

## **Knowledge of Benefits and Challenges of AI-Based Assessment Tools in Assessing Students' Affective Domain in Mathematics Education Among Mathematics Teachers**

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### **Abstract**

This study investigated knowledge of benefits and challenges of AI-based assessment tools in assessing students' affective domain in Mathematics education among mathematics teachers in Nsukka education zone in Enugu state. Four research questions and two null hypotheses guided the study. A Descriptive survey research design was employed. The population was 165 mathematics teachers. The sample size was 115 teachers, this was determined using Krejcie and Morgan table. Data collection was done using self-structured Knowledge of AI-based assessment Tools Questionnaire (KAI-BATQ). Three experts from department of sciences education, University of Nigeria Nsukka validated the instrument. The internal consistency of the instruments was 0.78 and 0.81 for benefits and challenges respectively and overall coefficient of 0.80 using Cronbach alpha. Mean and Standard deviation were used to answer the research questions, while ANOVA was used to test the null hypotheses at 0.05 level of significant. The results revealed that Mathematics teachers had moderate knowledge of benefits and high knowledge of challenges of AI-based assessment tools in assessing students' affective domain in mathematics education. Years of teaching experience was significantly associated with knowledge of benefits and challenges of AI-based assessment tools in assessing students' affective domain among mathematics teachers. The research shows that good knowledge of benefits and challenges of AI-based assessment tools in assessing students' affective domain in mathematics education can help improve assessment of students' affective domain which would enhance students' achievement in mathematics. The study highlights the need for teacher training, support, and involvement in the development and implementation of AI-based assessment tools to ensure effective integration into mathematics education.

**Key words:** Benefits, Challenges, AI-based assessment tools, Affective domain, Mathematics Teachers

### **Introduction**

AI-based assessment tools have emerged as a promising innovation for evaluating students' learning outcomes, including their affective domain in Mathematics education. AI-based assessment tools have the potential to change the way students are assessed in mathematics education. While they have several benefits, they also have some challenges that need to be addressed. Mathematics education is a critical component of the school curriculum, and assessing students' learning outcomes in mathematics is essential for evaluating their academic achievement. The successful adoption of these tools depends on teachers' knowledge of the benefits and challenges of AI-based assessment tools in assessing students' affective domain in mathematics education. However, there is need to understanding teachers' level of

knowledge of benefits and challenges of AI-based assessment tools in assessing students' affective domain in mathematics education for effective implementation and improving student learning outcomes.

AI-based assessment tools that evaluate students' affective domain in mathematics education use machine learning algorithms, natural language processing, and sentiment analysis to assess students' emotions, attitudes, and motivations towards mathematics. The following are the features of AI-Based Assessment Tools that assess students' affective domain in mathematics education: AI-powered emotion recognition technology analyses students' emotional states through facial recognition, speech patterns, and physiological responses. AI-powered

machine learning algorithm analyses students' behavior, performance, and emotional states to provide personalized feedback and assessment. AI-based assessment tools provide real-time feedback to students, helping them to develop self-awareness, self-regulation, and relationships skills. AI-based assessment tools have the potential of providing teachers with valuable insights into students' affective domain, enabling them to tailor their teaching practices to meet the diverse needs of their students. AI-based assessment tools use Natural Language Processor to analyze student responses to open-ended questions, providing insights into their thinking and problem-solving processes (GAO, 2020).

Examples of AI-Based Assessment Tools that can be in assessing affective domain; Moodler: An AI-powered mood analysis tool that uses natural language processing (NLP) to analyze students' emotional states through their written responses (Pedro et. al 2019). EmoTract: An AI-based emotional intelligence assessment tool that uses facial recognition, speech patterns, and physiological responses to analyze students' emotional states. Affective: A machine learning-based tool that analyses students' emotional states through facial recognition, speech patterns, and physiological responses. Class craft: A game-based learning platform that uses AI to assess students' social-emotional learning (SEL) skills, including empathy, self-awareness, and self-regulation. Dream Box Learning's Social-Emotional Learning (SEL) Assessment: An AI-based assessment tool that evaluates students' SEL skills, including self-awareness, self-regulation, and relationships.

Artificial intelligence (AI) assessment systems offer significant advantages in evaluating students' affective learning domains. Evidence from the National Science Board highlights that integrating technology into classrooms enhances learner participation, improves academic performance, and narrows achievement disparities among students (National Science Board, 2016). Several specific benefits are linked to AI-driven affective assessment. For instance, natural language processing (NLP) enables the interpretation of students' written responses to reveal their emotional states (Graesser et al., 2014). Unlike traditional methods, AI-based assessments provide objective and precise evaluations of learners' social-emotional learning (SEL) competencies. By automating assessment tasks, these systems reduce teachers' workload while supplying instant feedback to students. Additionally, AI tools deliver individualized feedback

that promotes self-awareness, emotional regulation, and interpersonal skill development (Hansen et al., 2015). The data generated through such assessments also equips educators with actionable insights to design targeted interventions and supportive strategies. Furthermore, the immediate feedback facilitated by AI nurtures students' ability to recognize their weaknesses, make improvements, and cultivate a growth-oriented mindset. Regardless of these benefits, the adoption of AI-based assessment tools also raises several challenges.

Some challenges of using AI-based assessment tools in assessing students' affective domains in mathematics education exist. Kane (2016) noted validity and reliability of these assessment tools, that is the accuracy and fairness of AI-based assessment tools. AI-based assessment tools can be affected by technical issues, such as connectivity problems or software glitches. AI-based assessment tools lack human judgment and empathy, which can lead to a lack of understanding of the context and nuances of student responses. The increased use of AI-based assessment tools may alter the nature of teacher-student relationships (Selwyn, 2016). AI-based assessment tools can be biased if the algorithms used to score student responses are biased, leading to inaccurate or unfair assessments. Potential bias in AI algorithms that is AI algorithms perpetuating biases and inequalities in education (O'Neil, 2016). AI-based assessment tools are only as good as the data they are trained on, which can lead to inaccurate or unfair assessments if the data is biased or of poor quality.

However, assessment in mathematics education encompasses not only cognitive and psychomotor aspects but also affective aspects. The affective domain, encompasses students' emotions, attitudes, and motivations towards learning. It plays a crucial role in students' learning outcomes, as it influences their engagement, motivation and influences their overall academic performance. Traditional assessment methods, such as pen-and-paper tests, often focus on evaluating students' cognitive abilities, neglecting the affective domain. Assessment of affective domain plays a critical role in mathematics education (Ma & Kishor, 2017). Research has consistently shown that students' attitudes and emotions towards mathematics significantly influence their motivation, engagement, and academic achievement in Mathematics education (Leder & Forgasz, 2017).

Mathematics education simply means the way in which mathematics teachers teach the students the

concepts, principles, processes and practice of mathematics in classroom situations. Mathematics education is a fundamental subject that provides a foundation for understanding and interacting with the world around us. Mathematics education is essential for individuals and society as a whole. It equips us with the skills we need to succeed in school, in our careers, and in life. Here are some of the key reasons why mathematics education is so important: Mathematics is all about solving problems. Whether you are trying to figure out the best route to take or analyzing data to make informed decisions, mathematics provides you with the tools you need to succeed. Mathematics education according to Ezeugbor (2018), is the way of teaching mathematics that stresses the understanding of the concepts rather than memorizing rules and performing repetitive works. He further noted that one of the goals of mathematics education is to encourage the use of precise and accurate thinking to solve problems, which is the primary duty of the mathematics teachers.

Mathematics teachers refers to educators who have both pedagogical and content knowledge in teaching mathematics to students at various educational levels based on formal training and experiences. Mathematics teachers assess students' learning outcome, using different assessment tools. Many mathematics teachers have accumulated long years of service, which translates into valuable professional experience. Generally, the length of time an individual spends in a profession tends to enhance both efficiency and effectiveness in job performance. According to Mbarika, extended work experience contributes to the acquisition of knowledge that sharpens one's proficiency. However, the depth of knowledge gained often varies according to the number of years each worker has invested in the profession. Within the educational sector, mathematics teachers may already be familiar with the potential advantages of integrating AI-based assessment tools into their practice. In addition, Razeih et al. (2013) observed that employees with greater work experience demonstrated a stronger awareness of the challenges associated with technological innovations compared to their less experienced counterparts. This finding underscores the notable differences in perspectives and competencies that exist among workers depending on their years of service.

Although interest in AI-based assessment tools is steadily increasing, further investigation is required to understand how much mathematics teachers know

about the advantages and limitations of using such tools to evaluate students' affective domains in mathematics education. The present study was therefore designed to examine teachers' knowledge of both the benefits and the challenges of AI-based assessment tools in this context, with a particular focus on the Nsukka Education Zone of Enugu State. More specifically, the study sought to determine the extent of teachers' knowledge of:

- i. benefits of AI-based assessment tools in assessing students' affective domain in mathematics education among mathematics teachers
- ii. challenges of AI-based assessment tools in assessing students' affective domain in mathematics education among mathematics teachers
- iii. benefits of AI-based assessment tools in assessing students' affective domain in mathematics education among mathematics teachers based on years of work experience
- iv. challenges of AI-based assessment tools in assessing students' affective domain in mathematics education among mathematics teachers based on years of work experience

### Research Questions

1. What is the level of knowledge of benefits of AI-based assessment tools in assessing students' affective domain in mathematics education among mathematics teachers?
2. What is the level of knowledge of challenges of AI-based assessment tools in assessing students' affective domain in mathematics education among mathematics teachers?
3. What is the level of knowledge of benefits of AI-based assessment tools in assessing students' affective domain in mathematics education among mathematics teachers based on years of work experience?
4. What is the level of knowledge of challenges of AI-based assessment tools in assessing students' affective domain in mathematics education among mathematics teachers based on years of work experience?

### Hypotheses

- H<sub>01</sub>: There is no significant difference in level of knowledge of benefits of AI-based assessment tools in assessing students' affective domain in mathematics education among mathematics

teachers with different years of work experience

H<sub>02</sub>: There is no significant difference in level of knowledge of challenges of AI-based assessment tools in assessing students' affective domain in mathematics education among mathematics teachers with different years of work experience

## Method

The study used a descriptive survey research design to investigate knowledge of benefits and challenges of AI-based assessment tools in assessing students' affective domain in mathematics education among mathematics teachers. This study was carried out with secondary school Mathematics teachers in Nsukka Education Zone in Enugu State. The population of the study consisted all the 165 mathematics teachers in secondary schools in Nsukka Education Zone. The sample size was 115 teachers, this was determined using Krejcie and Morgan table. This number was proportionally represented in each year of experience 1-10 years was 28, 11-20 years was 35 and 20 years and above was 52, using simple random sampling technique. The study used self-structured questionnaire titled "Knowledge of AI-based assessment Tools Questionnaire" (KAI-BATQ) to collect data from the teachers. The questionnaire consisted of 24 questions divided into three sections A, B, and C. Section A contained one item on teacher's demographic characteristic (Years of teaching experience) of the respondents. Section B contained 13 items on the Knowledge of Benefits of AI-based Assessment Tools in Assessing Students' Affective Domain in mathematics education. Section C contained 12 items on the Knowledge of Challenges of AI-based Assessment Tools in Assessing Students' Affective Domain in mathematics education. The questionnaire was validated by three experts from Department of Science Education University of Nigeria Nsukka; two

from Mathematics Unit and one from Measurement & Evaluation Unit. The internal consistency (reliability) of KAI-BATQ was analyzed and a reliability coefficient of 0.78 and 0.81 for benefits and challenges respectively and overall coefficient of 0.80 using Cronbach alpha was obtained, and deemed reliable for use in the study. Data analysis was done using mean and standard deviation to answer the research questions, while ANOVA was used to test the null hypotheses at 0.05 level of significance. Interpretation criteria: Very High Level (VHL) equal 4.50-5.00, High Level (HL) equal 3.50-4.49, Moderate Level (ML) equal 2.50-3.49, Low Level (LL) equal 1.50-2.49, Very Low Level (VLL) equal 1.00-1.49.

## Results

The results for this study were obtained based on the research questions answered. Responses to research questions are presented in tables 1 to 5 and hypotheses are in tables 6 and 7 as follows:

**Table 1: Soci-demographic Characteristics of the Respondents**

Variables	NUMBER
<b>Years of teaching experience</b>	
0-10 years	28
11-20 years	35
20 years and above	52
<b>Total</b>	<b>115</b>

Table 1 shows the distribution of Mathematics teachers' years of teaching experience. The vast majority of Mathematics teachers had 11 + years of teaching experience equal 87 and a good number of 28 had 0-10 years of teaching experience.

**Table 2: Level of knowledge of benefits of AI-based assessment tools in assessing students' affective domain in mathematics education among mathematics teachers (n= 115)**

S/N	Items	Mean	SD	Decision
1.	AI-based assessment tools provides real-time monitoring of students' emotional states in learning of Mathematics.	2.47	0.45	ML
2.	AI-based assessment tools enhances student engagement and motivation in learning of Mathematics	2.53	0.47	ML
3.	AI-based assessment tools improves student self-awareness and self-regulation skills in learning of Mathematics	2.45	0.68	ML
4.	AI-based assessment tools enhances teacher-student relationships in learning of Mathematics	2.47	0.61	ML
5.	AI-based assessment tools improves student learning outcomes in Mathematics	2.51	0.79	ML
6.	AI-based assessment tools reduces workload for teachers in teaching and learning of Mathematics	2.55	0.42	ML
7.	AI-based assessment tools improves accuracy and objectivity of assessments in Mathematics	2.96	0.28	ML
8.	AI-based assessment tools provides data-driven insights into student learning of Mathematics	2.53	0.90	ML
9.	AI-based assessment tools provides more time for instruction and support in teaching and learning of Mathematics	2.45	0.79	ML
10.	AI-based assessment tools helps teachers to identify areas where students need extra support in learning of Mathematics	2.52	0.78	ML
11.	AI-based assessment tools helps teachers to develop personalized learning paths for students in teaching and learning of Mathematics	2.48	1.02	ML
12.	AI-based assessment tools increases efficiency in assessment and grading of Mathematics.	2.56	0.55	ML
13.	AI-based assessment tools provide immediate and personalized feedback to students in teaching and learning of Mathematics	2.82	0.51	ML
<b>Grand Mean</b>		<b>2.56</b>	<b>0.63</b>	<b>ML</b>

Result in Table 2 shows that Mathematics Teachers level of knowledge of benefits of AI-based assessment tools in assessing students' affective domain in Mathematics Education. The result indicates that the mean rating scores of mathematics teachers for all the items (1-13) fall within the range of 2.50-3.49, which can be adjudged that Mathematics Teachers had moderate level of knowledge that AI-based assessment tools provides real-time monitoring of students' emotional states, enhances student engagement and

motivation improves student self-awareness and self-regulation skills, improves student learning outcomes, enhances teacher-student relationships reduces workload for teachers, improves accuracy and objectivity of assessments provides data-driven insights into student learning provides more time for instruction and support in teaching and learning, helps teachers to identify areas where students need extra support in learning, helps teachers to develop personalized learning paths for students in teaching and learning of



Mathematics, increases efficiency in assessment and grading of Mathematics, provides immediate and personalized feedback to students in teaching and learning of Mathematics

**Table 3: Level of knowledge of challenges of AI-based assessment tools in assessing students' affective domain in mathematics education among mathematics teachers (n= 115)**

S/N	Items	Mean	SD	Decision
1.	Lack of transparency in AI-based assessment algorithms poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education	3.20	0.56	ML
2.	Concerns about AI-based assessment bias poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education	3.50	0.60	HL
3.	Limited contextual understanding of AI-based assessment tools poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education	2.57	0.61	ML
4.	Dependence on high-quality data for AI-based assessment poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education	3.46	0.69	HL
5.	Technical issues with AI-based assessment platforms poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education	3.54	0.84	HL
6.	Limited teacher training and support for AI-based assessment poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education	3.29	0.86	ML
7.	Limited opportunities for student reflection and self-assessment poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education	4.43	0.63	HL
8.	Limited teacher control over AI-based assessment poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education	4.07	0.49	HL
9.	Limited research on the effectiveness of AI-based assessment poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education	3.50	0.80	HL
10.	Difficulty in integrating AI-based assessment with existing curriculum poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education	3.65	0.85	HL
11.	Concerns about student data privacy and security poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education	3.51	0.90	HL

12.	Limited scalability of AI-based assessment for large classrooms poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education	3.59	1.05	HL
	<b>Grand Mean</b>	<b>3.53</b>	<b>0.74</b>	<b>HL</b>

Result in Table 3 shows that Mathematics Teachers had high level of knowledge of challenges of AI-based assessment tools in assessing students' affective domain in Mathematics Education. This implies that Mathematics Teachers in Nsukka Education Zone in Enugu State had high level of knowledge of lack of transparency in AI-based assessment algorithms, AI-based assessment bias, limited contextual understanding of AI-based assessment tools, dependence on high-quality data for AI-based assessment, technical issues with AI-based assessment

platforms, limited teacher training and support for AI-based assessment, limited opportunities for student reflection and self-assessment, limited teacher control over AI-based assessment, limited research on the effectiveness of AI-based assessment, difficulty in integrating AI-based assessment with existing curriculum, lack of student data privacy and security, limited scalability of AI-based assessment for large classrooms as challenges of AI-based assessment tools in assessing students' affective domain in Mathematics Education.

**Table 4: Level of knowledge of benefits of AI-based assessment tools in assessing students' affective domain in mathematics education among mathematics teachers based on years of work experience (n= 115).**

S/N	Items	1-10 years (n=28)			11-20 years (n=35)			20 and above years (n=52)		
		X	SD	D	X	SD	D	X	SD	D
1.	AI-based assessment tools provides real-time monitoring of students' emotional states in learning of Mathematics.	1.45	0.41	LL	3.45	0.45	ML	3.47	0.55	HL
2.	AI-based assessment tools enhances student engagement and motivation in learning of Mathematics	1.43	0.45	LL	2.53	0.47	ML	3.50	0.75	HL
3.	AI-based assessment tools improves student self-awareness and self-regulation skills in learning of Mathematics	2.45	0.58	LL	2.51	0.98	ML	3.45	0.68	HL
4.	AI-based assessment tools enhances teacher-student relationships in learning of Mathematics	2.42	0.61	LL	2.57	0.69	ML	3.47	0.41	HL
5.	AI-based assessment tools improves student learning outcomes in Mathematics	1.51	0.79	LL	2.51	0.79	ML	3.51	0.59	HL



6.	AI-based assessment tools reduces workload for teachers in teaching and learning of Mathematics	2.25	0.42	LL	2.56	0.52	ML	3.54	0.72	HL
7.	AI-based assessment tools improves accuracy and objectivity of assessments in Mathematics	2.06	0.28	LL	2.94	0.28	ML	3.96	0.82	HL
8.	AI-based assessment tools provides data-driven insights into student learning of Mathematics	2.23	0.90	LL	2.54	0.90	ML	3.53	0.58	HL
9.	AI-based assessment tools provides more time for instruction and support in teaching and learning of Mathematics	1.45	0.49	LL	2.53	0.75	ML	3.45	0.77	HL
10.	AI-based assessment tools helps teachers to identify areas where students need extra support in learning of Mathematics	2.42	1.08	LL	2.50	0.79	ML	3.56	0.84	HL
11.	AI-based assessment tools helps teachers to develop personalized learning paths for students in teaching and learning of Mathematics	2.48	1.02	LL	2.74	1.02	ML	3.63	1.07	HL
12.	AI-based assessment tools increases efficiency in assessment and grading of Mathematics	1.56	0.45	LL	2.69	0.55	ML	3.56	0.65	HL
13.	AI-based assessment tools provide immediate and personalized feedback to students in teaching and learning of Mathematics	2.32	0.51	LL	2.82	0.41	ML	3.82	0.29	HL
<b>Grand Mean</b>		<b>2.00</b>	<b>0.61</b>	<b>LL</b>	<b>2.68</b>	<b>0.66</b>	<b>ML</b>	<b>3.57</b>	<b>0.67</b>	<b>HL</b>

**Table 4: Mean and Standard Deviations of the variation in mathematics teachers' mean perception of the benefits of AI-based assessment tools in assessing students' affective domain in mathematics education based on years of work experience**



Parents' Occupation	N	$\bar{X}$	SD.
0-10 years	28	2.00	0.61
11-20 years	35	2.68	0.66
20 years and above	52	3.57	0.67
<b>Total</b>	<b>115</b>	<b>2.56</b>	<b>0.63</b>

**Key:**  $\bar{X}$  = Mean, SD = Standard Deviation, Dec.=Decision, A=Agreed, D=Disagreed

Table 4 shows that overall; Mathematics Teachers with 20 years and above of teaching experiences had high level of knowledge () of benefits of AI-based assessment tools in assessing students' affective domain in Mathematics Education than those with 11-20 years () and 1-10 years () respectively.

**Table 5: Level of knowledge of Challenges of AI-based Assessment Tools in Assessing Students' Affective Domain in Mathematics Education among mathematics teachers based on years of work experience (n= 115)**

S/N	Items	1-10 years (n=28)			11-20 years (n=35)			20 and above years (n=52)		
		X	SD	D	X	SD	D	X	SD	D
1.	Lack of transparency in AI-based assessment algorithms poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education	1.47	0.25	VL	2.57	0.59	ML	3.67	0.45	HL
2.	Concerns about AI-based assessment bias poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education	1.37	0.37	VL	2.53	0.67	ML	4.03	0.47	HL
3.	Limited contextual understanding of AI-based assessment tools poses a big	1.45	0.68	VL	3.45	0.58	ML	4.45	0.68	HL

	challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education									
4.	Dependence on high-quality data for AI-based assessment poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education	1.47	0.65	VL	3.47	0.73	ML	4.74	0.61	VHL
5.	Technical issues with AI-based assessment platforms poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education	1.41	0.72	VL	2.51	0.91	ML	4.45	0.79	HL
6.	Limited teacher training and support for AI-based assessment poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education	1.35	0.42	VL	2.57	0.52	ML	3.55	0.42	HL
7.	Limited opportunities for student reflection and self-assessment poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education	1.46	0.28	VL	3.00	0.81	ML	4.39	0.28	HL
8.	Limited teacher control over AI-	1.43	0.39	VL	2.59	0.79	ML	3.53	0.90	HL

	based assessment poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education									
9.	Limited research on the effectiveness of AI-based assessment poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education	1.45	0.79	VL	2.55	0.77	ML	4.45	0.79	HL
10.	Difficulty in integrating AI-based assessment with existing curriculum poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education	1.09	0.56	VL	2.59	0.87	ML	3.52	0.78	HL
11.	Concerns about student data privacy and security poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education	1.48	0.42	VL	3.47	1.02	ML	4.00	1.05	HL
12.	Limited scalability of AI-based assessment for large classrooms poses a big challenge in using AI-based assessment tools in assessing students' affective domain in Mathematics Education	1.46	0.25	ML	2.76	0.55	ML	3.56	0.55	HL

<b>Grand Mean</b>	<b>1.40</b>	<b>0.48</b>	<b>VL</b>	<b>2.84</b>	<b>0.73</b>	<b>ML</b>	<b>4.95</b>	<b>0.64</b>	<b>VHL</b>
			<b>L</b>						

Table 5 shows that overall; Mathematics Teachers with 20 years and above of teaching experiences had very high level of knowledge ( ) of challenges of AI-based assessment tools in assessing students' affective domain in Mathematics Education than those with 11-20 years ( ) and 1-10 years ( ) respectively.

H<sub>01</sub> There is no significant difference in level of knowledge of benefits of AI-based assessment tools in assessing students' affective domain in mathematics education among mathematics teachers with different years of work experience

**Table 6: ANOVA analysis for the difference in level of knowledge of benefits of AI-based assessment tools in assessing students' affective domain in mathematics education among mathematics teachers with different years of work experience**

	<b>Sum of Squares</b>	<b>df</b>	<b>Mean Square</b>	<b>F</b>	<b>Sig.</b>
Between Groups	11026.657	4	2756.664	109.736	.000
Within Groups	2763.308	110	25.121		
Total	13789.965	114			

Result in Table 6 shows that an F – ratio of 109.736 with associated or exact probability value of .000 at (4, 114) degrees of freedom was obtained with respect to the difference in the mean rating score of difference in level of knowledge of benefits of AI-based assessment tools in assessing students' affective domain in mathematics education among mathematics teachers with different years of work experience. Given that the associated or exact probability value of 0.000 when compared with 0.05 (a priori value), was found significant because it is less, thus, the null hypothesis

one (H<sub>01</sub>) was rejected. Hence the conclusion drawn is that there is statistically significant difference in level of knowledge of benefits of AI-based assessment tools in assessing students' affective domain in mathematics education among mathematics teachers with different years of work experience.

H<sub>02</sub>: There is no significant difference in level of knowledge of challenges of AI-based assessment tools in assessing students' affective domain in mathematics education among mathematics teachers with different years of work experience.

**Table 7: ANOVA analysis for the difference in level of knowledge of challenges of AI-based assessment tools in assessing students' affective domain in mathematics education among mathematics teachers with different years of work experience**

	<b>Sum of Squares</b>	<b>df</b>	<b>Mean Square</b>	<b>F</b>	<b>Sig.</b>
Between Groups	4923.273	4	1230.818	60.858	.000
Within Groups	2224.675	110	20.224		
Total	7147.948	114			

Result in Table 6 shows that an F – ratio of 60.858 with associated or exact probability value of .000 at (4, 114) degrees of freedom was obtained with respect to the difference in the mean rating score of difference

in level of knowledge of challenges of AI-based assessment tools in assessing students' affective domain in mathematics education among mathematics teachers with different years of work experience. Given

that the associated or exact probability value of 0.000 when compared with 0.05 (a priori value), was found significant because it is less, thus, the null hypothesis two ( $H_{02}$ ) was rejected. Hence the conclusion drawn is that there is statistically significant difference in level of knowledge of benefits of AI-based assessment tools in assessing students' affective domain in mathematics education among mathematics teachers with different years of work experience.

### Discussion of findings

The findings of the study in table 2 showed that Mathematics teachers in Nsukka Education Zone in Enugu State had moderate level of knowledge of the benefits of AI-based assessment tools in assessing students' affective domain in mathematics education. The benefits include provides real-time monitoring of students' emotional states, enhances student engagement and motivation improves student self-awareness and self-regulation skills, improves student learning outcomes, enhances teacher-student relationships, reduces workload for teachers, improves accuracy and objectivity of assessments, provides data-driven insights into student learning, provides more time for instruction and support in teaching and learning, helps teachers to identify areas where students need extra support in learning, helps teachers to develop personalized learning paths for students in teaching and learning of Mathematics, increases efficiency in assessment and grading of Mathematics, provides immediate and personalized feedback to students in teaching and learning of Mathematics. Previous research has repeatedly confirmed that the advantages highlighted above represent the key benefits of employing AI-based assessment tools in evaluating students' affective domains within mathematics education. The results of the present study align with the findings of Wang, Chenchen, and Yun-Fang (2021), who reported that teachers' perceptions of AI-based educational tools are shaped by multiple factors, including their pedagogical orientations, years of teaching experience, prior exposure to educational technologies, and their views on the effectiveness and necessity of such tools.

Results presented in Table 3 revealed that mathematics teachers in the Nsukka Education Zone of Enugu State demonstrated a high level of awareness regarding the challenges associated with employing AI-based assessment tools in evaluating students' affective domains in mathematics education. Among the major

challenges identified were the lack of transparency in AI algorithms, potential bias in assessments, limited contextual sensitivity, reliance on high-quality datasets, and technical difficulties with AI platforms. Other issues highlighted include inadequate teacher training and support, restricted opportunities for student self-reflection, reduced teacher control over assessment processes, insufficient research evidence on effectiveness, difficulties in aligning AI-based assessments with existing curricula, concerns over data privacy and security, and the limited scalability of these tools in large classrooms. These findings are consistent with Nguyen (2016), who reported that although technological advancements have positively impacted many lives globally, a range of challenges—particularly technical barriers—continue to hinder widespread adoption.

Findings presented in Table 4 indicated that mathematics teachers with 1–10 years of teaching experience demonstrated a low level of knowledge regarding the benefits of AI-based assessment tools for evaluating students' affective domains in mathematics education. Teachers with 11–20 years of experience showed a moderate level of knowledge, while those with more than 20 years of experience exhibited a high level of knowledge on the subject. These results support the assertion of Ukoha and Egbokhare (2018), who emphasized that the accumulation of years in service enhances one's understanding of job-related activities, facilitates skill development, and improves overall proficiency.

Similarly, the results in Table 5 revealed that teachers with 1–10 years of experience had very limited knowledge of the challenges associated with AI-based assessment tools. Those with 11–20 years of work experience possessed a moderate level of knowledge, whereas teachers with over 20 years of experience demonstrated a very high level of awareness of such challenges. This finding aligns with Razieh et al. (2013), who observed that employees with longer years of service were more knowledgeable about the difficulties posed by technological innovations than their less experienced counterparts.

The results in Table 6 revealed a significant difference in mathematics teachers' knowledge of the benefits of AI-based assessment tools for evaluating students' affective domains, depending on their years of teaching experience in the Nsukka Education Zone of Enugu State. Prior research has shown that the longer an individual remains in a profession, the more knowledgeable and proficient they tend to become. This



outcome supports the view of Ukoha and Egbokhare (2018), who argued that extended years of service enhance workers' understanding of their responsibilities, enable the acquisition of new skills, and improve overall job performance. The findings also align with Mbarika (2004), who maintained that one of the key advantages of accumulated work experience is the expansion of professional knowledge. Thus, the evidence from this study suggests that greater teaching experience is associated with higher levels of knowledge among mathematics teachers regarding the benefits of AI-based assessment tools in assessing students' affective domains in mathematics education.

Findings presented in Table 7 indicated that mathematics teachers with 1–10 years of experience demonstrated a very low level of knowledge concerning the challenges of using AI-based assessment tools to evaluate students' affective domains in mathematics education. Those with 11–20 years of teaching experience possessed an average level of knowledge, whereas teachers with more than 20 years of service exhibited a very high level of awareness of these challenges. This outcome is consistent with the view of Mohammed-RajputNA (2011), who emphasized the importance of work experience in recruitment, noting that the knowledge gained through long-term service often leads to mastery of job-related tasks and deeper insights specific to the profession. Accordingly, mathematics teachers in the Nsukka Education Zone with extended years of service had a greater understanding of the difficulties associated with AI-based assessment tools. The findings also support Razieh et al. (2013), who observed that awareness of the challenges of technological innovations was more pronounced among employees with longer work experience compared to those with fewer years in service. These results have important implications for the Ministry of Education and government authorities, particularly in planning sensitization and training programs to equip teachers with the necessary knowledge and skills for adopting innovative assessment tools.

## Conclusion

Teachers' knowledge of benefits and challenges of AI-based assessment tools in assessing students' affective domain in mathematics education is essential in determining the successful integration of these tools into mathematics education. "The findings have shown that Mathematics teachers in Nsukka Education Zone in Enugu State possessed moderate level of knowledge of

the benefits and high level of knowledge of the challenges of AI-based assessment tools in assessing students' affective domain in mathematics education. Many years of work experience play a big role in acquiring knowledge of benefits and challenges of AI-based assessment tools in assessing students' affective domain in mathematics education. This is evidenced by mathematics teachers with fewer years of work experience reporting low knowledge of benefits and challenges of AI-based assessment tools in assessing students' affective domain in mathematics education." By understanding benefits, and challenges of AI-based assessment tools, teachers and educators can develop effective strategies for using these tools to assess students' affective domain in mathematics education.

## Recommendations

Based on the findings and conclusions of the study, the following recommendations were made:

1. Government should provide AI-based assessment tools and infrastructure to ensure the application of AI-based assessment in all levels of education in Nsukka Education Zone in Enugu State.
2. The State Government should increase the budgetary allocation in education sectors to fund the provision of AI-based assessment tools and technological infrastructure (electricity supply and availability of network) in order to enhance effective and efficient education system in Nsukka Education Zone in Enugu State.
3. The state Ministry of Education in collaboration with the federal and State Government should embark on massive recruitment and training of information technology (IT) experts to enhance the implementation of AI-based assessment tools and other technological innovations in education system.

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