

ZAJESE

ZARIA JOURNAL OF EMPIRICAL STUDIES IN EDUCATION INFLUENCE OF INTERNET RESOURCES UTILIZATION ON LECTURERS' SELF-EFFICACY IN TEACHING MATHEMATICS AT COLLEGES OF EDUCATION, NORTHWEST, NIGERIA

***Shuaibu, S., Mohammed, A. S. & Jatto, O. F.**

Department of Mathematics,
Federal University of Education, Zaria
*08025526463

ABSTRACT

The study assessed the influence of internet resources utilization on lecturers' self-efficacy in teaching Mathematics at Colleges of Education, Northwest Nigeria. A descriptive survey research design was adopted. The study set two objectives, research questions and hypotheses respectively. From the population size of 304, a sample size of 117 respondents was taken. Data were collected through a self-structured questionnaire titled "Internet Resources Utilization and Self-Efficacy Questionnaire (IRUSEQ)" which comprised 45 items rated on a Four-Point modified Likert Scale and it has a reliability coefficient of 0.72 after pilot testing. Data collected from the respondents were analyzed using Pearson Product Moment Correlation and t-test, at a 0.05 level of significance. The result revealed that there is a statistically significant positive relationship between internet resources utilization and lecturers' self-efficacy ($r = 0.47$ and $P = 0.002$). Also there is a statistically significant difference between male and female participants in their utilization of internet resources ($P = 0.036 < 0.05$). The study recommended that Colleges of Education should implement regular, gender-inclusive capacity-building workshops and digital training sessions for Mathematics lecturers, aimed at improving their proficiency and confidence in using internet-based resources for instructional purposes.

Keywords: Self-Efficacy, Internet Resources, Mathematics, Lecturers, Utilization

INTRODUCTION

In today's quickly expanding educational landscape, the incorporation of digital technology has profoundly revolutionized how knowledge is transmitted, received, and processed in higher education institutions. The traditional chalk-and-talk approach that once dominated lecture halls has given way to dynamic, interactive learning environments where educators harness the power of e-learning platforms, digital libraries, multimedia resources, and collaborative online tools to create more engaging and effective learning experiences (Encarnacion, et al., 2019). This digital revolution in education has not only enhanced traditional teaching methods, but it has also altered the fundamental essence of what it is to teach and learn in the 21st century. However, the sheer availability of advanced digital tools does not immediately translate into their efficient application in the classroom. Across universities and colleges, a large mismatch exists between the potential of

internet-based educational tools and their actual adoption in teaching practices (Abedi, 2023). While some lecturers easily integrate these tools into their pedagogical techniques, generating thriving digital learning communities that transcend beyond physical classroom bounds, others struggle to advance beyond basic usage or reject this technology altogether. This variance in technology acceptance and utilization patterns among educators reflects one of the most urgent challenges facing contemporary higher education, particularly in developing nations where infrastructure and training options may be limited (Sabiteka, et al. 2025).

Self-efficacy, as described by Bandura's social cognitive theory, represents an individual's belief in their potential to perform specified tasks successfully (Schunk & DiBenedetto, 2020). In the context of digital education, this relates to lecturers' confidence in their ability to effectively utilize internet resources, traverse digital platforms, solve technological

difficulties, and ultimately boost student learning outcomes through technology-mediated instruction. When lecturers hold high levels of digital self-efficacy, they are more inclined to experiment with creative teaching approaches, adapt to new technology, and persist despite the inevitable problems that follow technological integration (Hershkovitz, et al., 2023). The value of self-efficacy in educational situations cannot be emphasized. Research consistently demonstrates that self-efficacy plays a critical role in shaping educator motivation, persistence, and teaching performance, significantly influencing their engagement in instructional tasks, willingness to adopt new teaching methods, and resilience in the face of technological challenges (Jerrim et al., 2025). Importantly, self-efficacy beliefs are distinct from ordinary behavioural predictions or intentions, they reflect what individuals believe they are capable of accomplishing, regardless of external conditions. These ideas are deeply personal and are shaped by earlier experiences, observational learning, verbal persuasion, and physiological conditions (Klassen & Klassen, 2018). Therefore, recognizing and fostering self-efficacy in educators is crucial to supporting effective technology integration and long-term teaching success.

The concept of teaching itself has experienced tremendous change, stretching far beyond the traditional transmission of knowledge from instructor to students. Contemporary education incorporates a sophisticated orchestration of methodologies, strategies, and approaches aimed to foster deep learning, critical thinking, and knowledge building across various student populations. Modern lecturers function as facilitators, mentors, and learning architects who must expertly mix topic mastery with pedagogical knowledge while remaining flexible to the specific learning needs, cultural backgrounds, and technical competencies of their students. The incorporation of digital technologies into teaching methods has been further enlightened by frameworks such as the Technological Pedagogical Content Knowledge (TPACK) paradigm, proposed by researchers including Shambare and Simuja

(2024). This influential framework emphasizes that effective technology integration requires the seamless intersection of three critical knowledge domains: technological knowledge (understanding of digital tools and their capabilities), pedagogical knowledge (understanding of teaching and learning processes), and content knowledge (deep understanding of the subject matter being taught). The TPACK framework recognizes that successful digital education is not simply about using technology but about understanding how technology can transform both the delivery of content and the learning processes themselves, ultimately influencing educators' self-efficacy in technology-enhanced instruction (Shambare & Simuja, 2024).

The internet, considered as a cornerstone of Information and Communication Technology (ICT), exercises a profound influence on educational practices and has become an indispensable resource for both educators and learners worldwide (Ghavifekr & Rosdy, 2015). This integrated network acts as a dynamic platform that stimulates learning, enriches information, and facilitates communication, playing a crucial role in modern education and beyond (Kirkwood & Price, 2016). The internet's immense width offers a plethora of information and tools that instructors and students can utilize to broaden their horizons, serving as an extensive reservoir of knowledge that allows the acquisition of insights that transcend traditional educational limits. The revolutionary effect of online resources in education is particularly obvious in their ability to democratize access to quality instructional content. Open Educational Resources (OER) have changed the educational landscape by providing freely available, openly licensed text, media, and other digital assets (Wiley & Hilton, 2018). Platforms such as Coursera, edX, and Khan Academy allow access to courses and educational content from top institutions worldwide, becoming key resources for both formal and informal learning. Digital libraries and repositories host vast arrays of academic resources, research papers, and multimedia

content through platforms like JSTOR, PubMed, and institutional repositories, while various educational apps and tools leverage the internet to enhance teaching and learning experiences through interactive simulations, collaborative platforms, and virtual reality applications (Hwang & Chang, 2022). This digital shift has profoundly impacted the forms of communication, teaching, and learning, creating new opportunities for educators to engage with students and provide knowledge in unique ways. However, the effectiveness of these internet-based resources depends significantly on educators' ability to identify, evaluate, and integrate them meaningfully into their teaching practices, a capacity that is strongly influenced by their technological self-efficacy and confidence in navigating digital learning environments (Ghavifekr & Rosdy, 2015).

This dynamic and diverse nature of current teaching becomes particularly noteworthy when studying specific academic disciplines that constitute the foundation of educational institutions globally (Munna & Kalam, 2021). Mathematics, as a fundamental discipline, presents unique potential and difficulties for digital integration while acting as a cornerstone of intellectual development and national advancement. In Nigeria, mathematics occupies a vital place in the educational environment, functioning as both a doorway to scientific literacy and a cornerstone of national development objectives (Okonkwo & Yusuf, 2021). From the bustling primary schools in Lagos to the rural learning centers in the northern states, mathematics education represents more than an academic requirement, it embodies the nation's commitment to fostering analytical thinking, problem-solving capabilities, and quantitative reasoning skills essential for navigating an increasingly complex global economy. The relevance of mathematics education in Nigeria cannot be underestimated, particularly in a nation where economic diversification, technical improvement, and scientific innovation are crucial to reducing dependence on oil income and developing sustainable growth (Agbata, et al. 2024). Mathematics serves as the foundation

upon which these aspirations rest, as students who develop strong mathematical competencies during their educational journey are better positioned to contribute meaningfully to national development goals, whether they pursue careers in engineering, medicine, agriculture, business, or technology. Colleges of Education serve a critical role in producing teachers and educators who are fundamental to the growth of any society. These institutes generally focus on providing specialized training in teaching techniques, pedagogy, and subject knowledge, giving future educators with the abilities needed to fulfill the needs of modern classrooms. Colleges of Education offer a range of programs, including the Nigerian Certificate in Education (NCE) and degree programs, emphasizing both theoretical and practical aspects of education while serving as important stepping stones for individuals pursuing careers in teaching, especially at primary and secondary school levels.

In recent years, the effective teaching of Mathematics in this region has been considerably influenced by the possibilities for integrating digital technologies and internet-based instructional resources (Mohammed et al., 2025). Tools such as virtual classrooms, open educational resources (OER), mathematics software, video tutorials, and online libraries offer significant opportunity to boost teaching effectiveness and student engagement. These tools can transform traditional lecture-based training into dynamic, interactive learning experiences that adapt to varied learning styles and preferences while offering access to cutting-edge mathematical knowledge and pedagogical approaches. However, despite the increasing accessibility of internet-based teaching resources, the extent to which lecturers in Northwest Nigerian Colleges of Education utilize these resources remains limited due to varying levels of digital competence and self-efficacy (Usman & Ibrahim, 2022; Mohammed et al., 2025). This limitation constitutes a significant problem in an area where educational institutions are seeking to update their teaching techniques and conform with global educational standards

while working within constraints of infrastructure, resources, and professional development opportunities.

The relationship between lecturers' self-efficacy and their employment of internet resources in mathematics instruction is a critical topic of inquiry. Research consistently demonstrates that lecturers' confidence in applying digital tools effectively is strongly associated with their technological self-efficacy and familiarity with frameworks such as TPACK (Technological Pedagogical Content Knowledge), which emphasizes the integration of technological tools with sound pedagogical practices and content knowledge (Shambare & Simuja, 2024; Ifinedo et al., 2019). Lecturers with high self-efficacy are more likely to use effective learning strategies, set higher academic goals, and show greater perseverance in problem-solving, particularly in subjects like mathematics where confidence strongly correlates with achievement and successful technology integration (Okonkwo & Yusuf, 2021). Against this backdrop, this study intends to evaluate the influence of internet resources utilization on lecturers' self-efficacy in teaching mathematics at colleges of education, Northwest Nigeria.

Statement of the Problem

The teaching and learning of Mathematics in Colleges of Education in Northwest Nigeria are essential for developing analytical thinking, problem-solving skills, and intellectual growth among pre-service teachers. However, the integration of internet resources has become increasingly important for aligning Mathematics instruction with modern pedagogical standards. While digital tools and online platforms offer significant opportunities to improve instructional delivery, access up-to-date content, and foster interactive learning experiences, various challenges hinder their effective use in Mathematics education. A major concern is the limited confidence among many lecturers in using internet resources, which affects their willingness to adopt innovative teaching approaches. This low level of self-efficacy, coupled with limited exposure to digital teaching tools and insufficient institutional support, creates motivational

barriers that reduce engagement with internet-based resources. Furthermore, disparities in access to reliable internet infrastructure and educational technology limit the ability of both lecturers and students to fully benefit from digital learning environments. Integrating online resources into Mathematics education in Northwest Nigeria is no longer optional but necessary. Overcoming the challenges associated with self-efficacy and technological utilization is key to creating a more dynamic, engaging, and effective Mathematics learning environment. Addressing these issues will not only modernize the Mathematics curriculum but also prepare educators and students to meet the demands of a digitally driven educational landscape. This gap forms the central focus of this study.

Objectives of the Study

The study objective was to:

1. determine the influence of internet resources utilization on lecturers' self-efficacy in teaching Mathematics in Colleges of Education in Northwest Nigeria.
2. determine whether lecturers' gender has a significant influence on their utilization of internet resources in teaching Mathematics in Colleges of Education in Northwest Nigeria.

Research Questions

The following research questions were set to guide the study:

1. What is the influence of internet resources utilization on lecturers' self-efficacy in teaching Mathematics in Colleges of Education in Northwest Nigeria?
2. Does gender influence lecturers' utilization of internet resources in teaching Mathematics in Colleges of Education in Northwest Nigeria?

Null Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

- HO₁: There is no significant influence of internet resources utilization on lecturers' self-efficacy in teaching Mathematics in Colleges of Education in Northwest Nigeria.

HO₂: There is no significant difference in the utilization of internet resources in teaching Mathematics among lecturers based on gender in Colleges of Education in Northwest Nigeria.

METHODOLOGY

A descriptive survey design was employed in this study to obtain relevant data from a representative sample of Mathematics lecturers in public Colleges of Education across the North-West Zone of Nigeria. The target population consisted of 304 mathematics lecturers from 10 public Colleges as of February, 2025. To ensure a representative and equitable sampling, three Colleges of Education, comprising 30% of the total, were selected using a stratified sampling method to include both Federal and State institutions. A total of 117 lecturers from the selected colleges were surveyed, with respondents chosen via simple random sampling. The instrument used for data collection was a self-structured questionnaire titled Internet Resources Utilization and Self-Efficacy Questionnaire (IRUSEQ), which comprised 45 items rated on a Four-Point modified Likert Scale.

To ensure the instrument's validity and reliability, it underwent face, content, and construct validation by Mathematics education experts from Ahmadu Bello University and the Federal University of Education, Zaria. A pilot test was conducted using 50 lecturers from Federal College of Education, Kano, who shared similar characteristics with the study sample but were not part of it. The instrument was administered once to a sample of 50 respondents, and its reliability was assessed using the split-half method, where the test items were divided into two equal halves. The correlation between the scores of the two halves was computed and adjusted using the Spearman-Brown formula to estimate the overall reliability coefficient. The resulting reliability index of 0.72 indicated a strong positive correlation, confirming the instrument's consistency. Data collection spanned two weeks, during which the researcher and trained assistants distributed and retrieved the instruments on-site. Confidentiality was assured, and the data

collected were analyzed using inferential statistics, including Pearson Product Moment Correlation (PPMC) and t-test, at a 0.05 level of significance.

RESULTS

Table 1: Pearson Product-Moment Correlation between Internet Resources Utilization and Lecturers' Self-Efficacy

Variables	N	Mean	SD	r	P
Internet Resources Utilization	117	3.85	0.62		
Lecturers' Self-Efficacy	117	3.71	0.75	0.47	0.002*

*Significant at $p < 0.05$

The Pearson product-moment correlation analysis reveals a statistically significant positive relationship between internet resources utilization and lecturers' self-efficacy among the 117 participants. Internet resources utilization had a mean score of 3.85 (SD = 0.62), while lecturers' self-efficacy had a mean score of 3.71 (SD = 0.75). The correlation coefficient ($r = 0.47$) indicates a moderate positive correlation between these two variables, suggesting that as lecturers' utilization of internet resources increases, their self-efficacy also tends to increase. With a p-value of 0.002, which is well below the 0.05 significance level, this relationship is statistically significant and highly unlikely to have occurred by chance.

Table 2: Independent Samples t-test on Gender and Utilization of Internet Resources

Gender	N	Mean	Std	df	Tcal	P value	Remark
Male	66	3.91	0.58				
Female	51	3.72	0.65	115	2.12	0.036	Significant

*Significant at $p < 0.05$

The independent samples t-test results in Table 2 reveal a statistically significant difference between male and female participants in their utilization of internet resources. Male participants ($n=66$) demonstrated higher mean utilization scores ($M=3.91$, $SD=0.58$) compared to female participants ($n=51$, $M=3.72$, $SD=0.65$). With degrees of freedom of 115, the calculated t-value of 2.12 produced a p-value of 0.036, which falls below the 0.05 significance threshold. This indicates that the observed difference in internet resource

utilization between genders is statistically significant and unlikely to have occurred by chance alone.

DISCUSSION

Recent research strongly supports the positive correlation between internet resources utilization and lecturers' self-efficacy. Jerrim et al. (2025) found significant relationships between teacher self-efficacy and instructional effectiveness, demonstrating how technology integration enhances teaching confidence. The meta-analysis by Zhou et al. (2023) revealed that professional development involving technology had a strong positive effect on K-12 STEM teachers' self-efficacy which supports the correlation pattern found in the present study. The finding is in line with that of Wang et al., (2024) which demonstrated that teacher self-efficacy significantly impacts student learning engagement, with technology-enhanced teaching practices showing stronger correlations. Similarly, Futterer et al. (2024) examined technological self-efficacy and online teaching effectiveness, finding strong positive correlations between technology use and teaching confidence. Additional support comes from Song and Cheong (2024) study which examined 379 teachers and found significant positive relationships between technology integration and self-efficacy beliefs. The study of Aytac et al., (2024) also confirmed that teachers who utilized digital resources showed enhanced self-efficacy across multiple domains. However, some recent research suggests more nuanced relationships.

The results regarding gender indicate that the use of internet resources by male and female participants differs statistically significantly. The results align with those of Caluza and Trecene (2018), who found that there are gender differences in how college students perceived their Internet usage. According to a 2019 survey by Hek et al., in counties with educational systems in which students are placed into educational tracks at later ages, gender gaps in reading are bigger because girls gain more from late selection. The findings corroborate earlier studies showing that women use the Internet (social networking sites) more

frequently than men. Buba et al. (2018) also looked at how teenagers' online behaviour, internet accessibility, and purpose differed by gender. The study found that both sexes ranked the Internet as the second most significant medium, even though it is widely utilized and one of the major forms of media. Nevertheless, the findings showed that there are still disparities in how each sex uses the Internet, even though perceptions of it are similar. Boys use the internet more to play games and download apps, while ladies use it more to communicate with friends and conduct information searches. Despite growing interest in the gender variations in Internet usage, little is known about how male and female students in higher education use the internet differently, especially those studying information technology.

CONCLUSION

This study found that lecturers who make good use of internet resources tend to feel more confident and effective in teaching Mathematics. The use of digital tools appears to boost their ability to deliver lessons in ways that are more engaging and understandable for students. Many lecturers agreed that internet resources help them teach better, feel more prepared, and manage their classrooms more effectively. These findings show that access to and familiarity with internet-based teaching tools can play a key role in improving teaching outcomes. The study also found differences in how male and female lecturers use internet resources. While both groups value the internet for teaching, the ways they use it often differ. Male lecturers were more likely to use it for a wider range of teaching activities, while female lecturers tended to focus more on communication and searching for information. These differences highlight the need for support systems that consider individual needs and backgrounds when promoting internet resource use in the classroom.

RECOMMENDATIONS

Based on the findings of the study, the following recommendation was made:

1. Colleges of Education should implement regular, gender-inclusive capacity-building

workshops and digital training sessions for Mathematics lecturers, aimed at improving their proficiency and confidence in using internet-based resources for instructional purposes.

2. Government and institutional authorities should ensure that adequate, accessible, and gender-responsive internet facilities are provided across all colleges, while addressing socio-cultural or technical barriers that may inhibit equal usage among male and female lecturers.

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