

The Mathematics Teachers' Formative Assessment Practices on Improving Students' Academic Achievement: A Case of Secondary Schools in Mafinga town Council

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Abstract

This paper explored the mathematics teachers' formative assessment practices on improving students' academic achievement in mathematics in Secondary schools. Specifically, the study aimed to explore mathematics teachers' formative assessment practices when teaching mathematics. The study employed mixed method research approach and convergent parallel-research design. The target population involved Mathematics teachers', heads of schools and students from two (02) selected secondary schools with a sample size of 58 respondents including, 46 students, 10 mathematics teachers and 2 heads of school. Purposive and simple random sampling techniques were employed. Data were collected through questionnaire, interview and document review. The findings of the study revealed that formative assessment practices applied by mathematics teachers includes but not limited to; classroom exercises, tests, assignment, quizzes, group discussion and involving students in demonstrating mathematical concepts on the chalkboard. Also, findings indicated teachers apply formative assessment practices in following ways; providing assignment or assessment tasks during the and proving feedback during teaching process, by ensuring that each individual student attempt the quizzes or assignments given and by making corrections of quizzes and assignment of the previous lesson before starting a new lesson. It is concluded that, mathematics teachers should make sure that all assessment tasks given to students are formative, then for formative assessment practice to be effective it should be administered during teaching process and provide immediate feedback. It is recommended for the action that; firstly, administrators should ensure that mathematics teachers apply formative assessment practices and feedback provided on time, secondly, mathematics teachers should be provided with capacity building training on the implementation of formative assessment.

Keywords: formative assessment practices, academic achievement, assessment, mathematics, assessment

1.0 Introduction

Formative assessment practices can be defined as the teaching method that aims at improving students' learning by providing information about students' understanding and using this information to adjust teaching and learning process (Cizek, 2010). Formative assessment informs teachers as to whether the students have learned and they have an indicator qualification for how the teachers should plan their next lessons (Wuest & Fisette, 2012). Many African countries adopted educational changes towards the end of 1990s following the introduction of Competency –based curriculum in South (Makunja, 2016, Mkungua, 2018). The competency –based curriculum stressed the changes in teaching and learning strategies in which student-centered approach and formative assessment practices were emphasized to enhance classroom instructions. This is because it is believed that formative assessment practices enhance a way for students to learn and helps a teacher to learn about efficiency of their practices (Maki, 2014).

Formative assessment practices play a crucial role in the teaching and learning process by developing students' metacognitive skills, providing valuable feedback, and shaping instructional strategies (Black & Wiliam, 2014; Taras, 2013). However, many teachers lack sufficient training in assessment and often make assessment decisions without a sound understanding of assessment principles and techniques (Popham, 2014; DeLuca & Bellara, 2013). There is a need for teachers to recognize the link between assessment practices and quality teaching, considering assessment as a tool for active learning in the classroom (Sambell, McDowell, & Montgomery, 2013; Torrance, 2012; McGinnis, 2018).

The study done by Kasiisa and Tamale (2013), concerning effect of formative assessment practices in pupil's achievement on Primary social studies in eastern Uganda, revealed that there is a positive correlation between formative assessment practices as a teaching strategy with pupils' achievement. However, despite of showing the correlation between formative assessment practices and pupils' achievement, this study then did not indicate what formative assessment practices are applied.

In Tanzania, mathematics is given paramount importance in the curriculum and policies related to education, right from pre-primary to tertiary levels. Mathematics is one of the core subjects in both primary and secondary school curricula. Despite the importance given to mathematics, a

large number of students struggle to understand the subject (Mazana, Montero, & Casmir, 2019). This struggle is reflected with students' poor performance in the subject during national examinations in Tanzania. This concerning trend is evident in the Basic Education Statistics in Tanzania (BEST, 2014), which report that the majority of secondary school students have failed their mathematics national examinations for a period of ten consecutive years (2004-2013). Such low achievement raises significant concerns about the Continuous assessment as a truly formative practice in improving students' academic achievement.

Research shows that the use of proper formative assessment practices has positive effects on students' academic achievement (Bostrom & Palm, 2023). However, much of the available evidence on the effectiveness of formative assessment practices for improving students' academic achievement remains inconclusive and one of the reasons being inconsistency of what are proper formative assessment practices and how are implemented (Thum, 2015). However, despite the presence of a well-established infrastructure for assessment interventions through continuous assessment in the Tanzanian educational system, there remains a limited understanding of the formative nature and effectiveness of this assessment system. Therefore, it is essential to explore the formative assessment practices on students' academic achievement in secondary schools.

2.0 Materials and Methods

2.1 Research Approach and Design

This study employed a mixed method research approach, combining aspects of qualitative and quantitative methodologies. A mixed method research approach offered a chance to counteract unavoidable technique biases, strengthen inherent method strengths, and adjust for inherent method weaknesses. According to Creswell and Plano (2011) using a hybrid method allows for a deeper level of understanding to be developed than when using a single technique tailored to a particular study. By using this method, the researcher was able to gather and thoroughly evaluate both qualitative and quantitative data in a timely, methodical, and sequential manner that combined the two types of data. On the other hand, Convergent parallel design was employed in this study. According to Creswell and Clack (2011), a convergent parallel design involves the

researcher conducting both quantitative and qualitative portions of the study simultaneously in the same phase, weighing the approaches equally, analyzing the two components independently, and interpreting the results jointly. Therefore, the researcher found that employing a convergent parallel design help to communicate with the respondents and utilize contact methods to gather the information

2.2 Participants

The target population for the study involved the heads of school, mathematics teachers' and students from two (2) selected public secondary schools. A sample of 58 respondents including, 46 students, 10 mathematics teachers and 2 heads of school were selected by using both probability and non-probability sampling techniques. Students were selected using simple random sampling whereas; heads of schools and Mathematics teachers were selected using purposive sampling. Purposive sampling technique was used because heads of schools are administrators who could provide in-depth information on teachers' assessment practices. Also, Mathematics teachers are the ones who use formative assessment practices during teaching.

2.3 Data Collection Methods

This study employed interview and questionnaire methods to collect data concerning the mathematics teacher' formative assessment practices on improving students' academic achievement in secondary schools. Questionnaires were distributed to Mathematics teachers and students while interview were applied to heads of schools.

2.4 Data Analysis and Ethical Considerations

Qualitative data were classified and synthesized into major themes and sub-themes, some of explanations from participants were presented as direct quotations. Then researcher coded the data in order to develop categories and finally the result was interpreted and presented in descriptive and narrative way. On the other hand, Quantitative data obtained from closed ended questionnaire were coded and entered into Statistical Package for Social Science (SPSS) software version 25.0 and was subjected to descriptive statistics analysis. Specifically, data were analyzed using simple descriptive statistics such as percentages and frequencies. The data was presented with the aid of tables.

It is worth giving if a researcher considers ethical issues before conducting research. Before going to the field, the researcher was obliged to observe the Ruaha Catholic University (RUCU)

research protocols. The researcher had to observe the relevant rules and regulations to ensure that the study is in accordance to the research protocol such as obtained a clearance letter from RUCU. This allowed the researcher to be acceptable in other authorities like: Regional Administrative Secretary, District Executive Director (DED), and then to the District Education Officer (DEO) who introduced the researcher to the respective secondary school heads for data collection. The study considered all issues of confidentiality that is the information identified or provided was not by any means shared to the third parties. The information that was obtained was used only for the study and not otherwise. For better achievement, the researcher ignored names of the secondary schools and participants that were involved in the study to ensure that privacy was highly observed.

3.0 Results

3.1 Mathematics Teachers' Formative Assessment Practices in Improving Students' Achievement in Mathematics

The findings in study revealed that teachers practice formative assessment through the use of test, quizzes, assignments, group discussions and involving students in demonstrating various mathematical concepts on the chalkboard. (86.9%) of students participated in study agreed that mathematics teacher give them tests, quizzes which show that their teachers apply formative practices. In addition, (78.3%) of students agreed that mathematics teachers arrange students in groups and give them questions for discussion while passing through to check their progress. Moreover, (84.8%) of the respondents agreed that teachers give them a list of question as homework activities to be done after classes and submit on the next day. Further findings indicated that (96.6%) of students strongly agreed that, mathematics teachers' involve students in demonstrating various mathematical concepts on the chalkboard, the above findings proved that mathematics teachers uses formative assessment practices when teaching mathematics.

In an open-ended questionnaire, teachers responded that they apply tests, quizzes, assignments, group discussion activities as formative assessment practices which help students to improve their skills in solving mathematical problems and hence enhancing academic achievement. Table 1". Provides the least and the most formative assessment practices.

1: Teachers practices of formative Assessment (N=46)

S/N	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
		Fq.	Fq.	Fq.	Fq.	Fq.	Fq.
1.	Teachers application of tests, quizzes and assignments improves students achievement in mathematics	2(4.3%)	4(8.7%)	0%	3(6.5%)	37(80.4%)	46(100%)
2	Arranging students in pairs and giving questions for discussion(Think –pair-share) is an effective formative practice for promoting students’ achievement	2(4.3%)	2(4.3%)	6(13%)	9(19.6%)	27(58.7%)	46(100%)
3	Student’s involvement in demonstrating various Mathematical concepts	0%	0%	0%	14(30.4%)	32(96.6%)	46(100%)
4	Giving many quizzes and tests to be done at home and be effectively marked	3(6.5%)	2(4.3%)	2(4.3%)	19(41.3%)	20(43.5%)	46(100%)

On interview session with heads of schools, he also indicated that teacher applies tests, quizzes, assignment and Think-pair-share as formative assessment practices during teaching. One of the Head of school said:

In this school, teachers use quizzes, tests and assignment as part of formative assess effective in assessing students. They are the best ways since they provide feedback quickly to the students and make the teacher easily to identify some difficult concepts for revision (interview, Head of school C 14th August, 2023).

4.0 Discussion of the Findings

The findings revealed that mathematics teachers' apply formative assessment practices through giving exercises, tests, quizzes, assignments, group discussions, involving students in demonstrating mathematical concepts on the chalkboard and giving a list questions for student to attempt at home provide feedback to teachers. Further finding indicate applied formative practices significant influence in promoting students' academic achievement when teachers apply them during teaching. The study findings are in line with the study conducted by Kwek (2015), the findings indicated that problem-posing tasks can facilitate students' mathematical learning and thinking processes, leading to improved understanding and competencies in the subject. According to Ugodulunwa and Uzoamaka (2015), the implementation of quality assessment techniques and the subsequent use of the information obtained from these assessments to enhance teaching and learning instructions are the two most important conditions for successful formative assessment.

However, the study findings are not in line with the study conducted by Byabata and Kisamo (2014). The findings revealed the insufficient knowledge of teachers on formative assessment, inadequate training, time constraints and lack of resources as the barriers to success of effective implementation of formative assessment. In the same vein, the study findings contrasts with the study done by Sidhu et al. (2018), the findings showed that there were obstacles in implementing formative assessment in classroom such as; time constraints, classroom environment, heavy load and lack of training. On the other hand, the study findings are in line with the study done by

Kasiisa and Tamale (2013), the findings revealed that there is a positive correlation between formative assessment practices as a teaching strategy with pupils' achievement.

5.0 Conclusions

As far as the study findings is concern, mathematics teachers apply formative assessment practices through exercises, tests, quizzes, assignments and group discussion activities involving students in demonstrating mathematical concepts on the chalkboard, giving a list questions for student to attempt at home provide feedback which are effective in improving students' academic achievement in mathematics at secondary schools. This is evident when teachers apply proper formative assessment practices that encourage student participation and provides timely feedback.

6.0 Recommendations

Based on the findings on examining the effectiveness of mathematics teachers' formative assessment practices on students' academic achievement in mathematics in secondary schools, the study recommends to the Educational administrators and heads of schools to ensure that mathematics teachers' apply proper formative assessment practices and feedback provided on time, this will help teachers to adjust their teaching approaches to achieve the desired goals. The researcher also recommends the provision of motivation to mathematics teachers' dealing with large number of students and provision of capacity building training on implementation of formative assessment practice.

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