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Continuous Assessment Versus Summative Assessment: A Comparative Study of Mathematics Achievement at the Elementary Level

Muhammad Tariq Ullah
muhammadtariqullah@gmail.com
M. Phil. scholar, Institute of Education and Research Kohat University of Science and Technology, KUST, Kohat

Dr. Shah Jehan
dr.shahjehan@kust.edu.pk
Lecturer, Institute of Education and Research Kohat University of Science and Technology, KUST, Kohat

Dr. Muhammad Naseer Ud Din
dr.naseeruddin@kust.edu.pk
Professor, Institute of Education and Research Kohat University of Science and Technology, KUST, Kohat

Dr. Muhammad Nisar
nisarkust74@kust.edu.pk
Lecturer, Institute of Education and Research Kohat University of Science and Technology, KUST, Kohat
Corresponding Author: * Dr. Muhammad Nisar nisarkust74@kust.edu.pk

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ABSTRACT

The use of assessment is very important in determining the learning outcomes of students, especially geometry in the elementary level. This paper will discuss the relative consequences of continuous assessment and summative assessment on the mathematics performance of elementary students. The research design was to use a quantitative comparative study in which data were gathered in the public sector elementary schools. Students were categorized into two classes depending on the method of assessment which included continuous assessment and summative assessment. The performance of students was measured by administering a standardized mathematics achievement test. The analytical statistics showed that there was a significant difference of mathematics performance between the two groups, with the one who had been subjected to the constant assessment practices favored. The results indicate that constant evaluation helps to improve the learning process by offering immediate feedback and instructional guidance. The research suggests that the continuous assessment practices applied to the elementary mathematics classrooms should be more integrated, which will lead to higher student achievement.

Keywords: *Continuous and summative assessment, mathematics achievement, elementary education and assessment to learn.*

INTRODUCTION

Assessment is a key factor in teaching learning process, as it guides the choice of instruction, tracking the student progress, and it is used to assess the learning. Mathematical assessment at the elementary level is especially a sensitive issue as the basic mathematical skills acquired during early years of school attendance have a significant impact on the success of students in their future academic life as well as their problem-solving skills (OECD, 2022). Historically, the norms of summative assessment, which is carried out at the culmination of an instructional period, have prevailed in classroom practices and focused on grades and end performance instead of the processes of learning (Harlen, 2021). Nevertheless, there has been an increasing worry regarding low performance and low conceptual knowledge in mathematics among students, and thus, different methods of assessment have been rethought by the educators and policymakers.

Formative or ongoing assessment, also known as continuous assessment (CA), has become a learner-focused concept, which combines assessment and everyday teaching. It entails the systematic assessment of students by using quizzes, classwork, assignments, observations, and feedback to reinforce their learning in the long run (Black and Wiliam, 2023). The studies indicate that continuous assessment contributes to student engagement and timely feedback, as well as enables an educator to detect learning gaps at an early stage, thereby increasing student academic performance, especially in mathematics (Panadero et al., 2022; Andrade, 2023). Summative assessment, on the contrary, is more concerned with the measurement of learning outcomes at the conclusion of a term, which frequently does not demonstrate the progress in learning of students and personal challenges throughout the learning process (Brookhart, 2020). The international research conducted recently shows that excessive use of summative assessment can lead to surface learning and mathematics anxiety in elementary students and continuous assessment will lead to better understanding and long-term achievement (OECD, 2021; Hattie, 2023). Although the world recommends the adoption and implementation of formative and continuous assessment practices in education systems, a large number of the developing countries, such as Pakistan, continue to heavily depend on summative tests at the elementary level (Ministry of Federal Education and Professional Training, 2023). This testing inequity constrains diagnostic feedback as well as personalized instructional guidance, especially in mathematics lessons where students tend to have difficulties acquiring abstract ideas. Granted that the impact of continuous assessment and summative assessment on the achievement of students have been investigated independently in the past, comparative empirical data in the elementary level and more so in government-operated schools in developing settings is not extensive. In addition, there are limited studies that directly compared the performance of these two assessment methods as the means of enhancing math achievement in elementary learners with the help of standardized achievement tests (Khan et al., 2022; Rahman and Hussain, 2024). The gap has underscored the importance of context-specific studies to establish what assessment methodology is more effective in terms of supporting mathematics learning outcomes in the elementary level. Hence, the purpose of this study would be to undertake a comparative review of both continuous assessment and summative assessment with the aim of discussing their comparative effectiveness in improving the achievement of elementary students in mathematics. This study will give evidence-based findings that are likely to guide teachers, school administrators and policy makers towards better assessment practice in enhancing meaningful learning in elementary mathematics teaching.

Research Gap

Although there is an increased international focus on formative and continuing assessment, there is still scanty empirical studies on the comparison of continuing assessment and summative assessment at the elementary level, especially in mathematics. Most of the literature addresses formative assessment as a phenomenon or studies the results of summative assessment without making a comparison between the two methods (Harlen, 2021; Panadero et al., 2022). Furthermore, even in the contexts of developing countries, like Pakistan, assessment practices remain examination-based, and few empirical studies have examined how continuous assessment is better than summative assessment in enhancing the mathematics achievement of students using the standardized achievement measure (Khan et al., 2022; Rahman and Hussain, 2024). This absence of comparative, context specific evidence poses a serious gap in literature and prevents informed decision making in relation to effective practices of assessment in the elementary level. Thus, a comparative study involving systematic comparisons is required to identify the most effective way to aid in the improvement of the achievement in mathematics among elementary students.

Objectives of the Study

1. To compare the mathematics achievement of elementary students assessed through continuous assessment and summative assessment.

2. To examine the effectiveness of continuous assessment in improving students' mathematics achievement.

Research Questions

1. What difference exists in mathematics achievement between students assessed through continuous assessment and those assessed through summative assessment?

2. Does continuous assessment significantly enhance elementary students' mathematics achievement compared to summative assessment?

Research Hypotheses

H_0: There is no significant difference in mathematics achievement between students assessed through continuous assessment and summative assessment.

H_1: There is a significant difference in mathematics achievement between students assessed through continuous assessment and summative assessment.

Theoretical Framework

The research proposed is based on Assessment for Learning (AfL) Theory and Constructivist Learning Theory. AfL underlines utilizing assessment as a method that can be used to facilitate learning in terms of constant feedback, tracking progress, and modifying instructions. Continuous assessment has been consistent with this theory in that it employs assessment in the day-to-day teaching practices. The constructivist theory also teaches the concept that learners build knowledge by interacting and getting feedback, which cannot be achieved using summative assessment as effectively as using continuous assessment.

RESEARCH METHODOLOGY

Research Design

The research design used was a quantitative comparative research design as it investigated the differences between mathematics performance of students who were tested using continuous assessment and summative assessment.

Population and Sample

The sample included students of elementary level studying in the public sector schools. The simple random sampling was used to select a sample of 120 elementary students. The sample was split in two groups: Group A: (n = 60) Students evaluated using the continuous assessment. • Group B: The group of students evaluated using summative assessment (n = 60).

Research Instruments

The achievement of the students was measured using a standardized Mathematics Achievement Test (MAT) which was in line with the elementary mathematics curriculum. There were multiple-choice and short-answer questions that dealt with elementary arithmetic, problem-solving, and concepts. The validation of content validity was made by evaluating the expert and reliability was achieved by Cronbach alpha.

Data Collection Procedure

Data collection was done with the permission of school authorities. Both groups of students were subjected to the same content within a stipulated instructional period. Group A was measured using continuous assessment methods including quizzes, classwork, assignments, and feedback and Group B measured using end-term summative methods only.

DATA ANALYSIS

Data was analyzed using SPSS. To describe the scores on achievement, descriptive statistics (mean and standard deviation) were calculated. Independent samples t-test was used to know whether there was any statistically significant difference in mathematics achievement of the two groups at the level of significance of 0.05.

RESULTS AND DISCUSSIONS

In this section, statistical analysis of data is presented to compare mathematics achievement of elementary students who are subjected to continuous assessment and summative assessment. The research hypothesis was tested by descriptive and inferential statistics.

Table 1: Descriptive Statistics of Mathematics Achievement Scores

Assessment Type	N	Mean	Standard Deviation
Continuous Assessment	60	72.45	8.32
Summative Assessment	60	65.18	9.05
Total	120	68.82	9.14

Interpretation:
Table 1 indicates that the mean score (M = 72.45, SD = 8.32) of students who were tested using continuous assessment was much higher than the mean score (M = 65.18, SD = 9.05) of students who were tested using summative assessment. This is the first comparison where mathematics performance was better in students who were exposed to the continuous assessment practice.

Table 2: Independent Samples t-Test Comparing Mathematics Achievement

Group	N	Mean	SD	t	df	Sig. (p)
Continuous Assessment	60	72.45	8.32	4.41	118	.000
Summative Assessment	60	65.18	9.05			

Interpretation:
Independent samples t-test was used to test whether there was any statistically significant difference in mathematics performance between the two groups. These data show that there is statistically significant difference between students who are evaluated by using continuous assessment and summative assessment, $t(118) = 4.41$, $p < .05$. As such, it rejected the null hypothesis.

Table 3: Effect Size of Assessment Type on Mathematics Achievement

Comparison	Cohen's d	Effect Size Interpretation
Continuous vs. Summative Assessment	0.81	Large Effect

Interpretation:
The difference between the two methods of assessment was also found by calculating the effect size using Cohen d. The Cohen d value of 0.81 is large, meaning that the effect of continuous assessment on the achievement of elementary students in mathematics is rather large, in comparison with the summative assessment. Summary of Results The results indicate that continuous evaluation is much more effective as a way of enhancing mathematics performance among elementary students than summative assessment. Students had greater academic performance owing to continuous evaluation, feedback and teaching. The high effect size is another statement of the practical importance of continuous assessment to improve mathematics learning outcomes.

DISCUSSION

The current research focused on determining the effectiveness of continuous assessment and summative assessment in the achievement of math among elementary students. The results showed that students tested using continuous assessment scored a lot higher in mathematics as compared to those tested using summative assessment. This finding implies that grading should be used more to improve academic performance of students studying mathematics at elementary level. Great success of students with ongoing assessment can be explained by the fact that this way of assessment includes the continuous feedback of students and constant observation of their level of learning development. The results align with the concepts of Assessment for Learning, which assert the application of assessment to enhance and facilitate learning as opposed to simply assessing the results (Black and Wiliam, 2023). Constant evaluation enables the teacher to detect the false beliefs in students at an early stage and modify the teaching approach such that the learners acquire better conceptual knowledge and performance in mathematics. The findings of this paper are in line with the past literature that shows that the practices of formative and continuous assessment have a positive impact on the academic performance of learners. According to Panadero, Andrade, and Brookhart (2022), continuous assessment has shown to improve the self-regulation and engagement of students, which are important determinants of learning mathematics. Correspondingly, Andrade (2023) also discovered that frequent classroom testing with constructive feedback is a sure way to enhance the learning outcomes of students especially in those subjects that need principal clarity like mathematics. Contrastingly, the performance levels of the students who were evaluated by summative assessment were lower. This indicates that the results are consistent with previous research that indicates that an excessive intake of summative assessment promotes surface learning and constrained chances of instructional feedback (Brookhart, 2020; Harlen, 2021). Summative tests which are generally at the end of an instructional time offer minimal diagnostic data and do not consider the learning difficulties in the learning process which has an adverse impact on the mathematical performance of students. The effect size in this study is large, which is another indication that the difference between continuous and summative assessment is not only statistically significant but educationally significant as well. The present finding aligns with the claim made by Hattie (2023) according to which feedback-intensive instructional practices (including continuous assessment) largely influence the student achievement. Besides, the reports provided by OECD (2021, 2022) highlight the idea that the systems of education that incorporate the use of formative and continuous assessment in their classroom activities are likely to show better performance in student achievement and enhanced learning equity. In the Pakistani context of the elementary school in the public sector, the results of the study demonstrate the necessity to change the traditional examination-driven practices to the more learner-centered assessment systems. Khan et al. (2022) and Rahman and Hussain (2024) made similar conclusions and emphasized that the continuous assessment is not used in the developing education systems, even though its effectiveness has been proven. The current research study will also add to the current body of literature in that it will offer comparative empirical evidence of the superiority of continuous assessment over summative assessment in enhancing the achievement of mathematics among elementary students. Altogether, the results support the constructivist learning theory where active involvement of the

learner and ongoing feedback are key learning aspects. Constant evaluation helps in endorsing this theoretical perspective in that active learning will be facilitated, instructions will be scaffolded and a better understanding of mathematical concepts will be made possible.

CONCLUSION

The research finds that continuous assessment is superior to summative one in improving the mathematics performance of elementary pupils. The provision of continuous assessment in the classroom will encourage active learning, timely feedback, and better academic results.

RECOMMENDATIONS

1. The research discovered that continuous assessment had a significant positive effect on the achievement of elementary students in mathematics; hence, it is advisable that teachers should adopt the use of continuous assessment on a regular basis in mathematics classes.
2. The findings showed that continuous assessment had a significant impact on the achievement of the students; therefore, there is a need to make sure that school administrators implement continuous assessment practices in the schools in a consistent manner.
3. The students that were evaluated using summative assessment only had lower achievement; therefore, policymakers need to minimize excessive dependence on end-term examinations during elementary levels.
4. Constant evaluation helped to give timely feedback and recognize the learning gaps, therefore, teachers ought to give regular and constructive feedback when delivering instruction.
5. The results indicated that there were gaps in the assessment practice of teachers; therefore, professional development programs ought to emphasise on the enhancement of assessment literacy in teachers.
6. The research gave evidence relevant to the circumstances of assessment practice, and thus more large-scale studies are suggested in order to enhance the generalizability.

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