

Perception of Secondary School Students on Usefulness, Ease-of-Use, and Attitude towards Formative Assessment Tools for Learning Mathematics in Ilorin, Nigeria

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Abstract

Persistent underperformance in mathematics among Nigerian secondary school students necessitates a critical examination of pedagogical and assessment practices that can enhance learning outcome. This study investigated secondary school students' perceptions of the usefulness, ease-of-use, and attitude towards formative assessment tools for learning mathematics grounded in the Technology Acceptance Model (TAM). The scope of the paper focuses on students' perceptions of formative assessment tools in mathematics and how these reflect the realities of formative assessment practices in mathematics curriculum as applied to the teaching and learning of mathematics. The study employed a descriptive survey design with sample of 150 secondary school students selected through purposive sampling technique. Data were collected using a structured questionnaire comprising three sub-scales: perceived usefulness (10 items, $\alpha = 0.82$), perceived ease-of-use (10 items, $\alpha = 0.79$), and attitude (10 items, $\alpha = 0.85$), with an overall reliability coefficient of $\alpha=0.82$. The findings revealed that students held positive perceptions of the usefulness of formative assessment tools (mean = 3.44, SD = 0.59), indicating they enhance understanding and performance in mathematics. Students also perceived the tools as easy to use (mean = 3.42, SD = 0.58), suggesting accessibility and user-friendliness. Consequently, students displayed a strong positive attitude (mean = 3.46, SD= 0.61) toward using formative assessment tools. Furthermore, independent t-test analyses revealed no statistically significant gender differences in perceived usefulness ($t = 1.37$, $p = 0.17 > 0.05$) or perceived ease-of-use ($t = 0.84$, $p = 0.40 > 0.05$). Effective use of formative assessment tools in mathematics instruction is well accepted by secondary school students. The study highlights gender-inclusive mechanisms for supporting mathematics learning. It recommends that teachers integrate formative assessment

tools more frequently, schools provide continuous support and training, and curriculum developers promote gender-inclusive strategies in assessment design.

Keywords: Formative Assessment, Perceived Usefulness, Perceived Ease-of-Use, Student Attitude, Mathematics Learning,

INTRODUCTION

Mathematics remains a cornerstone of the Nigerian secondary school curriculum, serving as both a compulsory subject and a critical determinant of future educational and career opportunities. However, student performance in mathematics continues to be a source of concern, with national examinations consistently revealing widespread underachievement. Reports from the West African Examinations Council (WAEC) revealed that failure rates in mathematics stood at 53% in 2020, 57% in 2021, and 48% in 2022, underscoring the depth of the problem (Mawak & Odulum, 2024). Scholars have attributed this persistent underachievement to various factors, including negative attitudes towards mathematics, mathematics anxiety, the abstract nature of concepts, ineffective teaching strategies, inadequately qualified teachers, lack of teaching materials, and overcrowded classrooms (Adegunju & Taiwo, 2023; Musa & Aremu, 2021).

While numerous interventions have targeted instructional improvement, the role of assessment practices, particularly formative assessment, has gained increasing attention as a strategy capable of addressing these persistent learning challenges. Formative assessment, often described as "assessment for learning," is a dynamic and ongoing process through which educators gather evidence of student understanding during instruction to enable timely adaptations in teaching and learning (Black & Wiliam, 2009). Unlike summative assessment, which evaluates learning after instruction, formative assessment emphasizes continuous feedback, diagnosis of learning gaps, scaffolding, and active student engagement with mathematical concepts, all of which contribute to improved achievement (Olufemi, 2022). Tools such as quizzes, peer-assessments, self-checklists, and digital platforms are increasingly leveraged to boost students' engagement, motivation, and achievement in mathematics (Oyekunle et al., 2024).

However, the successful adoption of formative assessment is heavily dependent on students' perceptions, namely their views on the usefulness and ease of use of these tools, as well as their

overall attitudes towards them. These constructs are at the heart of the Technology Acceptance Model (TAM), which posits that perceived usefulness and perceived ease of use predict attitudes and behavioural intentions toward technology adoption (Davis, 1989). In mathematics learning, when students perceive formative assessment tools as beneficial for concept clarity, practice, or performance improvement, positive attitudes and engagement tend to follow. Conversely, perceptions that tools are cumbersome or irrelevant may result in avoidance.

In the Sub-Saharan African context, several empirical studies highlight this dynamic. In Kenya, secondary students reported positive perceptions of scaffolding, but overall formative practices were underutilized in favour of traditional summative assessments (Wafubwa & Ochieng, 2023). In Tanzania, secondary students' perceptions of feedback delivery and scaffolding positively predicted their feedback use, which in turn positively influenced their mathematics performance (Kyaruzi et al., 2019). Within Nigeria, Asimiyu (2020) demonstrated that formative assessment significantly improved students' achievement in Oyo State schools, with no gender differences observed in outcomes.

Theoretical Review: Technology Acceptance Model (TAM)

This study is anchored on the Technology Acceptance Model (TAM), first introduced by Davis (1989), which posits that the adoption and effective use of a technological tool are determined primarily by two key factors: perceived usefulness and perceived ease-of-use. Perceived usefulness refers to the degree to which individuals believe that using a particular tool will enhance their performance, while perceived ease-of-use denotes the extent to which they believe the tool will be free of effort (Venkatesh & Davis, 2000). Both constructs directly influence users' attitudes and behavioural intentions, which in turn shape actual usage.

TAM has been widely applied in educational research to examine students' perceptions of digital learning and assessment technologies. In mathematics education, it provides a framework for analysing how students' perceptions of formative assessment tools influence their learning experiences. Within the scope of this study, TAM provides a robust theoretical framework to investigate secondary school students' perceptions of formative assessment tools in mathematics. By examining the constructs of perceived usefulness, ease-of-use, and attitude, TAM helps to explain how these perceptions influence students' acceptance, participation, and overall learning outcomes.

Concept of Formative Assessment in Mathematics Education

Formative assessment refers to a range of evaluative processes employed during instruction to provide feedback that enhances teaching and learning. Unlike summative assessment, which measures achievement at the end of instruction, formative assessment focuses on monitoring student progress and guiding improvement while learning is ongoing (Black & Wiliam, 1998). Mathematics, as a subject that builds sequentially on prior knowledge, requires continuous feedback for effective learning. Formative assessment tools such as quizzes, assignments, peer evaluation, and oral questioning help teachers gauge students' understanding in real time (Brookhart, 2013). Studies have shown that consistent use of formative assessment improves students' engagement and motivation, as they see immediate connections between effort, feedback, and performance (Kyaruzi et al., 2019).

The benefits of formative assessment extend beyond cognitive gains to include affective and behavioural improvements. When properly implemented, formative assessment enhances self-regulated learning, encourages positive attitudes toward mathematics, and reduces mathematics anxiety (Rahaman, 2024). In contexts such as Nigeria and Ghana, research has shown that formative practices are critical for bridging learning gaps and improving mathematics performance in secondary schools (Oladejo & Yusuf, 2016; Abdul Rahaman, 2024).

Perceived Usefulness of Formative Assessment Tools

Perceived usefulness, as defined within the Technology Acceptance Model, refers to students' beliefs that formative assessment tools enhance their learning and performance in mathematics. Research has shown that when students view formative assessment practices as useful, they are more likely to participate actively in learning tasks and apply feedback effectively. Kyaruzi et al. (2019) demonstrated that secondary school students in Tanzania who perceive teacher feedback and formative assessment practices as effective are more inclined to use feedback constructively, which positively influences their mathematics performance. In Nigerian secondary schools, Olatunji and Adebayo (2022) found that students' positive perception of formative assessment was linked to improved problem-solving abilities and stronger performance in mathematics. More recent studies by Oyinloye, Awofala, and Olaniyi (2025) confirm that students who perceive formative feedback as useful demonstrate higher achievement and more positive attitudes toward mathematics.

Perceived Ease-of-Use of Formative Assessment Tools

Perceived ease-of-use refers to the degree to which students find formative assessment tools simple, clear, and convenient to use during mathematics learning. A learning tool that is perceived as easy to use reduces cognitive overload, allowing learners to focus on understanding concepts rather than struggling with the assessment process (Davis, 1989). Studies have shown that ease-of-use directly shapes students' learning experiences by influencing their willingness to adopt formative assessment tools. In a study of Nigerian secondary schools, students reported greater participation in mathematics tasks when assessment techniques such as quizzes and feedback loops were designed to be clear and manageable (Olatunji & Adebayo, 2022). Similarly, research in Kenya highlighted that when learners found peer and self-assessment activities simple to engage with, they demonstrated higher levels of collaboration and critical reflection (Wafubwa & Ochieng, 2023).

Ease-of-use also plays a significant role in reducing mathematics anxiety and fostering positive classroom engagement. According to Rahaman (2024), learners who perceive formative feedback mechanisms as user-friendly are more likely to apply the feedback constructively and improve their performance. Conversely, overly complex or poorly structured assessments can discourage student participation and limit the effectiveness of formative practices.

Students' Attitude towards Formative Assessment Tools

Students' attitude refers to their overall disposition, feelings, and readiness positive or negative towards adopting and using educational innovations. In the context of assessment technologies, attitude reflects the extent to which learners are willing to engage with formative assessment tools, including digital platforms, quizzes, feedback systems, and peer-evaluation strategies. In mathematics education, student attitude toward assessment technologies plays a decisive role in shaping learning outcomes. Research shows that students who perceive assessment technologies as beneficial and enjoyable are more likely to demonstrate higher achievement and problem-solving skills (Ogbodo et al., 2023). Conversely, skepticism or frustration toward such tools often linked to perceived complexity or lack of feedback reduces students' interest in mathematics and limits the effectiveness of formative practices (Rahaman, 2024).

Recent studies confirm that digital formative assessment platforms positively influence attitudes by providing immediate feedback and promoting interactive learning experiences. Awofala and

Olaniyi (2021) noted that students' attitudes toward formative evaluation strategies were moderately positive, though heavily dependent on teachers' effective implementation. Poorly designed or inconsistently applied assessment tools can generate negative attitudes, leading students to perceive assessments as punitive rather than supportive. This underscores the need for teachers to carefully integrate formative assessment tools in ways that are meaningful and student-centred. Kültür and Kutlu (2021) further demonstrated that formative assessment significantly improves both mathematics achievement and attitudes when implemented consistently.

Gender and Formative Assessment Perceptions

Research on gender differences in perceptions of formative assessment tools has yielded mixed findings. Some studies suggest that gender may influence how students engage with different assessment formats. For instance, Adeyemi (2020) reported that male students generally favour objective and problem-solving tests, whereas female students often prefer descriptive or essay-type formats. However, other studies have found no significant gender differences in perceptions of formative assessment practices. Asimiyu (2020) demonstrated that formative assessment significantly improved students' achievement in Oyo State schools, with no gender differences observed in outcomes. Similarly, Lema and Kissima (2024) found that peer and self-assessment practices were equally effective for male and female students in Tanzanian secondary schools.

The Technology Acceptance Model does not inherently posit gender as a moderating variable, suggesting that perceptions of usefulness and ease-of-use should theoretically be similar across genders when tools are well-designed and implemented. However, contextual factors such as cultural norms, differential access to technology, and variations in classroom experiences may create gender-based differences in specific settings. This underscores the importance of examining gender as a variable in the Ilorin context to determine whether formative assessment tools are equally accepted and perceived as useful and easy to use by both male and female students. Zhou and Liu (2025), in a systematic review, noted that while most studies find no gender differences in formative assessment perceptions, context-specific factors warrant continued investigation.

Research Gap and Contribution of the Study

Although existing Nigerian studies like (Asimiyu, 2020; Olatunji & Adebayo, 2022; Awofala & Olaniyi, 2021) have consistently shown that formative assessment enhances students' mathematics achievement, their emphasis has largely been on learning outcomes, instructional effectiveness,

and teachers' classroom assessment practices. Consequently, limited attention has been given to how students perceive and accept the formative assessment tools used during instruction. Likewise, studies from other educational contexts, including Tanzania (Kyaruzi et al., 2019), Kenya (Wafubwa & Ochieng, 2023), Ghana (Rahaman, 2024), and Turkey (Kültür & Kutlu, 2021), have predominantly explored issues such as formative feedback, classroom implementation, and the influence of formative assessment on students' achievement and attitudes. Despite these valuable contributions, there remains a notable gap in understanding the factors that influence students' acceptance of formative assessment tools. Specifically, empirical evidence integrating the core constructs of the Technology Acceptance Model (TAM); perceived usefulness, perceived ease of use and students' attitudes within the context of Nigerian secondary school mathematics education remains scarce. Addressing this gap, the present study investigates students' acceptance of formative assessment tools through the TAM framework, thereby extending existing knowledge beyond achievement-focused research and providing evidence to support the effective integration of formative assessment practices in Nigerian mathematics classrooms.

Also, previous studies have shown that formative assessment can improve students' academic achievement, they have paid relatively little attention to the factors that determine students' acceptance and sustained use of formative assessment practices. Specifically, there is limited empirical evidence on how secondary school students perceive the usefulness and ease of use of formative assessment tools, as well as how these perceptions influence their attitudes toward such practices. In addition, gender-based differences in students' acceptance of formative assessment tools remain insufficiently explored within the Nigerian secondary school context. To address these gaps, the present study adopts the Technology Acceptance Model (TAM) as its theoretical framework to investigate secondary school students' acceptance of formative assessment tools in mathematics classrooms in Ilorin metropolis. The study examines three key dimensions of technology acceptance-perceived usefulness, perceived ease of use, and attitude toward use while also exploring whether these perceptions differ by gender. By shifting the focus from the effectiveness of formative assessment to students' acceptance of the tools themselves, this study provides fresh empirical evidence from the Nigerian educational context. The findings are expected to enrich the existing body of knowledge on technology-supported formative assessment

and offer practical insights that can inform instructional practices, curriculum development, and educational policy aimed at promoting effective classroom assessment.

Despite these findings, there remains a notable research gap: limited studies directly examine secondary students' perceptions of the usefulness, ease of use, and attitudes toward formative assessment tools in mathematics within the Nigerian context, particularly in Ilorin metropolis. Such insights are vital; understanding students' perception profiles can empower educators and policymakers to refine formative strategies, tailor tools to student preferences, and ultimately improve learning outcomes.

The study was guided by the following questions:

- 1) What is the perception of secondary school students on the usefulness of formative assessment tools for learning mathematics?
- 2) What is the perception of secondary school students on the ease of use of formative assessment tools for learning mathematics?
- 3) What is the attitude of secondary school students towards formative assessment tools in learning mathematics?

The following Research Hypotheses were tested

H0₁: There is no significant difference in the perceived usefulness of formative assessment tools for learning mathematics among secondary school students based on gender.

H0₂: There is no significant difference in the perceived ease of use of formative assessment tools for learning mathematics among secondary school students based on gender.

H0₃: There is no significant difference in the attitude towards formative assessment tools for learning mathematics among secondary school students based on gender.

Methodology

This study adopted a descriptive survey research design with a quantitative approach to systematically investigate secondary school students' perceptions of the usefulness, ease-of-use, and attitude towards formative assessment tools for learning mathematics in Ilorin metropolis, Nigeria. The population comprised all secondary school students in Ilorin metropolis, Kwara State, numbering approximately 42,195 students according to the Kwara State Ministry of Education (2023). A purposive sampling technique was employed to select 150 respondents based on specific criteria: schools that regularly implement formative assessment practices in mathematics

instruction, students with at least one year of experience using formative assessment tools, and students willing to participate.

Purposive sampling was considered more appropriate than probability sampling because the study specifically required respondents who had sufficient experience using formative assessment tools in mathematics classrooms. Selecting schools that had already implemented formative assessment practices ensured that participants possessed adequate knowledge and practical exposure to evaluate the usefulness, ease-of-use, and attitudes toward such tools. A probability sampling approach could have included students with little or no exposure to formative assessment, thereby limiting the validity of their responses. However, because participants were intentionally selected from schools already implementing formative assessment, the findings should be generalized cautiously. The results are most applicable to similar secondary schools with established formative assessment practices and may not fully represent schools where such assessment strategies are rarely used.

The sample consisted of 78 males (52.0%) and 72 females (48.0%), providing a balanced gender distribution for meaningful comparative analysis. The research instrument was a structured questionnaire developed by the researchers based on the Technology Acceptance Model and relevant literature. The questionnaire items were adapted from previously validated Technology Acceptance Model (TAM) instruments developed by Davis (1989) and Venkatesh and Davis (2000), particularly the constructs measuring perceived usefulness and perceived ease-of-use. Additional attitude-related items were adapted from mathematics education and formative assessment literature (Black & Wiliam, 1998; Brookhart, 2013; Kyaruzi et al., 2019) and subsequently modified to reflect the context of formative assessment tools in secondary school mathematics. The adapted items were reviewed by experts to ensure content relevance, clarity, and contextual suitability for Nigerian secondary school students.

The questionnaire comprised four sections; Section A captured demographic information (gender), Section B contained 10 items measuring perceived usefulness, Section C contained 10 items measuring perceived ease-of-use, and Section D contained 10 items measuring attitude toward formative assessment tools, including two negative words items to reduce response bias. Items were rated on a four-point Likert scale with Strongly Agree = 4, Agree =3, Disagree =2, and Strongly Disagree =1. Negatively worded items were reverse-coded during analysis to ensure

higher scores consistently indicated more positive perceptions. The instrument underwent face and content validation by two mathematics educators and one measurement and evaluation specialist whose feedback led to reworking of the three items, removal of two redundant items, and adjustment of item sequence. Reliability was established through a pilot study with 30 students from non-participating schools, yielding Cronbach's alpha coefficients of 0.82 for perceived usefulness, 0.79 for perceived ease-of-use, 0.85 for attitude, and 0.82 for the overall instrument. Data collection was conducted with permission obtained from school principals and the instrument was administered during regular class periods with trained assistants and completed instruments were collected immediately to ensure high return rate. Data were analysed using both descriptive and inferential statistics. Descriptive statistics (means and standard deviations) were used to answer the three research questions, with mean scores interpreted using the following decision rule: 3.50-4.00 = Very Positive, 2.50-3.49 = Positive, 1.50-2.49 = Moderate, and 1.00-1.49 = Negative. Inferential statistics (independent samples t-tests) was employed to test the three research hypotheses at 0.05 significance level, comparing male and female students' mean scores on perceived usefulness, perceived ease-of-use, and attitude toward learning of mathematics.

Results and Discussion

Table 1 shows that of the 150 students who participated in the study, 78 (52.0%) were male and 72 (48.0%) were female. This near-parity suggests that the findings are unlikely to be heavily biased by gender, and that both male and female students' opinions about formative assessment tools are well represented.

Table 1: Distribution of Respondents by Gender

Gender	Frequency (f)	Percentage (%)
Male	78	52.0
Female	72	48.0
Total	150	100.0

Research Question One: Students' Perceived Usefulness of Formative Assessment Tools

Table 2: Students' Perception of the Usefulness of Formative Assessment Tools

S/N	Statement	Mean	SD
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1	Formative assessment tools help me to understand mathematics concepts better.	3.42	0.58
2	Using formative assessment tools improves my performance in mathematics.	3.45	0.57
3	Formative assessment tools help me identify my strengths and weaknesses in mathematics.	3.41	0.60
4	Regular feedback from formative assessments helps me learn mathematics effectively.	3.44	0.59
5	Formative assessment tools make learning mathematics more engaging.	3.48	0.56
6	The use of formative assessment tools enhances my problem-solving skills in mathematics.	3.43	0.58
7	I am able to retain mathematical concepts longer when formative assessments are used.	3.44	0.60
8	Formative assessment tools encourage me to study mathematics more regularly.	3.46	0.57
9	Continuous assessment through formative tools helps me prepare better for examinations.	3.42	0.61
10	Formative assessment tools make learning mathematics more meaningful and relevant.	3.43	0.59
Overall		3.44	0.59

Table 2 presents students' perception of the usefulness of formative assessment tools for learning mathematics. Item means ranged from 3.41 to 3.48, with an overall mean of 3.44 (SD = 0.59). According to the decision rule (2.50-3.49 = Positive), this overall mean indicates that students in Ilorin metropolis have a positive perception of the usefulness of formative assessment tools. The data indicate that students agree that formative assessment tools contribute positively to understanding mathematical concepts, improving performance, enhancing retention, and encouraging continuous study habits.

Research Question Two: Students' Perceived Ease-of-Use of Formative Assessment Tools

Table 3: Students' Perception of the Ease of Use of Formative Assessment Tools

S/N	Statement	Mean	SD
1	It is easy for me to access formative assessment tools used in mathematics class.	3.43	0.58
2	I can use formative assessment tools without much assistance.	3.40	0.61
3	Instructions for using formative assessment tools are clear and easy to follow.	3.42	0.59
4	The design of formative assessment tools makes them simple to use.	3.44	0.57
5	I can complete online or paper-based formative assessments without difficulty.	3.43	0.60
6	Using formative assessment tools does not take too much time during lessons.	3.45	0.56
7	I find it convenient to submit responses through formative assessment platforms.	3.41	0.62
8	I rarely encounter technical problems while using formative assessment tools.	3.42	0.60
9	The teacher provides enough guidance on how to use formative assessment tools.	3.40	0.63
10	I find formative assessment tools user-friendly and easy to navigate.	3.42	0.59
Overall		3.42	0.58

Table 3 presents students' perception of the ease of use of formative assessment tools. Item means ranged from 3.40 to 3.45, with an overall mean of 3.42 (SD = 0.58). According to the decision rule (2.50-3.49 = Positive), this overall mean indicates that secondary school students in Ilorin metropolis positively perceive formative assessment tools as easy to use in learning mathematics. Students find the tools accessible, user-friendly, and manageable with minimal difficulty, suggesting that they encounter few challenges in using formative assessment tools.

Research Question Three: Students' attitude towards formative assessment tools

Table 4: Students' Attitude Toward the Use of Formative Assessment Tools

S/N	Statement	Mean	SD
1	I enjoy using formative assessment tools in learning mathematics.	3.45	0.58
2	Formative assessment tools make mathematics lessons more interesting.	3.44	0.60
3	I feel confident when using formative assessment tools in mathematics.	3.43	0.59
4	I am motivated to participate more in class when formative assessments are used.	3.42	0.61
5	I prefer teachers who use formative assessment tools in teaching mathematics.	3.44	0.58
*6	I find formative assessment tools stressful and discouraging.	3.47	0.57
7	I believe formative assessment tools can improve my overall attitude toward mathematics.	3.45	0.59
8	I am always eager to take part in formative assessment activities in mathematics.	3.43	0.60
*9	I feel anxious when formative assessment tools are used in mathematics class.	3.46	0.58
10	I have a positive attitude toward the use of formative assessment tools in mathematics learning.	3.48	0.56
Overall		3.46	0.61

Table 4 presents students' attitude toward the use of formative assessment tools. Item means ranged from 3.42 to 3.48, with an overall mean of 3.46 (SD = 0.61). According to the decision rule (2.50-3.49 = Positive), this overall mean indicates that secondary school students in Ilorin metropolis have a positive attitude toward the use of formative assessment tools in learning mathematics. Students enjoy using formative assessment tools, find them engaging, and believe that these tools enhance their motivation, confidence, and understanding of mathematical concepts. The reverse-

coded items (6 and 9) show means of 3.47 and 3.46 respectively, confirming that students generally disagree with negative statements about formative assessment tools.

Table Note

Note: * mean reverse coded

Items 6 (“I find formative assessment tools stressful and discouraging”) and 9 (“I feel anxious when formative assessment tools are used in mathematics class”) are negatively worded items and were reverse-coded during data analysis. Higher mean scores therefore indicate more positive attitudes toward formative assessment tools.

Hypothesis Testing

H0₁: There is no significant difference in the perceived usefulness of formative assessment tools for learning mathematics among secondary school students in Ilorin metropolis based on gender.

Table 5: Independent t-test Analysis of Perceived Usefulness Based on Gender

Gender	N	Mean	SD	Df	t-cal	p-value	Remark
Male	78	3.46	0.58	148	1.37	0.17	Not Significant
Female	72	3.42	0.60				

Table 5 presents the independent t-test analysis of students' perceived usefulness based on gender. Male students had a mean score of 3.46 (SD = 0.58), while female students had a mean score of 3.42 (SD = 0.60). The calculated t-value (t-cal = 1.37) with 148 degrees of freedom has a corresponding p-value of 0.17, which is greater than the 0.05 level of significance. This indicates that there is no statistically significant difference in the perceived usefulness of formative assessment tools between male and female students. Therefore, the null hypothesis (H₀₁) is retained.

H0₂: There is no significant difference in the perceived ease of use of formative assessment tools for learning mathematics among secondary school students in Ilorin metropolis based on gender.

Table 6: Independent t-test Analysis of Perceived Ease of Use Based on Gender

Gender	N	Mean	SD	Df	t-cal	p-value	Remark
Male	78	3.44	0.57	148	0.84	0.40	Not Significant
Female	72	3.40	0.59				

Table 6 presents the independent t-test analysis of students' perceived ease of use based on gender. Male students had a mean score of 3.44 (SD = 0.57), while female students had a mean score of 3.40 (SD = 0.59). The calculated t-value ($t_{\text{cal}} = 0.84$) with 148 degrees of freedom has a p-value of 0.40, which is greater than the 0.05 level of significance. This indicates that there is no statistically significant difference in the perceived ease of use of formative assessment tools between male and female students. Therefore, the null hypothesis (H_{02}) is retained.

H₀₃: There is no significant difference in the attitude towards formative assessment tools for learning mathematics among secondary school students based on gender.

Table 7: Independent t-test Analysis of Attitude Based on Gender

Gender	N	Mean	SD	Df	t-cal	p-value	Remark
Male	78	3.48	0.60	148	0.95	0.34	Not Significant
Female	72	3.44	0.62				

Table 7 presents the independent t-test analysis of students' attitudes toward formative assessment tools based on gender. Male students had a mean attitude score of 3.48 (SD = 0.60), while female students had a mean score of 3.44 (SD = 0.62). The calculated t-value ($t_{\text{cal}} = 0.95$) with 148 degrees of freedom has a p-value of 0.34, which is greater than the 0.05 level of significance. This indicates that there is no statistically significant difference in attitudes toward formative assessment tools between male and female students. Therefore, the null hypothesis (H_{03}) is retained.

Discussion

Students' Perceived Usefulness

The findings indicated that students generally regarded formative assessment tools as valuable for learning mathematics. This favourable perception is likely linked to the nature of formative assessment, which provides timely feedback, encourages learners to monitor their own progress, and offers continuous opportunities for practice and improvement. Through these processes, students are better able to recognize areas requiring further attention, address misconceptions promptly, and develop a deeper understanding of mathematical concepts. This outcome is consistent with the assumptions of the Technology Acceptance Model (Davis, 1989), which

suggests that users are more inclined to adopt and respond positively to instructional technologies when they perceive them as useful in achieving desired learning outcomes. In the present study, students' positive perceptions may therefore reflect their recognition of the instructional value of formative assessment tools in supporting meaningful learning and enhancing classroom engagement.

The finding also aligns with previous empirical evidence. Olatunji and Adebayo (2022) found that secondary school students in Nigeria perceived formative assessment practices as effective in enhancing their understanding and achievement in mathematics. Similarly, Kyaruzi et al. (2019) reported that students in Tanzania who recognized the value of formative feedback were more likely to engage with teachers' comments, use feedback to improve their learning, and subsequently demonstrate better academic performance in mathematics. The consistency of these findings across different educational settings suggests that well-implemented formative assessment can positively influence students' perceptions and learning experiences regardless of context.

Ease-of-Use

Students perceived formative assessment tools as easy to use, suggesting that the assessment practices implemented in their classrooms were clear, accessible, and manageable. This positive perception may be attributed to teachers' effective guidance and students' familiarity with formative assessment strategies such as classroom quizzes, constructive feedback, peer assessment, and self-assessment activities. As students become more accustomed to these practices, they are likely to develop greater confidence in using them as part of the learning process. This finding is consistent with the Technology Acceptance Model (TAM), which posits that perceived ease of use is a key determinant of individuals' acceptance and continued use of educational technologies and instructional innovations. When students perceive assessment activities as straightforward and uncomplicated, they are more inclined to participate actively and benefit from the feedback provided. The present result aligns with the findings of Wafubwa and Ochieng (2023), who reported that Kenyan secondary school students readily engaged in formative assessment because they considered the assessment processes simple and accessible. Similarly, Rahaman (2024) found that students demonstrated greater willingness to utilize formative feedback when the assessment procedures were perceived as clear, user-friendly, and easy to navigate.

Students' Attitude

The study further revealed that students demonstrated positive attitudes toward formative assessment tools. Their favourable attitude is likely associated with their belief that these tools improve understanding, reduce uncertainty about learning progress, and encourage active classroom participation. Since students perceived the tools as both useful and easy to use, their positive attitude is consistent with the predictions of the Technology Acceptance Model. This finding aligns with Kültür and Kutlu (2021), who reported that formative assessment positively influenced students' attitudes toward mathematics, and with Awofala and Olaniyi (2021), who found that effective implementation of formative assessment strategies enhanced students' engagement and motivation.

Gender

The absence of significant gender differences suggests that both male and female students perceived formative assessment tools similarly. This may indicate that formative assessment practices provide equitable learning opportunities regardless of gender. The finding agrees with Asimiyu (2020), who reported no significant gender differences in students' achievement following formative assessment, and Lema and Kissima (2024), who found that peer and self-assessment practices benefited male and female students equally.

Summary of Findings

- 1) Secondary school students in Ilorin metropolis have a positive perception of the usefulness of formative assessment tools for learning mathematics (mean = 3.44, SD = 0.59).
- 2) Students positively perceive formative assessment tools as easy to use in learning mathematics (mean = 3.42, SD = 0.58).
- 3) Students possess a positive attitude toward the use of formative assessment tools in mathematics learning (mean = 3.46, SD = 0.61).
- 4) There is no significant difference in students' perceived usefulness of formative assessment tools based on gender ($t = 1.37, p = 0.17 > 0.05$).
- 5) There is no significant difference in students' perceived ease of use of formative assessment tools based on gender ($t = 0.84, p = 0.40 > 0.05$).
- 6) There is no significant difference in students' attitudes toward formative assessment tools based on gender ($t = 0.95, p = 0.34 > 0.05$).

Conclusion

This study investigated secondary school students' perceptions of the usefulness, ease-of-use, and attitude towards formative assessment tools for learning mathematics in Ilorin metropolis, Nigeria. The findings reveal that students hold positive perceptions of formative assessment tools, recognizing their usefulness in enhancing mathematical understanding, improving performance, and promoting engagement. Students also find these tools easy to use, indicating that they are accessible, user-friendly, and free from unnecessary complexity. Consequently, students demonstrate a positive attitude toward formative assessment tools, enjoying their use and believing in their potential to improve mathematics learning outcomes. Crucially, the study found no significant gender differences in perceived usefulness, perceived ease of use, or attitude, suggesting that formative assessment tools are equally well-accepted by male and female students. This gender-inclusive finding underscores the potential of formative assessment strategies to serve as equitable pedagogical approaches that benefit all learners regardless of gender.

The study concludes that formative assessment tools are well-accepted by secondary school students in Ilorin, suggesting these tools are effective, gender-inclusive mechanisms for supporting mathematics learning. The findings are consistent with the Technology Acceptance Model, confirming that perceived usefulness and perceived ease of use are associated with positive attitudes toward formative assessment tools. By demonstrating that students recognize the value of these tools and find them easy to use, this study provides empirical support for continued and expanded use of formative assessment in Nigerian secondary mathematics education.

Limitations of the Study

This study offers important insights into students' perceptions of formative assessment in mathematics; however, several limitations should be acknowledged. The use of purposive sampling, involving only schools already implementing formative assessment, limits the generalizability of the findings to schools where such practices are not yet adopted. In addition, the study relied solely on self-reported questionnaire data, which may have been influenced by social desirability and other response biases. The descriptive survey design was suitable for assessing students' perceptions but does not establish causal relationships between formative assessment and learning outcomes. Furthermore, because the study was conducted only in secondary schools within Ilorin metropolis, the findings may not fully represent students in other

regions with different educational and socio-cultural contexts. Future research should employ probability sampling techniques, extend the study to broader geographical areas, incorporate mixed-methods approaches, and investigate the relationship between students' perceptions of formative assessment and their actual mathematics achievement to enhance the robustness and applicability of the findings.

Recommendations

Based on the findings of this study, the following recommendations are proposed for educators, policymakers, and curriculum developers:

- 1) Mathematics teachers should be encouraged to integrate formative assessment tools more frequently into their classroom practices. The positive student perceptions suggest that such tools enhance conceptual understanding, improve performance, and promote engagement.
- 2) Schools should provide continuous support and training to both teachers and students to sustain and improve the effective use of formative assessment tools.
- 3) Educators should design engaging and interactive formative activities that further strengthen students' motivation and participation in mathematics learning.
- 4) Both male and female students should be given equal opportunities and encouragement to use formative assessment tools in learning mathematics.
- 5) Curriculum developers and policymakers should promote gender-inclusive strategies in assessment design and ensure that formative assessment tools remain accessible and user-friendly for all students.
- 6) Future studies should employ mixed-methods designs to link students' perceptual measures to classroom implementation fidelity and actual mathematics achievement.

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