TEACHERS' READINESS AND USABILITY PERCEPTION OF ADAPTIVE VIDEO CAPSULES FOR TEACHING SENIOR SECONDARY MATHEMATICS

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Abstract
This study examined mathematics teachers' readiness and usability perceptions of adaptive video capsules, an emerging AI-driven tool for personalized learning. A descriptive survey design was employed, involving 285 mathematics teachers from three local government areas of Ilorin, Kwara State, selected through stratified and simple random sampling. Data were collected with a validated questionnaire on perceived usefulness (PU), perceived ease of use (PEOU), technology self-efficacy (TSE), and behavioural intention (BI). Descriptive statistics addressed the research questions, while ANOVA tested hypotheses at the 0.05 significance level. Findings revealed that teachers demonstrated high technology self-efficacy and strong intention to adopt adaptive video capsules, perceiving them as useful and easy to use. Teaching experience significantly influenced PU and BI, suggesting that less-experienced teachers found the tools more useful and were more inclined to adopt them. The study concludes that adaptive video capsules can enhance mathematics instruction if contextual challenges are addressed through training and policy support.
Key words: Adaptive video capsules, mathematics education, perceived usefulness, technology self-efficacy, behavioural intention

Introduction

Global education systems are undergoing rapid transformation under the influence of digital technologies and artificial intelligence (AI). The World Economic Forum (2024) notes that AI is reshaping education by enabling personalized learning, refining assessments, and allowing educators to focus more on pedagogy than administrative tasks. Studies also show that AI-powered instructional strategies increase student engagement and improve outcomes across diverse contexts (Kehinde-Awoyele *et al.*, 2024). In developing countries, learner-centered approaches such as online, hybrid, and adaptive models are gaining ground, offering flexibility and accessibility that were previously limited (Eva *et al.*, 2024).

This shift is closely tied to the demand for 21st-century skills, including critical thinking, creativity, collaboration, and digital literacy. Educators are expected to move beyond lecture-based methods toward learner-centered designs, where AI tools help personalize content, pacing, and feedback (Ayeni *et al.*, 2024). The impact of digital transformation in education lies not in digitizing old practices but in reimagining learning around individual needs, making constructs such as perceived usefulness (PU), ease of use (PEOU), and trust in AI central to adoption.

Among AI-driven innovations, adaptive learning systems have emerged as a compelling way to tailor instruction. These systems adjust content, pacing, and feedback dynamically based on learner performance, using data analytics and machine learning (Gligorea *et al.*, 2023; Wu *et al.*, 2023). While effective in supporting students, they also raise important questions about teacher usability, workflow integration, and curricular alignment. In STEM education, where abstract concepts and procedural knowledge are often difficult, adaptive tools have proven especially valuable. Global and Nigerian evidence shows that they improve comprehension, but adoption depends heavily on teacher readiness (Villegas-Ch *et al.*, 2025; Ekwu *et al.*, 2025).

Video-based learning has been particularly effective in mathematics by simplifying abstract concepts and supporting self-paced learning. Research confirms that flipped classrooms using videos enhance achievement compared to traditional lecture formats (Daahiljabir *et al.*, 2023; Nurmawati *et al.*, 2024). The modular design of video lessons, delivered in small chunks, reduces cognitive overload and helps learners build understanding progressively. Adaptive video capsules expand these benefits by offering flexibility and learner tracking. Students can control pacing, choose among content paths, or receive supplementary materials, while teachers gain access to analytics that inform instructional alignment (Sayed *et al.*, 2023).

The successful integration of adaptive video capsules, however, depends less on the sophistication of the technology and more on teachers' perceptions of its usability and usefulness. Usability, captured through perceived ease of use (PEOU), determines whether teachers find the system manageable within their daily instructional routines, while perceived usefulness (PU) reflects the degree to which they believe it enhances teaching and learning effectiveness. These two constructs jointly shape overall perceptions, serving as primary drivers of adoption (Venkatesh *et al*., 2021; Yakubu *et al.*, 2022).

Beyond these, technology self-efficacy (TSE) and behavioural intention (BI) act as critical pointers of teacher readiness. Self-efficacy reflects teachers' confidence in their ability to use adaptive tools effectively, while behavioural intention represents their willingness or commitment to adopt them in practice (Bandura, 1997; Yakubu *et al*., 2022). High self-efficacy enhances perceived ease of use and strengthens the likelihood of actual implementation, making it a crucial readiness factor in technology adoption studies. Thus, understanding how PU, PEOU, TSE, and BI interact offers a comprehensive view of readiness for adaptive video capsule integration.

Teaching experience may further influence these perceptions. While veteran teachers may approach new technologies cautiously due to established pedagogical routines, early-career teachers often exhibit greater openness to experimentation and change. Prior studies reveal mixed evidence: some report no significant influence of experience, while others suggest it moderates PU and BI (Yakubu *et al.,* 2022; Idoga *et al.*, 2022). Examining this dynamic provides deeper insight into differential adoption patterns among mathematics teachers.

Statement of the Problem

Short instructional videos have become central to mathematics instruction, enabling teachers to illustrate procedures and students to revisit worked examples. However, most video resources remain static and uniform, offering little room for individualized pacing or targeted remediation (Navarrete *et al*., 2025). Recent advances in artificial intelligence have introduced adaptive video capsules, short modular clips sequenced to learners' performance, that promise personalized pacing, targeted remediation, and more efficient classroom use of time (Du Plooy, 2024). Yet, research consistently demonstrates that the technical promise of adaptive systems does not guarantee their classroom adoption. Teachers' perceptions of usefulness, ease of use, alignment with curriculum, and trust in AI-driven recommendations significantly influence whether such tools are embraced and sustained (Simon & Zeng, 2024; Ayanwale *et al*., 2025).

In Nigeria, where improving mathematics achievement remains a persistent challenge, video-based interventions have shown encouraging effects in recent studies. However, the contextual realities of infrastructure limitations, high data costs, and uneven professional development opportunities shape the feasibility of adopting AI-driven adaptive solutions (Mohammed & Bello, 2024; Eke, 2024). Despite this, empirical evidence is limited regarding how Nigerian senior secondary mathematics teachers perceive the usefulness, usability, technological self-efficacy, and behavioural intention that determine adoption of adaptive video capsules. Without such insights, interventions risk being underutilized or misaligned with

classroom realities. This study therefore examines teachers' readiness and perceptions of adaptive video capsules for teaching senior secondary mathematics in Nigeria.

Objectives of the study

The following are the specific objectives of this study:

1. determine teachers' perceptions of the usefulness of adaptive video capsules for teaching senior secondary mathematics;
2. examine teachers' perceptions of the ease of use of adaptive video capsules in classroom practice;
3. investigate teachers' levels of technology self-efficacy for integrating adaptive video capsules into instruction;
4. evaluate teachers' behavioural intention to adopt adaptive video capsules for mathematics teaching.
5. examine whether teachers' years of teaching experience influence their perceived usefulness (PU) of adaptive video capsules.

Research Questions

1. What are teachers' perceptions of the usefulness of adaptive video capsules for teaching senior secondary mathematics?
2. How do teachers perceive the ease of use of adaptive video capsules in classroom practice?
3. What are teachers' levels of technology self-efficacy in integrating adaptive video capsules into instruction?
4. What is the level of teachers' behavioural intention to adopt adaptive video capsules for mathematics teaching?

Research Hypothesis

H_{o1}: There is no significant difference in the perceived usefulness (PU) of adaptive video capsules based on teachers' years of teaching experience.

Theoretical Framework

This study is anchored on the Technology Acceptance Model (TAM) developed by Davis (1986), which explains the factors influencing users' acceptance and use of technology. The model posits that two key beliefs, Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), determine an individual's Behavioural Intention (BI) to adopt a technological system. Perceived usefulness refers to the extent to which a person believes that using a particular technology will enhance job performance, while perceived ease of use denotes the degree to which one believes that using the technology will be free of effort. According to TAM, PEOU influences PU, and together they shape BI, which ultimately leads to actual technology use.

In the context of education, TAM has been widely applied to understand teachers' and students' adoption of digital tools, learning management systems, and other forms of educational technology. However, while TAM provides a solid foundation, it often requires contextual adaptation to reflect specific teaching environments and user characteristics. This study extends TAM by integrating Technology Self-Efficacy (TSE) as an external variable. Prior studies (Teo, 2011; Venkatesh & Bala, 2008) have shown that self-efficacy strongly influences both perceived ease of use and behavioural intention, suggesting that teachers who feel competent with technology are more likely to view it as easy to use and useful in their teaching practice. Theoretically, this study contributes by validating TAM's core constructs (PU, PEOU, and BI) within the context of mathematics instruction in Nigeria and by reinforcing the role of TSE as a critical antecedent that enhances the model's explanatory power in educational technology adoption.

Methodology

This study employed a descriptive survey design, considered appropriate because it enables the systematic collection of quantitative data from a representative sample for generalization to the target population. The population consisted of all senior secondary school teachers in Ilorin Metropolis, Kwara State, while the target population comprised mathematics teachers across the three Local Government Areas (Ilorin East, Ilorin South, and Ilorin West). A stratified random sampling technique was used to ensure representation across the three strata. Ilorin Metropolis has 123 public senior secondary schools distributed as follows: Ilorin East (41), Ilorin South (33), and Ilorin West (49). Through proportionate allocation, 95 schools were sampled: 32 from Ilorin East, 26 from Ilorin South, and 37 from Ilorin West. From each school, three mathematics teachers were selected using simple random sampling, yielding a total sample of 285 mathematics teachers. This sample size was considered adequate based on prior educational technology studies in Nigeria that used comparable or smaller samples to achieve reliable generalization (Yakubu *et al.*, 2022; Olayinka & Yusuf, 2022). Data were collected using a researcher-developed questionnaire

structured into five sections (A–E). Section A captured respondents' demographic information, while Sections B–E measured the core constructs: perceived usefulness (PU), perceived ease of use (PEOU), technology self-efficacy (TSE), and behavioural intention (BI). Each construct was assessed with seven items on a four-point Likert scale ranging from Strongly Agree (4) to Strongly Disagree (1). The instrument underwent face and content validation by experts in educational technology and mathematics education to establish clarity, relevance, and alignment with the study objectives. Reliability was confirmed through a pilot test with mathematics teachers outside the study area, and internal consistency was determined using Cronbach's alpha, which yielded the following coefficients: Perceived Usefulness (0.82), Perceived Ease of Use (0.79), Technology Self-Efficacy (0.85), and Behavioural Intention (0.81). These values indicate acceptable reliability for all measured constructs. Descriptive statistics (mean and standard deviation) were used to address the research questions. Inferential statistics, specifically one-way Analysis of Variance (ANOVA), was employed to test the hypothesis at the 0.05 level of significance.

Results

Research Question 1: What are teachers' perceptions of the usefulness of adaptive video capsules for teaching senior secondary mathematics?

Table 1

Teachers' Perceived Usefulness of Adaptive Video Capsules

Item	Mean	Std. D
Using AI-powered adaptive video capsules can improve my teaching of mathematics.	2.97	.52
The technology would make it easier to explain abstract mathematical concepts.	3.16	.60
Students' performance in mathematics will likely improve with the use of adaptive video capsules.	2.93	.63
The system will save time in lesson delivery and assessment.	2.99	.57
AI-powered video capsules can personalize learning to meet individual student needs.	3.04	.57
The technology will enhance the effectiveness of classroom instruction.	3.06	.52
Integrating adaptive video capsules will make teaching more engaging and interactive.	2.99	.60

Key; *SD* = Strongly Disagree, **D =** Disagree, **A =** Agree, **SA =** Strongly Agree

Decision Value: = 2.50

The results in Table 1 show that mathematics teachers in Ilorin Metropolis generally perceive adaptive video capsules as useful for instructional purposes, with all items scoring above the 2.50 decision value. Stronger agreement was recorded for adaptive video role in explaining abstract concepts (M = 3.16), enhancing instructional effectiveness (M = 3.06), and personalizing learning (M = 3.04), while comparatively lower ratings were observed for the adaptive video potential to directly improve student performance. This indicates that teachers regard adaptive video capsules primarily as a supportive instructional tool, reflecting an overall positive perception of their usefulness for teaching mathematics.

Research Question 2: How do teachers perceive the ease of use of adaptive video capsules in classroom practice?

Table 2

Teachers' Perceived Ease of Use of Adaptive Video Capsules

Item	Mean	Std. D
Learning to use AI-powered adaptive video capsules would be easy for me.	3.17	.52
I find it simple to operate new educational technologies when provided with basic training.	3.18	.48
Navigating an AI-powered video capsule platform would not require much mental effort.	3.21	.51
The technology would be flexible to use alongside existing teaching methods.	3.18	.52

I would quickly become skillful at using adaptive video capsules in teaching.	3.17	.48
The steps required to use the system would be clear and understandable.	3.19	.54
I would not need much technical support to effectively use the technology.	3.14	.48

Key; *SD* = Strongly Disagree, **D =** Disagree, **A =** Agree, **SA =** Strongly Agree
Decision Value: = 2.50

The results in Table 2 reveal that mathematics teachers in Ilorin Metropolis generally perceive adaptive video capsules as easy to use, with all mean ratings exceeding the 2.50 decision value. The strongest agreement centered on the simplicity of navigating the platform (M = 3.21) and the clarity of the required steps (M = 3.18), while slightly lower, but still positive, ratings were observed for the extent to which teachers felt they would need minimal technical support (M = 3.14). Overall, these findings suggest that teachers anticipate little difficulty in adopting adaptive video capsules, reinforcing the perception that ease of use would not be a major barrier to classroom integration.

Research Question 3: What are teachers' levels of technology self-efficacy in integrating adaptive video capsules into instruction?

Table 3

Teachers' Technology Self-Efficacy in Using Adaptive Video Capsules

Item	Mean	Std. D
I am confident in my ability to learn how to use AI-powered adaptive video capsules.	3.52	.68
I can troubleshoot minor problems that arise when using technology for teaching.	2.56	.73
I can effectively integrate technology into my teaching without constant supervision.	3.30	.68
I am capable of adapting to new instructional technologies with minimal difficulty.	3.38	.69
I believe I have the necessary skills to use AI-powered tools in my mathematics classroom.	3.17	.67
Even if no one is around to guide me, I can independently learn to use new technologies.	3.19	.68
I can easily keep up with technological innovations in teaching and learning.	3.05	.58

Key; *SD* = Strongly Disagree, **D =** Disagree, **A =** Agree, **SA =** Strongly Agree
Decision Value: = 2.50

The results in Table 3 show that mathematics teachers generally reported high levels of technology self-efficacy in relation to adaptive video capsules, as all items exceeded the decision value of 2.50. The strongest confidence was expressed in their ability to learn how to use the technology (M = 3.52) and adapt to new instructional tools with minimal difficulty (M = 3.38). Teachers were also confident in their ability to integrate technology without constant supervision (M = 3.30). However, comparatively lower ratings were observed in troubleshooting minor technical problems (M = 2.56), indicating that while teachers feel capable of learning and using new tools, they may require technical support to handle system breakdowns or malfunctions. Overall, the findings suggest that teachers in Ilorin Metropolis possess a generally strong sense of self-efficacy, which is a positive indicator for the adoption of adaptive video capsules, though complementary technical assistance may be necessary.

Research Question 4: What is the level of teachers' behavioural intention to adopt adaptive video capsules for mathematics teaching?

Table 4

Teachers' Behavioural Intention to Adopt Adaptive Video Capsules for Mathematics Teaching

Item	Mean	Std. D
I am willing to use AI-powered adaptive video capsules in my mathematics teaching.	3.47	.67
I plan to adopt this technology once it becomes available in schools.	3.37	.66

I would encourage my colleagues to use adaptive video capsules in their teaching.	3.38	.69
I intend to integrate AI-powered video capsules into my lesson delivery regularly.	3.40	.65
I am open to receiving training on how to use adaptive video capsules.	3.47	.66
I would prefer AI-powered capsules over conventional teaching methods for difficult concepts.	3.42	.67
I am committed to continuous use of adaptive video capsules once I start.	3.50	.69
Weighted Average	**3.43**	

Key; *SD* = Strongly Disagree, **D =** Disagree, **A =** Agree, **SA =** Strongly Agree
Decision Value: = 2.50

The results in Table 4 show that mathematics teachers in Ilorin Metropolis demonstrated a high level of behavioural intention to adopt adaptive video capsules, with all items scoring above the decision value of 2.50 and a weighted average of 3.43. Teachers expressed strong willingness to use the technology (M = 3.47), openness to training opportunities (M = 3.47), and commitment to continuous use once adopted (M = 3.50). They also indicated readiness to integrate the capsules into regular lesson delivery and to encourage colleagues to embrace the innovation. These findings suggest that the level of teachers' behavioural intention to adopt adaptive video capsules is high.

Hypotheses Testing

Ho_1: There is no significant difference in the perceived usefulness (PU) of adaptive video capsules based on teachers' years of teaching experience.

Table 5:

Summary of One-Way ANOVA Showing Differences in the Perceived Usefulness (PU) of Adaptive Video Capsules Across Teachers' Years of Teaching Experience

ANALYSIS OF VARIANCE

Model	Sum of Squares	df	Mean Square	F	Sig.	Remark
Between Groups	5.849	3	1.950	12.590	.039	Significant
Within Groups	2197.084	281	7.819			
Total	**2202.933**	**284**				

The one-way ANOVA in Table 5 tested whether teachers' perceived usefulness of adaptive video capsules differed significantly across years of teaching experience. The results revealed a statistically significant difference, $F(3, 281) = 12.59$, $p = .039$. Since the p-value is less than the 0.05 threshold, the null hypothesis is rejected. This indicates that mathematics teachers' perceptions of the usefulness of adaptive video capsules vary significantly depending on their years of teaching experience. Descriptive statistics showed that teachers with 1–5 years of experience reported the highest mean PU score, followed by those with 6–10 years, while teachers with 11–15 years and above 15 years of experience had comparatively lower mean ratings. This pattern suggests that younger teachers or those earlier in their careers found the adaptive video capsules more useful than their older or more experienced counterparts.

Discussion of Findings

This study revealed that mathematics teachers perceived adaptive video capsules as positively useful, particularly for simplifying abstract concepts and enhancing classroom instruction. This aligns with international findings that digital video tools make mathematics more engaging and comprehensible (Nguyen *et al.*, 2022). Also, the study of Adebanjo and Orifah (2023) found that teachers in Abuja recognized the usefulness of digital tools for improving mathematics instruction, while Abdulazeez,

Akinyemi, and Aremu (2025) reported that mathematics teachers in Ondo State viewed adaptive technologies as valuable in bridging instructional gaps. Together, these findings emphasize that usefulness is a central driver of teachers' willingness to adopt innovative technologies.

Teachers reported that adaptive video capsules would be easy to learn and operate, especially when supported with training. This finding resonates with international literature where teachers noted that minimal training reduced the cognitive effort needed to integrate educational technologies (Teo & Zhou, 2021). Locally, Olaleye and Salami (2024) observed that basic science teachers in Oyo State felt AI-based tools could be flexibly integrated into teaching when designed with user-friendliness in mind. Similarly, Oloyede (2023) reported that Nigerian secondary school teachers expressed confidence in handling new tools when technical support was provided. This suggests that perceived ease of use is likely to encourage adoption if institutional support structures are in place.

The results showed that teachers generally had confidence in their ability to learn and adapt to new technologies, though their capacity to troubleshoot was comparatively weaker. This mirrors findings by Tondeur *et al.* (2021), who highlighted that teachers' confidence significantly shapes classroom technology integration. Another study such as Adebanjo and Orifah (2023) further corroborate this that teacher's self-efficacy strongly predicted digital tool usage, while Abdulazeez *et al.* (2025) emphasized that self-efficacy was critical to readiness for AI-based teaching innovations in Ondo State. Thus, while confidence is high, targeted technical training is necessary to strengthen self-reliance and reduce overdependence on external support.

Teachers demonstrated a high level of behavioural intention to adopt adaptive video capsules, as reflected in their willingness to use, integrate, and even advocate the technology. The findings align with the Technology Acceptance Model (TAM), which identifies perceived usefulness (PU) and perceived ease of use (PEOU) as core predictors of behavioural intention (Davis, 1989; Venkatesh & Davis, 2000). Teachers who found adaptive video capsules useful and easy to operate also showed stronger technology self-efficacy (TSE) and intention to adopt them. Similar patterns have been observed in Nigerian studies where usefulness and ease of use significantly influenced teachers' adoption of digital tools (Olaleye & Salami, 2024; Olayinka & Yusuf, 2022).

The result from the hypothesis revealed a significant difference in teachers' perceived usefulness of adaptive video capsules based on years of experience. Evidence shows that less experienced teachers, often more recently exposed to digital pedagogies, tend to perceive new technologies as more useful and are quicker to integrate them into practice, while more experienced teachers may rely on established methods and thus adopt cautiously (Zheng, 2024). Similar trends have been observed in Nigeria, where studies reported that younger or less experienced teachers demonstrated stronger perceptions of usefulness and readiness to adopt digital and AI tools in mathematics and science classrooms (Adebanjo & Orifah, 2023; Olaleye & Salami, 2024)

Conclusion

In conclusion, mathematics teachers in Ilorin demonstrated strong readiness and intention to adopt adaptive video capsules, perceiving them as useful, easy to use, and aligned with instructional needs. The study affirms that with adequate training, infrastructural support, and institutional encouragement, adaptive video capsules can be effectively integrated to enhance mathematics teaching and learning. Theoretically, the study contributes to the Technology Acceptance Model by validating its applicability to AI-driven adaptive systems and highlighting the amplifying role of teacher self-efficacy in shaping adoption behaviour.

Recommendations

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

1. Continuous professional development programs should be organized by the government to build teachers' confidence and skills in adopting adaptive video capsules.
2. Educational policymakers in Kwara State and beyond should prioritize the integration of AI-powered instructional tools, including adaptive video capsules, into secondary school mathematics curricula.

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