



# Awareness, Perception, and Utilization of e-Learning Platforms for Enhancing Self-Study Practices among Science, Technology, Engineering, and Mathematics (STEM) Teachers

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## ABSTRACT

This study investigated STEM teachers' awareness, perception, and utilization of e-learning platforms for enhancing self-study practices in Akinyele Local Government Area, Oyo State, Nigeria. A quantitative survey design was used. The sample comprised 55 STEM teachers from 10 randomly selected public junior secondary schools. Data were collected using a structured questionnaire measuring awareness, perceived ease of use, perceived usefulness, and utilization of e-learning platforms. Descriptive statistics and Pearson correlation were used for analysis. Findings showed high awareness and positive perceptions of e-learning platforms, but institutional promotion and frequent personal use for self-study were moderate. Perceived ease of use and perceived usefulness were significantly related to utilization. The study recommends stronger institutional support, digital literacy training, and integration of e-learning into teacher professional development.

## ARTICLE INFO

### Article History:

Submitted/Received 07 Dec 2025

First Revised 12 Apr 2026

Accepted 01 May 2026

First Available online 15 May 2026

Publication Date 01 Mar 2027

### Keyword:

Digital literacy;

e-learning platforms;

Professional development;

Self-study;

STEM teachers.

## 1. INTRODUCTION

The use of e-learning platforms has become an important part of contemporary science education, especially in science, technology, engineering, and mathematics (STEM) teaching. Digital platforms such as learning management systems, online learning resources, virtual laboratories, video-based learning materials, and professional learning communities provide opportunities for teachers to access information, update subject knowledge, and improve instructional practices beyond the traditional classroom setting [1, 2]. These platforms are increasingly relevant because STEM education requires continuous knowledge renewal, practical demonstration, digital resources, and flexible access to learning materials.

In many education systems, e-learning is no longer viewed only as a tool for student instruction. It is also considered a resource for teacher self-study and professional development. Self-study enables teachers to independently search for learning materials, review subject content, explore new teaching methods, and reflect on their classroom practices. For STEM teachers, this is particularly important because scientific knowledge, technology-based pedagogy, and curriculum expectations continue to change. Teachers who engage in self-study through digital platforms can strengthen their content knowledge, improve pedagogical competence, and develop confidence in using digital tools for teaching [3, 4].

The COVID-19 pandemic increased the visibility of e-learning platforms in Nigeria and other countries. During and after the pandemic, teachers and learners became more exposed to online learning environments, digital communication tools, and remote instruction. However, the increased availability of e-learning platforms did not automatically lead to meaningful and sustained use among teachers [5, 6]. In many contexts, access to digital platforms remains uneven, and teachers' engagement is influenced by digital competence, institutional support, motivation, perceived usefulness, and perceived ease of use.

In Nigeria, e-learning platforms such as Google Classroom, WhatsApp learning groups, YouTube, open educational resources, and other online learning tools are becoming more common in educational practice. Nevertheless, many teachers are aware of digital tools but do not always use them consistently for self-study or professional growth [7, 8]. Some teachers use e-learning platforms mainly for communication or classroom tasks, while their use for independent professional learning, content updating, lesson redesign, and STEM-related exploration remains limited. Awareness alone is not enough; teachers also need positive perceptions, confidence, access, motivation, and institutional encouragement.

The Technology Acceptance Model explains that users' adoption of technology is influenced by perceived ease of use and perceived usefulness [9]. If teachers believe that e-learning platforms are easy to navigate and useful for their professional needs, they are more likely to use them. In addition, Self-Determination Theory suggests that sustained engagement depends on autonomy, competence, and relatedness [10, 11]. Teachers may use e-learning platforms more effectively when they feel confident, personally motivated, and connected to professional learning communities. Therefore, understanding teachers' awareness, perception, and utilization of e-learning platforms is important for improving digital professional development in STEM education.

For STEM teachers, the value of e-learning platforms lies in their ability to support flexible and continuous learning. Through online platforms, teachers can access instructional videos, simulations, subject-specific resources, assessment materials, digital laboratories,

professional forums, and curriculum-related content. These resources can support self-study practices and help teachers integrate new knowledge into classroom instruction. However, in low-resource contexts, the use of e-learning platforms may be affected by unstable electricity, limited internet connectivity, lack of devices, insufficient training, and weak school-level promotion of digital learning [5, 12]. These barriers may reduce the regular use of e-learning platforms even when teachers recognize their benefits.

The situation in Oyo State, Nigeria, reflects this broader challenge. STEM teachers may be aware of different e-learning platforms and may perceive them as useful, but actual utilization for self-study and professional development may remain inconsistent. Institutional promotion of e-learning, digital literacy training, and structured professional development support are therefore necessary to help teachers move from basic awareness to meaningful use. Without such support, e-learning adoption may remain superficial and may not fully contribute to teacher growth or improved STEM instruction.

Previous studies have examined digital learning, teacher technology acceptance, online education, and digital literacy in different contexts [6, 8, 13, 14]. However, there is still a need for focused evidence on how STEM teachers in Oyo State understand, perceive, and use e-learning platforms specifically for self-study practices. This gap is important because sustainable technology integration in science education depends not only on classroom use but also on teachers' independent engagement with digital learning resources.

This study, therefore, investigated the awareness, perception, and utilization of e-learning platforms in enhancing self-study practices among STEM teachers in Akinyele Local Government Area, Oyo State, Nigeria. Specifically, the study assessed teachers' awareness of e-learning platforms, examined their perceived ease of use, investigated their perceived usefulness, and evaluated the extent to which they utilize these platforms for self-study and professional development. The study also tested whether perceived ease of use and perceived usefulness were significantly related to the utilization of e-learning platforms.

## **2. LITERATURE REVIEW**

E-learning platforms refer to digital systems, applications, or online spaces that support the delivery, access, organization, and management of learning materials. These platforms may include learning management systems, open educational resources, video-based platforms, communication tools, and collaborative learning spaces. In education, e-learning platforms are not limited to formal systems such as Moodle or Google Classroom. They may also include tools such as YouTube, WhatsApp groups, Khan Academy, and other digital resources when they are used intentionally for learning and professional development [1, 15].

For STEM teachers, e-learning platforms are important because they provide flexible access to subject content, instructional demonstrations, simulations, teaching resources, and professional communities. STEM education requires teachers to update their knowledge continuously because scientific concepts, digital technologies, and classroom practices change over time. Through e-learning platforms, teachers can review difficult concepts, access video demonstrations, explore digital teaching strategies, and improve their instructional planning. This makes e-learning platforms useful not only for student learning but also for teachers' self-study and professional growth [3, 4].

Learning management systems are among the most structured forms of e-learning platforms. They help organize learning materials, assignments, discussions, assessments, and

feedback in one digital environment. Platforms such as Google Classroom and Moodle can support teacher self-study by allowing teachers to access resources, manage learning materials, and participate in online training or professional development activities. However, the usefulness of these platforms depends on teachers' digital literacy, confidence, and ability to use them for meaningful learning rather than only for storing or distributing materials [13, 16].

Social media-based platforms also function as informal e-learning spaces. Tools such as WhatsApp, Telegram, and YouTube are widely accessible and can support teacher learning through resource sharing, peer discussion, instructional videos, and professional communication. WhatsApp groups may help teachers exchange ideas and learning materials, while YouTube provides access to science demonstrations, mathematics tutorials, technology-related content, and classroom strategies. However, informal platforms can also encourage passive consumption if teachers do not critically evaluate the quality and relevance of the materials they use [7, 17].

Open educational resources are another important category of e-learning platforms. They provide free or low-cost access to teaching and learning materials that can be reused or adapted. Platforms such as Khan Academy and other open digital repositories may support STEM teachers by providing videos, exercises, and explanations in mathematics, science, and technology-related topics. Nevertheless, the availability of open resources does not automatically improve professional learning. Teachers need time, digital competence, curriculum knowledge, and reflective ability to adapt these resources to their teaching contexts [18, 19].

In Nigeria, the use of e-learning platforms has grown in response to educational reforms, digital transformation, and the impact of the COVID-19 pandemic. Online learning tools became more visible during school disruptions, and many teachers were exposed to digital platforms for teaching and communication [5, 6]. However, access and awareness do not always lead to meaningful use. Challenges such as poor internet connectivity, unstable electricity, limited devices, lack of training, and weak institutional support continue to affect teachers' use of e-learning platforms in Nigerian schools [5, 12].

Awareness is a major factor in e-learning adoption. Teachers must first know that digital platforms exist and understand how they can support self-study before they can use them effectively. Awareness includes knowledge of available platforms, understanding of their functions, and exposure to training or information about their professional value. However, awareness may remain superficial if teachers only know the names of platforms but do not understand how to use them for self-directed learning, lesson improvement, or professional development [7, 8].

Perception also plays an important role in teachers' use of e-learning platforms. According to the Technology Acceptance Model, perceived ease of use and perceived usefulness influence technology adoption [9, 13]. Perceived ease of use refers to the extent to which teachers believe that a platform is simple, clear, and manageable. Perceived usefulness refers to the extent to which teachers believe that a platform can improve their learning, teaching, and professional competence. When teachers view platforms as useful and easy to use, they are more likely to adopt them for self-study and classroom improvement.

Self-study is an important component of teacher professional development. It refers to teachers' independent and reflective engagement with learning materials, professional

resources, and new pedagogical ideas. Self-study allows teachers to improve subject knowledge, explore new teaching strategies, and respond to changes in curriculum and technology. For STEM teachers, self-study may include watching instructional videos, studying digital simulations, joining online professional groups, reading open resources, and applying new knowledge in classroom practice [3, 4].

Motivation also affects the quality of self-study. Self-Determination Theory explains that sustained learning engagement is supported by autonomy, competence, and relatedness [10, 11]. Teachers are more likely to continue using e-learning platforms when they feel capable of using them, have freedom to choose relevant resources, and are connected to professional learning communities. Therefore, e-learning utilization should not be understood only as a technical issue. It is also connected to teachers' motivation, professional identity, confidence, and institutional environment.

The effective use of e-learning platforms depends on the interaction of awareness, perception, digital competence, motivation, and contextual support. Teachers may be aware of platforms and may even consider them useful, but regular use for self-study can remain limited if institutional promotion, digital literacy training, and infrastructural support are weak. Therefore, understanding STEM teachers' awareness, perception, and utilization of e-learning platforms is important for strengthening self-study practices and improving teacher professional development in science education.

### 3. METHODS

This study used a quantitative survey research design to examine STEM teachers' awareness, perception, and utilization of e-learning platforms for enhancing self-study practices. The quantitative design was appropriate because the study measured teachers' responses using numerical data and examined the relationships between perception variables and platform utilization.

The study was conducted in the Akinyele Local Government Area of Oyo State, Nigeria. The population comprised STEM teachers in public junior secondary schools in the area. A two-stage sampling procedure was used. First, 10 public junior secondary schools were randomly selected from the available schools. Second, all STEM teachers who were available during the school visits were included in the study. A total of 55 STEM teachers participated in the survey.

Data were collected using a structured questionnaire titled E-Learning Awareness, Perception, and Utilization Questionnaire (ELAPUQ). The questionnaire consisted of sections on demographic information, awareness of e-learning platforms, perceived ease of use, perceived usefulness, and utilization of e-learning platforms for self-study practices. The items were structured using a five-point Likert scale ranging from Strongly Disagree = 1 to Strongly Agree = 5. The questionnaire items were informed by previous studies on technology acceptance, digital literacy, and e-learning adoption [9, 13, 14].

The instrument was validated by experts in educational technology and STEM education to ensure clarity, relevance, and alignment with the objectives of the study. A pilot study was conducted with 20 STEM teachers outside the main sample to determine reliability. The Cronbach's alpha coefficients for the questionnaire sections ranged from 0.714 to 0.744, indicating acceptable internal consistency.

Data were collected using Google Forms to allow efficient distribution and reduce data-entry errors. The responses were organized and analyzed using descriptive and inferential

statistics. Frequencies, percentages, means, and standard deviations were used to describe respondents' demographic information, awareness, perceived ease of use, perceived usefulness, and utilization of e-learning platforms. Pearson correlation was used to test the relationships between perceived ease of use and utilization, and between perceived usefulness and utilization. The hypotheses were tested at the 0.05 significance level using SPSS version 25.

#### 4. RESULTS AND DISCUSSION

The demographic information of the respondents is presented in **Table 1**. A total of 55 STEM teachers participated in the study. The respondents were mostly female teachers, representing 61.8% of the sample. Most respondents held B.Ed and BSc qualifications. The participants had formal educational preparation relevant to teaching. The distribution of teaching experience shows that both early-career teachers and highly experienced teachers were represented. This is useful because the study captured responses from teachers at different stages of professional development.

**Table 1.** Demographic characteristics of respondents.

VARIABLE	CATEGORY	FREQUENCY (N)	PERCENTAGE (%)
Gender	Female	34	61.8
	Male	21	38.2
Educational qualification	NCE	12	21.8
	B.Ed	20	36.4
	BSc	16	29.1
	M.Ed	4	7.3
	Others	3	5.5
Teaching experience	1-5 years	21	38.2
	6-10 years	8	14.5
	11-15 years	6	10.9
	Above 15 years	20	36.4

The level of awareness of e-learning platforms among STEM teachers is presented in **Table 2**. STEM teachers had a high level of personal awareness of e-learning platforms. The highest mean score was recorded for awareness of the existence of e-learning platforms for professional development. Teachers were also familiar with platforms that could support self-study. However, the item on school or educational authority promotion had the lowest mean score and fell within the moderate range. Awareness was more individually driven than institutionally supported. This finding agrees with previous studies. Teachers may know about digital tools, but institutional support for meaningful adoption is often limited [7, 8].

The perceived ease of use of e-learning platforms is presented in **Table 3**. STEM teachers generally perceived e-learning platforms as easy to use. The highest mean score was recorded for clarity and understandability of the platforms. Many respondents found e-learning platforms understandable and manageable. However, the lower means for navigation and independent use indicate that some teachers still experienced usability challenges. This supports the Technology Acceptance Model. Perceived ease of use influences technology adoption [9, 13].

The perceived usefulness of e-learning platforms for self-study is presented in **Table 4**. STEM teachers perceived e-learning platforms as useful for self-study and professional development. The highest mean score was recorded for the item stating that e-learning

platforms help teachers integrate new knowledge into teaching. Respondents did not only view e-learning platforms as sources of information, but also as tools that could improve instructional practice. Perceived usefulness is an important factor in technology adoption and sustained use [9, 20].

**Table 2.** Awareness of e-learning platforms among STEM teachers.

S/N	ITEM STATEMENT	SD N (%)	D N (%)	U N (%)	A N (%)	SA N (%)	MEAN
1	I am aware of the existence of e-learning platforms designed for teachers' professional development.	1 (1.8)	0 (0.0)	1 (1.8)	34 (61.8)	19 (34.5)	4.27
2	I have received information or training on available e-learning platforms for STEM teachers.	3 (5.5)	0 (0.0)	4 (7.3)	36 (65.5)	12 (21.8)	3.98
3	I am familiar with different e-learning platforms that can support self-study.	3 (5.5)	0 (0.0)	3 (5.5)	36 (65.5)	13 (23.6)	4.02
4	My school/educational authority promotes awareness of e-learning platforms for teachers.	18 (32.7)	0 (0.0)	8 (14.5)	24 (43.6)	5 (9.1)	2.96

Key: 1.00-1.49 = Very low; 1.50-2.49 = Low; 2.50-3.49 = Moderate; 3.50-4.49 = High; 4.50-5.00 = Very high.

**Table 3.** Perceived ease of use of e-learning platforms among STEM teachers.

S/N	ITEM STATEMENT	SD N (%)	D N (%)	U N (%)	A N (%)	SA N (%)	MEAN
1	I find it easy to learn how to use e-learning platforms for self-study.	5 (9.1)	0 (0.0)	6 (10.9)	35 (63.6)	9 (16.4)	3.78
2	Navigating e-learning platforms does not require much effort.	7 (12.7)	0 (0.0)	10 (18.2)	30 (54.5)	8 (14.5)	3.58
3	I feel confident in my ability to use e-learning platforms without external help.	7 (12.7)	0 (0.0)	9 (16.4)	30 (54.5)	9 (16.4)	3.62
4	Using e-learning platforms is clear and understandable.	1 (1.8)	0 (0.0)	3 (5.5)	41 (74.5)	10 (18.2)	4.07

Key: 1.00-1.49 = Very low; 1.50-2.49 = Low; 2.50-3.49 = Moderate; 3.50-4.49 = High; 4.50-5.00 = Very high.

The extent of utilization of e-learning platforms is presented in **Table 5**. The utilization of e-learning platforms ranged from moderate to high. The lowest mean score was recorded for frequent personal use for self-study. However, teachers reported high use of skills gained from e-learning platforms in teaching practice and high encouragement of colleagues to use such platforms. Teachers recognized the practical value of e-learning platforms, but regular personal self-study was not yet fully established as a consistent professional habit. Digital platform use may remain uneven when teachers lack sustained institutional support, time, infrastructure, or digital confidence [5, 12, 19].

The relationship between perceived ease of use and utilization of e-learning platforms is shown in **Table 6**. And, the relationship between perceived usefulness and utilization of e-learning platforms is shown in **Table 7**.

**Table 4.** Perceived usefulness of e-learning platforms for self-study among STEM teachers.

S/N	ITEM STATEMENT	SD N (%)	D N (%)	U N (%)	A N (%)	SA N (%)	MEAN
1	E-learning platforms can improve my self-study practices as a STEM teacher.	4 (7.3)	0 (0.0)	14 (25.5)	32 (58.2)	5 (9.1)	3.62
2	E-learning platforms can enhance my knowledge and professional competence.	4 (7.3)	0 (0.0)	4 (7.3)	34 (61.8)	13 (23.6)	3.94
3	E-learning platforms make my self-study more effective and efficient.	4 (7.3)	0 (0.0)	7 (12.7)	32 (58.2)	12 (21.8)	3.87
4	Using e-learning platforms helps me integrate new knowledge into my teaching.	2 (3.6)	0 (0.0)	7 (12.7)	33 (60.0)	13 (23.6)	4.04

Key: 1.00-1.49 = Very low; 1.50-2.49 = Low; 2.50-3.49 = Moderate; 3.50-4.49 = High; 4.50-5.00 = Very high.

**Table 5.** Extent of utilization of e-learning platforms by STEM teachers for self-study practices.

S/N	ITEM STATEMENT	SD N (%)	D N (%)	U N (%)	A N (%)	SA N (%)	MEAN
1	I frequently use e-learning platforms for my self-study practices.	11 (20.0)	0 (0.0)	8 (14.5)	32 (58.2)	4 (7.3)	3.44
2	I rely on e-learning platforms to update my knowledge in STEM subjects.	5 (9.1)	0 (0.0)	8 (14.5)	37 (67.3)	5 (9.1)	3.77
3	I apply skills gained from e-learning platforms in my teaching practices.	0 (0.0)	0 (0.0)	9 (16.4)	35 (63.6)	11 (20.0)	4.04
4	I encourage other teachers to use e-learning platforms for professional development.	4 (7.3)	0 (0.0)	9 (16.4)	33 (60.0)	9 (16.4)	3.84

Key: 1.00-1.49 = Very low; 1.50-2.49 = Low; 2.50-3.49 = Moderate; 3.50-4.49 = High; 4.50-5.00 = Very high.

**Table 6.** Perceived ease of use and utilization of e-learning platforms among STEM teachers.

VARIABLE	N	MEAN	SD	DF	R	SIG. (2-TAILED)
Ease of use	55	3.76	0.75	53	0.681**	0.000
Utilization	55	3.70	0.65	53		

\*Note: df = N - 2. \*p < 0.01.

**Table 7.** Perceived usefulness and utilization of e-learning platforms among STEM teachers.

VARIABLE	N	MEAN	SD	DF	R	SIG. (2-TAILED)
Perceived usefulness	55	3.86	0.68	53	0.749**	0.000
Utilization	55	3.70	0.65	53		

\*Note: df = N - 2. \*p < 0.01.

**Table 6** shows a strong positive and statistically significant relationship between perceived ease of use and utilization of e-learning platforms,  $r = 0.681$ ,  $p = 0.000$ . Since the p-value is below 0.01, the first null hypothesis was rejected. STEM teachers who found e-learning

platforms easier to use were more likely to utilize them for self-study and professional development. The result supports the Technology Acceptance Model. Ease of use is an important determinant of technology adoption [9, 13].

**Table 7** shows a strong positive and statistically significant relationship between perceived usefulness and utilization of e-learning platforms,  $r = 0.749$ ,  $p = 0.000$ . Since the p-value is below 0.01, the second null hypothesis was rejected. STEM teachers who perceived e-learning platforms as useful were more likely to use them for self-study. The relationship between perceived usefulness and utilization was stronger than the relationship between perceived ease of use and utilization. Teachers' belief in the professional value of e-learning platforms may be a stronger predictor of use than ease of navigation alone.

STEM teachers had high awareness and positive perceptions of e-learning platforms, but regular personal use for self-study was only moderate. This indicates a gap between awareness, perception, and consistent utilization. The findings support the combined relevance of the Technology Acceptance Model and Self-Determination Theory. Teachers may adopt e-learning platforms when they perceive them as easy and useful, but sustained use also depends on motivation, confidence, autonomy, institutional support, and professional relevance [9-11]. The findings have important implications for STEM teacher development in Nigeria. First, schools and educational authorities need to move beyond assuming that teachers' awareness of e-learning platforms is enough. Awareness should be supported by structured digital literacy training and continuous professional development. Second, institutional promotion is necessary because teachers' use of e-learning platforms should not depend only on personal initiative. Third, e-learning platforms should be linked directly to STEM teachers' classroom needs, including lesson preparation, subject updating, simulations, assessment design, and peer collaboration. These actions can help transform e-learning platforms from optional digital tools into meaningful resources for STEM teacher self-study and professional growth.

#### 4. CONCLUSION

STEM teachers in Akinyele Local Government Area, Oyo State, Nigeria, had high awareness and positive perceptions of e-learning platforms for self-study. They considered the platforms easy to use and useful for improving professional competence and classroom practice. However, frequent personal use for self-study was only moderate, and institutional promotion remained weak. Perceived ease of use and perceived usefulness were significantly related to platform utilization, with perceived usefulness showing the stronger relationship. Therefore, stronger institutional support, digital literacy training, better infrastructure, and integration of e-learning into STEM teacher professional development are needed to promote sustained self-study and improve teaching practice.

#### 5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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