, can lead to meaningful and measurable learning gains. Overall, the study confirms that intentional and data-informed instructional practices play a vital role in promoting academic achievement and closing learning gaps.

Recommendations

Based on the findings of this study, the following recommendations are proposed:

For Learners: The Teacher should encourage learners to actively participate in formative assessment activities, reflect on feedback provided, and take responsibility for improving their mathematical problem-solving skills. The Teacher should guide learners in setting personal learning goals and developing confidence in solving mathematical problems independently.

Teachers: The Teacher should consistently integrate formative assessment techniques such as timely feedback, guided questioning, peer assessment, and reflective activities into daily

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mathematics instruction to strengthen learners' problem-solving skills. The Teacher should also use assessment results to identify misconceptions and adjust teaching strategies to better address learners' needs.

For School Heads: The Teacher should be supported by the School Head through the provision of professional development programs, instructional materials, and regular monitoring of classroom practices that promote the effective use of formative assessment. The School Head should also encourage collaborative planning sessions that allow teachers to share best practices in improving mathematical problem-solving.

For Public Schools District Supervisor: The Teacher should be guided and assisted by the Public Schools District Supervisor in implementing formative assessment practices across schools. The District Supervisor should promote training workshops, conduct instructional supervision, and ensure that policies support assessment strategies that enhance learners' mathematical competencies.

For Parents: The Teacher should collaborate with parents by communicating learners' progress and suggesting home-based activities that reinforce mathematical problem-solving skills. The Teacher should encourage parents to provide a supportive learning environment that promotes practice, reflection, and positive attitudes toward mathematics.

For the Researcher: The Teacher should continue refining and documenting the use of formative assessment techniques to further enhance instructional effectiveness. The

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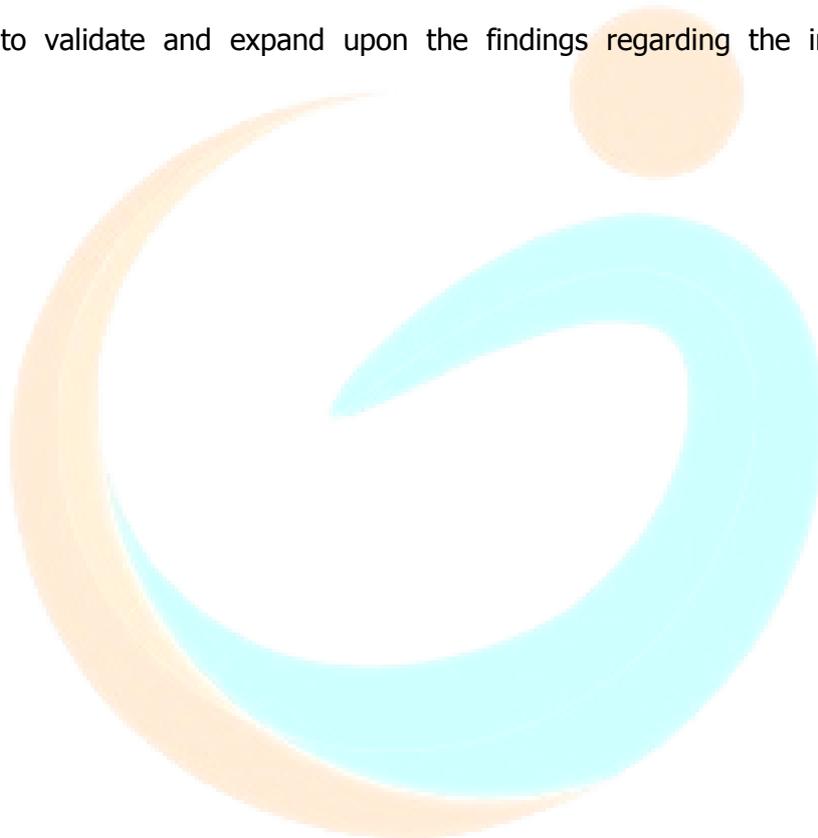
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Researcher should also monitor long-term learner progress to determine the sustained impact of the intervention.

For Future Researchers: The Teacher should be encouraged by future researchers to explore additional formative assessment strategies and examine their effects in different grade levels or subject areas. Future researchers should also consider conducting similar studies with a larger scope to validate and expand upon the findings regarding the improvement of mathematical



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The author was born on November 26, 1999, in Ormoc City, Leyte, Philippines. She earned her Bachelor's degree in Elementary Education from Visayas State University – Baybay Campus, graduating with flying colors. During her secondary and tertiary education, she actively assumed leadership roles in various student organizations, which developed her foundational skills in elementary leadership and supervision.

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