Assessing the Impact of Formative Assessment on Students` Motivation in Mathematics in Public Secondary Schools in Tanzania

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Abstract

This study assessed the influence of formative assessment on motivating learning progress in mathematics in secondary schools in Tanzania. Specifically, it explored the relationship between the frequently used formative assessment methods and motivation to learn mathematics and assessed the extent to which students were motivated in learning mathematics. The study was carried out in six selected secondary schools in Iringa municipality, Tanzania. Both quantitative and qualitative research approach were used whereby descriptive research design was employed. It involved 90 respondents where 72 were form three students, 12 were secondary school mathematics teachers and 6 secondary school academic teachers. Questionnaire and documentary review were used to collect data. The quantitative data were analysed using descriptive statistics while qualitative data were thematically analysed. The results revealed that, formative assessment within mathematics education experiences underutilization of diverse, interactive and engaging methods leading to low student motivation to learn the subject in which 60% students lack motivation. In addition, teachers tend to rely heavily on traditional methods like quizzes and exercises which limits effectiveness on motivating learning progress in mathematics. Thus, Students express dissatisfaction with current practices and find mathematics as irrelevant. The study recommended for teachers` professional development concerning formative assessment methods.

Keywords: *Assessment, Formative assessment, Motivation.*

1. Introduction

Effective teaching and learning can be achieved through assessment (Cruickshank, 2017), which plays a vital role in education by supporting student learning and informing instructional decisions (Stehle & Peters-Burton, 2019). Unlike summative assessment, which is conducted at the end of a course to evaluate overall achievement, formative assessment (FA) involves ongoing, frequent and interactive evaluations of students` learning progress. This continuous process allows for the identification of learning needs and the adjustment of teaching through feedback to enhance learning outcomes to students (Zhai, Li & Guo, 2018).

In Tanzania, where education faces significant challenges, particularly in mathematics, the need to understand how formative assessment impacts motivation and learning progress is not only essential for improving educational outcomes but also a good topic of significant educational importance. Given the persistent poor performance in mathematics, investigating the potential of formative assessment to address these challenges is essential and necessary for the nation`s educational advancement.

Formative assessment helps teachers in guiding instruction, identifying learning gaps, and encouraging student engagement through regular feedback. Additionally, it also promotes self-reflection by encouraging students to evaluate their own learning (Klute, Apthorp, Harlacher & Reale, 2017). By understanding individual student needs and progress, teachers can more effectively differentiate instruction to cater to diverse learning styles and abilities. Research consistently shows that the effective use of formative assessment leads to improved student learning, motivation and academic achievement as it provides the essential feedback and support for learning to occur (Lane, Parrila, Bower, Bull, Cavanagh, Forbes, Jones, Leaper, Khosronejad, Pellicano, Powell, Ryan & Skrebneva, 2019; Kyaruzi, 2018).

Mathematics is globally regarded as one of the most important subjects in schools, forming a foundation of science, technology, engineering, innovations, business operations and knowledge that contributes positively toward the economic development of any nation (Tshabalala & Ncube, 2016; Shahanga & Kasambala, 2024). Despite its importance, over 230 million students worldwide are not achieving minimum proficiency levels in mathematics, with six out of ten students failing the subject

(UNESCO, 2017). This widespread underachievement is alarming, as it threatens the development of critical reasoning and decision-making skills in students who are the future workforce for regional, national and global development (Algani, 2022).

Despite formative assessment being integrated into teaching and learning, empirical evidence shows persistent poor performance in mathematics, even in developed countries like China, Japan, Korea, Russia, England, and Hong Kong, with the situation being worse in developing countries (Mullis, Martin, Foy, Kelly & Fishbein, 2019).

The urgency of addressing this issue is evident in the consistent failure rates in national examinations, which highlight a serious need for interventions that can motivate and improve learning progress.

In Finland, formative assessment is deeply integrated into the education system as a means of supporting student learning and development, students benefit from immediate feedback, growth mindset encouragement, individualized learning paths, peer collaboration and clear learning goals (Finnish National Agency for Education, 2015). Finland`s mathematics education has been receiving attention worldwide for its students` high performance in mathematics and science on the Programme for International Student Assessment (PISA) (OECD, 2023).

In contrast, African countries, including Tanzania, continue to face significant challenges. In Tanzania, formative assessment has been practiced since the colonial period, yet the performance in mathematics remains critically poor, particularly in secondary schools. The pass rate in the Certificate of Secondary Education Examination (CSEE) for mathematics has been consistently below 25% between 2012 and 2022 (Mkenda, 2022). This poor performance highlights the need for targeted strategies to improve mathematics outcomes, Therefore, this study is sought to assess the influence of formative assessment on motivating learning progress in mathematics in public secondary schools in Iringa Municipality.

1.1 Statement of the Problem

Generally, it is known that formative assessments are an effective tool for improving students` understanding, academic achievement through motivation, as it stimulates and motivates student work harder after getting feedback and thus improves performance. However, in mathematics subject this motivation is not reflected with the actual results of acknowledged benefits of formative assessment which is associated with motivating learning progress, in particular, it was expected to enhance students` understanding and performance in the realm of mathematics education, but still there persists a notable significant issue of failure in mathematics subject despite its implementation. Thus, this poses a gap of whether, formative assessment motivates learning progress in mathematics subject or not. Thus, the researcher wants to assess the influence of formative assessment on motivating learning progress in mathematics in public secondary schools in Iringa Municipality.

1.2 Purpose of the Study

The main objective of this study was to assess the impact of formative assessment on students` motivation in mathematics in public secondary schools in Iringa Municipality. Specifically, the study is sought to; explore the relationship between the frequently used formative assessment methods and motivation to learn mathematics and assess the extent to which students are motivated to learn mathematics.

2.0 Literature Review

2.2.1 Formative Assessment Methods and Motivation.

Formative assessment methods are considered to be a powerful tool in education, can greatly enhance students` motivation in mathematics education by providing immediate feedback, promoting a growth mindset, involving students in the learning process, thus creating a supportive and engaging learning environment. As a result, it encourages students to take ownership of their learning, persist when faced with challenges and finally improve their understanding and performance. Kyaruzi (2019) efforts to improve mathematics learning should capitalize on empowering learners to appreciate the formative role of using assessment information or feedback to improve learning. Evidence indicates a need to improve mathematics performance including student perceptions of mathematics. Mathematics teachers should enable students to develop positive perceptions on teacher assessment practices and encouraging students to use assessment information.

Ferdinal and Isramirawati (2020) assert that formative assessment enables teachers to monitor and interfere with the students` learning process to achieve the class learning objectives. This method, identifies learning problems and adjust teaching to students` needs. Student-centred learning methods significant influence on students' performance as compared to teacher-centred methods. Teachers should use student-centred methods in teaching and learning mathematics in secondary schools (Mbedule, 2020). Also, Ally and Kitula (2022) found out that lecturers perceived themselves as competent on using group assignments but most of the students were not satisfied with how the whole process of group assignment was conducted. Despite its infectiveness the study concluded that group assignments are frequently used to assess learning acquisition among university students.

Formative assessment improves the academic performance of the students on the subject. Formative test serves as a basis for finding out the sources of difficulties on the contents of the subject. In this way, this enables teachers to give necessary remediation and correctives measures to improve the understanding of students on the contents of the subject in order to improve their academic achievements in the subject concerned (Moyosore, 2015). Also, it motivates students to study, make them aware of what they have learned and where they need to study more. Thus, formative assessment can act as a tool for learning, contributing to the process and outcomes of learning (Weurlander, Söderberg, Scheja, Hult and Wernerson, 2012). All these shows that formative assessment is essential in learning but it`s implementation whether motivates or demotivates learning progress in mathematics is not documented, as there are high failure rates in mathematics subject worldwide.

2.2.2 Students` Motivation to Learn Mathematics

Muho and Taraj (2022) revealed that strategic questions used by teacher during formative assessment, student portfolio, self-assessment and peer assessment affected positively motivation for learning the English language. However, in mathematics this study can help to motivate students in learning mathematics through use of suitable method in teaching and learning. In addition, the study noted deficiencies in studying the effects of assessment practices on student motivation. Formative assessment has a positive effect on intrinsic motivation in learning (Aust, et al., 2023).

Mlemba, Massam and Mrema (2024) found that feedback was more generalized, delayed and rarely occurred. Hence, the assessment did not motivate students and the study suggests on the provision of effective feedback which should be conducted regularly to equip students with appropriate knowledge and skills in turn, enhance students learning and improve performance in mathematics.

3.0 Materials and Methods

The study utilized both qualitative and quantitative research techniques to provide a comprehensive analysis of the topic on the influence of formative assessment on motivating learning progress in mathematics. This approach enabled triangulation of data, validating findings by cross-referencing insights obtained from both qualitative and quantitative methods. The study aimed to enhance the validity and reliability of the results, as supported by Cresswell (2012). The qualitative approach focused on gaining a deep understanding of individual students' perspectives, while the quantitative approach provided measurable, objective data to assess the extent of respondents` agreement or disagreement with specific constructs.

The study employed a descriptive research design, chosen for its ability to provide detailed descriptions of the current situation and explore associations between variables. Descriptive research was considered suitable for accurately capturing the state of formative assessment practices and their impact on student motivation in mathematics (Kumar, 2005; Cresswell, 2012; Kothar, 2014).

The study targeted public secondary schools in Iringa Municipality, with a sample of 90 participants. This sample was carefully selected from six public secondary schools within the municipality, which collectively offered a reasonable number of mathematics teachers and students. The sample included 72 students (12 from each school), 12 mathematics teachers (2 from each school), and 6 academic teachers (1 from each school). Form III students were specifically chosen for their experience with the current assessment methods over the past two years and their lack of involvement in National Examinations Council of Tanzania, which reduced stress and ensured more genuine participation. Their Enlish language skills also made them suitable participants for the study.

Mathematics teachers with at least five years of teaching experience were included to leverage their expertise and familiarity with formative assessment practices. Their insights were invaluable in providing real-world evidence on how formative assessments were implemented and how these practices influenced student motivation and learning progress. Academic teachers were involved due to their roles in maintaining academic records, which allowed the researcher access to students` progressive academic reports and teachers` formative assessment materials such as schemes of work, syllabi, lesson notes and lesson plans.

The study utilized a combination of purposive sampling, cluster sampling, and simple random sampling techniques. Purposive sampling was employed to select the schools, mathematics teachers and academic teachers who participated in the study. Cluster sampling was used to select Form III streams within the schools in case multiple streams existed. Simple random sampling was then applied to choose students from these streams to participate in the study. Data were collected using questionnaires and documentary reviews, the use of more than one method helps in enhancing the reliability of the research findings (Cresswell, 2012).

Quantitative data were analysed using the Statistical Package for the Social Sciences (SPSS) version 20.0, applying descriptive statistics such as frequencies, percentages, and mean values to present the findings in tabular form. Qualitative data were analysed thematically, identifying key themes that emerged from the respondents` responses.

Ethical considerations were strictly adhered throughout the study. Informed consent was obtained from all participants, ensuring they were aware of the study`s purpose and their right to withdraw at any time without penalty. Confidentiality was maintained by anonymizing participants` identities and handling data with care. The study also ensured that all research activities were conducted in accordance all ethical guidelines and regulations.

4.0 Results

4.1 Frequently Used Formative Assessment Methods and Motivation to Learn Mathematics

To analyze this objective, frequencies and means for each item were computed as per Table 4.1.

Table 4.1 Frequently Used Formative Assessment Methods and Motivation to Learn Mathematics

Description	SD	D	N	A	SA	Mean
	Number of observations					
How much do you agree that formative assessment activities in mathematics class help you understand the topics better?	5	6	11	22	28	**3.86**
I am motivated to participate in formative assessment activities in mathematics class.	8	3	15	25	21	**3.67**
To what extent do you agree that formative assessment activities in mathematics class contribute to your overall understanding of the subject?	8	4	13	24	23	**3.69**
Do you value the feedback you receive during formative assessment activities in mathematics class?	2	4	12	26	28	**4.03**
How much do you agree on how formative assessment activities in mathematics class boost your confidence in your mathematical abilities?	16	13	12	20	11	**2.96**
Do you believe formative assessment activities help you identify areas where you need improvement in mathematics?	2	4	1	31	34	**4.26**
Do you enjoy participating in formative assessment activities in mathematics class?	10	7	13	28	14	**3.40**
I believe formative assessment activities prepare me for summative assessments in mathematics?	2	3	8	20	39	**4.26**
How much do you think formative assessment activities in mathematics class contribute to your overall motivation to learn the subject?	13	9	16	23	11	**3.14**

Source: Field Data July, 2024

The results in table 4.1 shows that the *statement "How much do you agree that formative assessment activities in mathematics class help you understand the topics better"?* had a mean score (M = 3.86). This implies that, students generally agreed that formative assessment activities contribute to a better understanding of the topics in mathematics subject suggesting that these activities are perceived to be effective tools for understanding mathematical topics.

Also, another statement that stated that *"I am motivated to participate in formative assessment activities in mathematics class"?* Had a mean score (M = 3.67) which implied that students were to a certain degree motivated to engage in formative assessment activities. While this score indicates a positive feeling, it also suggests readiness of students to participate in a class of formative assessment.

The statement that asked that "*To what extent do you agree that formative assessment activities in mathematics class contribute to your overall understanding of the subject"?* had a mean of (M = 3.69) this shows that formative assessment activities are viewed as contributing positively to students' general understanding of mathematics, aligning with the idea that these activities support learning.

Another statement that stated that *"Do you value the feedback you receive during formative assessment activities in mathematics class"?* had a mean score (M = 4.03), which indicates that students highly value the feedback they receive during formative assessments. This shows that feedback is a significant and appreciated part in the assessment process.

Also, the statement on *"How much do you agree on how formative assessment activities in mathematics class boost your confidence in your mathematical abilities"?* had a mean score (M= 2.96), results show that students were neutral about the impact of formative assessments on their confidence in their mathematics subject. This suggests that formative assessment did not significantly influence confidence as students were in the middle to agree with the construct.

The statement on *"Do you believe formative assessment activities help you identify areas where you need improvement in mathematics"?* had a mean score (M=4.26) which implies that students strongly believe that formative assessments are effective in identifying areas where they need improvement. This shows that formative assessment is valued for its benefits to diagnose areas that need improvements for learning.

Also, the statement that stated that *"Do you enjoy participating in formative assessment activities in mathematics class"?* had a mean score (M = 3.40). This signifies that student have a neutral to slightly positive view regarding their enjoyment towards formative assessment activities. This indicates that while they see the value, their enjoyment level is moderate.

The statement that stated that *"I believe formative assessment activities prepare me for summative assessments in mathematics"? had the highest mean score* (M = 4.26), these results show that students strongly agree that formative assessment activities prepare them well for their summative assessments, this also align with learning on rote memorization where students need to remember and recall on what they have been taught.

Another statement stated that "*How much do you think formative assessment activities in mathematics class contribute to your overall motivation to learn the subject"?* had a mean score (M =3.14) which indicates that the impact of formative assessments on overall motivation to learn mathematics is seen as neutral. This implies that while formative assessments are beneficial in various aspects, their practices do not influence the overall motivation for students to be motivated with mathematics subject.

Table 4.1 summary suggests that formative assessment activities in mathematics are viewed positively by students, especially in terms of understanding the subject, receiving valuable feedback and identifying areas that need improvements. Students find these activities beneficial for preparing for summative assessments. However, there is less agreement on the role of formative assessments in boosting confidence and overall motivation to learn mathematics. Thus, influencing enjoyment and confidence could more improve the effectiveness of formative assessments in motivating students learning mathematics subject.

Apart from closed-ended questionnaire items, there were two open-ended questionnaires. This part had item number two and number three. Item number two was aimed to know whether students have interest with the formative assessment methods conducted in their mathematics class as well as how those methods impacted their motivation to learn mathematics subject. The first part of the item two stated that "*How do you feel about the formative assessment methods used in your mathematics class"?* The results showed that more than half of the students 38 (52.8%) have a negative perception of the formative assessment methods used in their mathematics class, while 34 (47.2%) have a positive perception. This indicates a nearly even split in opinions, suggesting that over a half of students have a negative view of current assessment methods in mathematics.

The second part of the same item stated that, "*How do these methods impact your motivation to learn mathematics"?* the results comprised three main themes in which only 34 respondents responded. 17 (50%) replied that they feel better on quizzes which help to provide regular feedback, 8 (23.5%) problem-solving tasks promote critical thinking and engagement while 14 (41.2%) said that classroom discussion leads to motivation, engagement and deeper understanding. Results show that half of the students view that regular feedback through quizzes were beneficial for their motivation. Classroom discussions also positively impacted motivation while problem-solving tasks was less impactful. This suggests that quizzes and discussions are more effective in fostering motivation and engagement among students.

Similarly, another item number three was aimed to understand students` beliefs about whether formative assessment methods help them to understand their strengths and weaknesses. It stated that, "do you believe that formative assessment helps you understand your strengths and weaknesses in mathematics better"? majority of respondents 62 (86.1%) of students believe that formative assessments help them understand their strengths and weaknesses in mathematics better. This high percentage indicates that formative assessment is perceived as a valuable tool for self-awareness in academic performance.
Also, part two of the same item stated that, *"How do you believe that formative assessment helps you understand your strengths and weaknesses in mathematics better"?* there were three main themes which were through immediate feedback, through active learning and through identification of misconception hence high performance. Results showed that, immediate feedback was seen as helpful by (41.7%) of the students, though a larger portion (58.3%) do not find it beneficial. Active learning is perceived positively by only 12.5% of students, suggesting it is not widely effective. Identification of misconceptions is seen as helpful by 33.8% of students, but the majority (66.2%) do not find it beneficial. This suggests that while formative assessments are generally seen as beneficial, specific methods of implementation need improvement.

Generally, most of respondents (52.8%) feel negatively about the formative assessment methods used in their mathematics class. However, a significant portion finds that these methods positively impact their motivation, particularly through quizzes and classroom discussions. Most respondents believe formative assessment helps them understand their strengths and weaknesses in mathematics, although fewer agree that this understanding is achieved through immediate feedback, active learning, or identification of misconceptions. This indicates a need for refinement in the implementation of formative assessments to make best use of/maximize their effectiveness and address students` various preferences and needs.

Students` Motivation to Learn Mathematics

This section aimed to collect information on the extent to which students were motivated in learning mathematics. Information collected through questionnaire in which both closed-ended and open-ended questionnaire were used. Information from closed-ended questionnaire were analysed and presented as per Table 4.2

Table 4.2 Students` Motivation to Learn Mathematics

Description	SD	D	N	A	SA	Mean
	Number of observations					
Do you find mathematics enjoyable?	23	11	20	16	2	**2.49**
Do you seek additional resources (extra books, online materials) to enhance your understanding of mathematical concepts?	19	16	13	18	6	**2.71**
Do you believe that your mathematical skills will be beneficial to you in the future?	19	12	16	19	6	**2.71**
Do you think it is important for teachers to create a supportive and motivating learning environment in mathematics classes?	17	16	19	11	9	**4.31**
Do you feel motivated when you receive positive feedback or recognition for your mathematical achievements?	2	1	8	23	38	**4.06**
How much do you agree that your motivation to learn mathematics is influenced by your peers` attitudes towards the subject?	4	3	8	27	30	**2.74**
How do you agree learning mathematics through more interactive methods (questioning and solving, group discussions)?	21	12	15	13	11	**2.67**
Do you persist until you find a solution when faced with a challenging mathematical problem?	17	15	13	18	9	**2.66**

Source: Field Data July, 2024

The results in Table 4.2 indicates that *"Teachers to create a supportive and motivating learning environment in mathematics classes"* was the mostly practiced aspect to motivate students learning mathematics in which majority of students agreed with the construct and had a mean score (M=4.31), followed by the statement that was asked "*Do you feel motivated when you receive positive feedback or recognition for your mathematical achievements"?* This had a mean score (M=4.06) and shows that most of students were motivated when they received positive feedback from their mathematics achievements.

The statement *"Do you find mathematics enjoyable"?* had the little reaction with mean score (M=2.49). This implies that majority of students do not enjoy studying mathematics thus they disagree with the construct which might lead to negative attitude towards mathematics, this was followed the statement "*Do you persist until you find a solution when faced with a challenging mathematical problem"?* This had a mean score (M=2.66) showing that students have little engagement with mathematics and lack interest with the subject. The statement, *"how do you agree learning mathematics through more interactive methods"*? This statement had a mean score (M=2.67) which signifies that the current interactive methods used were not effective engaging to motivate students in mathematics subject. Also, another statement, "*do you believe that your mathematical skills will be beneficial to you in the future"?* The responses were neutral means that they neither strongly agree nor strongly disagree and had a mean score (M=2.71). This indicates that students might not see clear connection between mathematical skills and their future goals or careers and they lack information on the practical applications of mathematical skills.

Table 4.2 shows that while formative assessment is beneficial, its effectiveness is limited by issues such as student engagement, teaching methods, beliefs and attitudes towards the subject of mathematics and lack of knowledge on the applicability of mathematics in their future goals.

In the same line, information collected through closed-ended questionnaire above concurred with information collected through open-ended questionnaire which had three items that is item number two, three and four. The majority of students through item number two (2) suggested that interactive methods that could be used to increase motivation in teaching mathematics would include discussion method, real world application, quizzes and tests, problem solving and differentiated instruction. a significant majority of respondents 54(75%) preferred discussion methods. This indicates that most participants valued interactive and collaborative learning where ideas and concepts could be exchanged and clarified through dialogue. Also, 26(36.1%) of respondents preferred real-world application methods, indicating a strong preference for teaching methods that connect mathematics subject concepts to real-life situations which would enhance understanding and relevance for students and thus motivating them in mathematics subject.

About 19 (26.4%) of respondents agreed on using quizzes and tests. This suggests a moderate preference, likely recognizing the role of assessments in measuring understanding and progress but perhaps not as a primary teaching method. Only 10 (13.9%) of respondents suggested problem-solving as a method. This might indicate that while problem-solving is important, it may not be seen as the most effective separate teaching strategy, or it may require more support to be effective. Also, only 6 (8.3%) supported differentiated instruction has the least suggestion. This could suggest challenges in its implementation or a perception that it is less effective, despite its potential benefits for addressing diverse learning needs. Information regarding methods of teaching, frequency and percentages are as shown as per Table 4.2.1.

Table 4.2.1: Suggested Methods of Teaching, Frequency and Percent

Suggested method of teaching	Frequency	Percent
Discussion	54	75.0
Problem solving	10	13.88
Quizzes and tests	19	26.38
Differentiated instruction	6	08.3
Real world application	26	36.11

Source: Field Data July, 2024

Generally, Table 4.2.1 above implies that while various methods have varying magnitude of agreement, discussion-based teaching is particularly valued, because of its interactive and engaging nature. Real-world applications assessments also play significant role, but differentiated instruction and problem-solving might need more support to gain wider acceptance and therefore, traditional methods of teaching are discouraged.

Another item number two from open-ended questionnaire that stated that, "*How do you feel about the relevance of mathematics to your future goals or aspirations? Does this affect your motivation to learn it"?* This item had two parts, while the first part was intended to determine whether students see the relevance of mathematics in their life by responding *yes or no* the second part was aimed to know how that relevance or irrelevance affected their motivation to learn mathematics. The results were as shown in Table 4.2.2 and Table 4.2.3 respectively.

Table 4.2.2: Relevance of Mathematics

Feeling on relevance of mathematics	Frequency	%
Relevance	43	59.7
Irrelevance	29	40.3
Total	72	100

Source: Field Data July, 2024

Table 4.2.2 shows the belief on the relevance of mathematics by students. While 59.7% respondents showed mathematics was relevant but 40.3% respondents believed that mathematics was irrelevant to their future goals and aspirations. This indicates that while majority of respondents see mathematics as not significant in their future, still a significant comparable number of students see mathematics relevance in their future goals. This makes many students lack motivation due to the belief in its irrelevance.

The second part of this open-ended questionnaire, the respondents who said mathematics is relevance in their future goals had the main theme that it is due to the fact that mathematical concepts connect to the real-world application.

5.0 Discussion of Findings

5.1 Frequently used Formative Assessment Methods and Motivation to Learn Mathematics

The findings reveal that the current frequently used formative assessment methods does not motivate students to study mathematics as they are traditional based assessments. The most used methods for assessments are tests, exercises and quizzes. Students find these methods preparing them for summative assessments only rather than their future goals as well as in their

everyday life situations. This indicates that traditional formative assessment methods are prevalent but often fail to motivate students and connect their learning to real-world applications and did not encourage deeper understanding of being practical in their life.

Findings relate with Meenakumari (2017) result show that there is a positive correlation between formative and exam results which indicates that a student scored high in weekly exams has a possibility of getting high marks in their final exams. The study findings found that ongoing formative assessment and provision of feedback serve as bench mark for students to improve their learning, which promotes deeper understanding of subjects and performs better in academics.

Findings concur with McCallum and Milner (2021) revealed that students who effectively engage in formative assessment activities experience a clearer understanding of the subject and receive valuable feedback. These findings align with the current study that formative assessments help students prepare better for summative assessments, Heritage (2010). However, the study also notes that despite these benefits, students` confidence and motivation to learn mathematics are less influenced by these assessments.

Findings relates with Ku and Lee (2023) found that while formative assessments are generally perceived negatively by students, those incorporating interactive elements like peer assessment and discussions were associated with increased motivation and engagement. This aligns with study findings where discussions positively impacted student motivation, suggesting that interactive elements can enhance the effectiveness of formative assessments in mathematics.

Similarly, Rached and Grangeat (2024) align with observation that quizzes and classroom discussions are viewed positively by students. This study found that formative assessments, particularly quizzes and peer discussions, positively impact students' motivation and engagement. This implies that to maximize achievement in mathematics, formative assessments methods which are engaging in nature need to be used in teaching and learning mathematics.

Further findings reveal that there is less agreement on the role of the current formative assessments in boosting confidence and overall motivation to learn mathematics however, if effectively used and various methods are integrated in mathematics class, these methods were perceived positively by students especially in terms of understanding the subject, receiving valuable feedback and identifying areas that needs improvement. Students find these activities beneficial for preparing for examinations as well as boosting confidence and overall motivation to learn mathematics.

Findings are supported by Yang (2024) highlighted that while formative assessments are beneficial for identifying misconceptions and controlling instructional adjustments, students often feel that current methods do not fully address their individual learning needs. This relates to this study findings that there is a need for refinement in formative assessment practices to better accommodate diverse student preferences and enhance overall effectiveness.

In the same line Jones and Patel (2022) highlight that formative assessments help students identify their strengths and weaknesses, but emphasizes that immediate feedback is vital for this understanding.

Similarly, Lee and Park (2023) pinpoint that formative assessment activities are positively perceived by students, particularly on how they aid in identifying areas for improvement. The study also discusses the limited impact of formative assessments on boosting students' overall confidence and motivation in mathematics, reflecting the broader concerns about the efficiency of formative assessment methods when ineffectively implemented.

Williams and Davis (2024) find that formative assessments are valuable for student feedback and understanding but do not significantly enhance students' confidence or motivation. This corresponds with the finding that while formative assessments are effective in helping students prepare for summative assessments, their role in increasing confidence and motivation remains unclear. This reflects the challenges faced when teachers lack training in effective formative assessment methods.

Storai and Salvadori (2023) indicates that formative assessments help students identify their strengths and weaknesses, but the effectiveness of immediate feedback in this process varies among students. This correlates with results that students generally recognize their strengths and weaknesses through formative assessments, though the role of immediate feedback and active learning in this process was less universally agreed upon.

Majority of respondents feel negatively about the formative assessment methods used in their mathematics class. However, a significant portion finds that these methods positively impact their motivation, particularly through quizzes and classroom discussions. Most students believe formative assessment helps them understand their strengths and weaknesses in mathematics, although fewer agree that this understanding is achieved through immediate feedback, active learning, or identification of misconceptions. This indicates a need for modification in the implementation of formative assessments to make best use of their effectiveness and address students` various preferences and needs.

5.2 The Extent to which Students are Motivated to Learn Mathematics

Findings indicates that most of students (60%) were not motivated in learning mathematics. While formative assessment was believed to be beneficial, its effectiveness was limited by issues such as lack of student engagement and teaching methods. This in turn hinders their achievement due to lack of motivation which is considered to foster understanding of mathematical concepts.

Black and Wiliam (2011) study emphasizes that formative assessment can improve student outcomes, but its effectiveness is often hindered by poor student engagement and ineffective teaching methods. This aligns with findings on student motivation, as lack of engagement and inadequate instructional approaches can weaken motivation and make formative assessments less impactful in enhancing students` interest in mathematics. Also, Sanga (2016) comment that teachers are always caught in inactive teaching.

Findings by Linnenbrink-Garcia, Patall and Pekrun (2016) aligns with the findings of the current study as they found that students' motivational decline in mathematics was linked to negative classroom experiences and a lack of meaningful engagement. Their findings connect with the broader issue of motivation by underlining how a positive and engaging learning environment can foster greater motivation in mathematics.
Moreover, findings revealed that the best methods that can motivate students in learning mathematics methods are interactive and engaging methods such as discussion-based teaching which is particularly valued by students, because of its interactive and engaging nature. Teachers should also show real-world applications of mathematics, use differentiated instruction to meet individual need as well as problem-solving methods to build wider acceptance of mathematics concepts and therefore, traditional methods of teaching should be discouraged.

The study conducted by Liu and Carless (2023) concurs with the findings of this study where they revealed that interactive methods can significantly improve students` motivation. This relates to motivation issues, as teachers' interest and positive beliefs about using varieties of formative assessment methods and techniques in mathematics can significantly influence students` motivation and perceptions, affecting how they respond to formative assessments and engage with the subject.

Further findings reveal that majority of students see mathematics as irrelevant in their future. Their poor beliefs, negative attitudes and lack of commitments towards mathematics impact negatively in their achievements. This indicates a lack of contextual learning opportunities that demonstrate the value of the subjects in everyday life. This makes them lack motivation due to the belief in its irrelevance. Students lack knowledge on the applicability of mathematics in their future goals.

Sadler (1989) work reveals that students' understanding of the relevance of mathematics to their future goals plays a vital role in their motivation. This finding connects with issues in formative assessment by underscoring that without a clear connection between mathematical concepts and real-life applications, students may remain unmotivated, limiting the effectiveness of formative assessments in fostering a deeper interest in mathematics.

In the same line, Mujtaba and Reiss (2021) found that both high and low-achieving students normally view mathematics as boring and irrelevant subject, suggesting that traditional teaching methods fail to engage students effectively. Many students find mathematics unconnected to real-world applications, emphasizing the need for pedagogical strategies that highlight practical relevance.

Findings indicates that majority of students (60%) were not motivated in learning mathematics. While formative assessment was believed to be beneficial, its effectiveness was limited by issues such as lack of student engagement and teaching methods. This in turn hinders their achievement due to lack of motivation which is considered to foster understanding of mathematical concepts.

6.0 Conclusion and Recommendations

Based on the findings the results reveal that, formative assessment within mathematics education experiences underutilization of diverse, interactive and engaging methods leading to low student motivation in learning the subject. While formative assessment is seen as valuable for guiding learning and improving student engagement, teachers tend to rely heavily on traditional methods like quizzes and exercises which limits effectiveness of formative assessment and motivation. Thus, Students express dissatisfaction with current practices and believe that mathematics is irrelevant subject highlighting a need for more advanced and interactive assessment approaches to better motivate students and enhance their understanding and outcomes. The study recommended for teachers' professional development.

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