

The Predictive Role of Internet-Based Media on Teaching and Learning Outcomes in Technical Education

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Abstract

The study assessed internet-based media as a predictor of teaching and learning outcomes in technical education, specifically at Government Technical College, Oyo. The objectives include examining the availability and utilization of internet-based media, evaluating its impact on skill acquisition and knowledge retention, identifying challenges faced by educators and students, and exploring strategies for improving integration. Using a case study methodology, the research involves a purposive sampling of 100 participants, 80 students and 20 educators ensuring diverse perspectives. Data collection methods include questionnaires for quantitative insights, interviews for qualitative understanding, and classroom observations to assess practical integration. Descriptive statistics were used to analyze quantitative data, while thematic analysis was applied to qualitative responses, providing a comprehensive understanding of the effectiveness of internet-based media in enhancing technical education. The findings revealed that while internet-based media holds significant potential for improving educational outcomes such as skill acquisition and knowledge retention, there are notable challenges including limited digital literacy among educators, unreliable internet connectivity, and insufficient hardware resources. Respondents proposed strategies such as enhanced training programs for educators, investment in infrastructure, provision of affordable hardware, development of localized e-learning content, and collaboration with the private sector to address these barriers effectively. The study underscores the need for a multi-stakeholder approach to strengthen the role of internet-based media in technical education, ultimately contributing to improved teaching and learning outcomes at Government Technical College, Oyo.

Keywords: Internet-based media, Technical education, Digital literacy, Skill acquisition, E-learning

Introduction

The rapid advancement of technology in education has introduced internet-based media such as e-learning platforms, virtual labs, multimedia content, and collaborative software as a transformative force in the teaching and learning of practical concepts. In technical education, where the acquisition of practical skills is paramount, internet-based media is playing an increasingly significant role in enhancing instructional delivery, learner engagement, and skill development. This shift aligns with global trends emphasizing digitalization and technology-driven solutions to address educational challenges (Zulfiqar et al., 2023). Internet-based media provides educators and students with access to vast resources, interactive tools, and real-time collaboration opportunities, making technical education more accessible and effective. McGunagle and Zizka, (2020) defined technical education as an education which engaged with acquire of skills and knowledge to perform well in the fields of engineering, information technology, vocational education and training that demands innovative teaching approaches to meet the evolving demands of industries. However, despite its potential, the adoption of internet-based media in technical education remains uneven, particularly in regions with limited technological infrastructure.

The integration of internet-based media in technical education poses several challenges and opportunities. Olaisen (2022) noted that media bridges the gap between theoretical knowledge and practical application with innovative approaches; however, many technical institutions still struggle with effective implementation of these tools. Government Technical College, Oyo, like many other institutions in Nigeria, might be experiencing infrastructural and resource constraints that limit the full adoption of internet-based media. Factors such as inadequate internet connectivity, limited digital literacy among educators and students, and insufficient funding for technological upgrades hinder effective utilization. Moreover, there may be lack of comprehensive understanding regarding the direct impact of these tools on teaching and learning outcomes in technical education. Understanding the role of internet-based media in technical education is critical in addressing the skills gap in the workforce. As industries demand a more digitally competent workforce, technical institutions must align their teaching methods with technological advancements.

Therefore, this study investigated the predictive role of internet-based media on teaching and learning outcomes in technical education. Additionally, it aims to establish whether the use of internet-based media correlates with improved learning outcomes, particularly in terms of skill acquisition and knowledge retention. By focusing on Government Technical College, Oyo, this research provides a perspective on the impact of internet-based tools in technical education, offering insights that could inform policy decisions and institutional strategies.

Statement of the Problem

The integration of internet-based media in technical education presents both challenges and opportunities. While such media provide innovative means of bridging the gap between theoretical knowledge and practical application, many technical institutions still face difficulties in effectively implementing these tools. Although internet-based media is increasingly incorporated into education, its specific impact and predictive capacity on teaching and learning outcomes in technical education remain underexplored. Technical education, which heavily relies on hands-on, practical instruction, faces unique challenges and opportunities with digital integration. While anecdotal evidence and preliminary studies suggest that tools like online simulations, instructional videos, and e-learning platforms can enhance student engagement and performance.

However, there is still a shortage of empirical research quantifying these effects. As a result, educators and policymakers lack adequate data to support the systematic integration of these tools into technical curricula. This study, therefore, aims to fill this gap by examining how internet-based media predict teaching effectiveness and learning outcomes within technical education contexts. The growing incorporation of digital technologies has reshaped traditional teaching and learning processes. Specifically, in technical education where practical skills and real-world applications are fundamental, internet-based media offers new opportunities for interactive and personalized learning. Accordingly, this study investigates the predictive role of internet-based media in improving teaching and learning outcomes in technical education.

The objectives of the study

The objective of this study is to assess the role of internet-based media as a predictor of teaching and learning outcomes in Government Technical College, Oyo. Specific objectives are to:

- i. Examine the availability and utilization of internet-based media in Government Technical College, Oyo.
- ii. To evaluate how the use of internet-based media influences students' skill acquisition and knowledge retention in Government Technical College, Oyo.
- iii. To identify the challenges encountered by educators and students in the utilization of internet-based media in Government Technical College, Oyo.
- iv. To explore strategies for enhancing the effective utilization of internet-based media in Government Technical College, Oyo.

Research Questions

- i. To what extent are internet-based media available and utilized in Government Technical Colleges in Oyo State?
- ii. How does the use of internet-based media impact students' skill acquisition and knowledge retention in Government Technical College, Oyo?
- iii. What are the challenges encountered by educators and students in the utilization of internet-based media in Government Technical College, Oyo?
- iv. What are the strategies for enhancing the effective utilization of internet-based media in Government Technical College, Oyo?

Internet-Based Media and Learning Outcomes

Internet-based media and digital tools can significantly influence student learning outcomes, though the nature of the effects often depends on how these tools are used. For example, a systematic review of online learning literature reports that engagement with online platforms and digital content has positively affected student performance and interaction in various contexts, especially when coupled with broadband access and supportive infrastructure, with enhanced engagement and academic performance noted through regression and inferential analysis of student data (Sobia Tasneem et al., 2025). Similarly, studies in digital education find that digital literacy, mediated by factors like self-efficacy and the learning atmosphere, plays a crucial role in translating internet usage into improved academic outcomes, demonstrating pathways through which internet-based media contribute to performance gains among university students (Yuan, Qiuhui & Liu, 2025). However, the literature also highlights complexity in the relationship between internet-based media and learning. Some research emphasizes that while

structured and purposeful online activities enhance understanding and mastery of academic content, unmanaged or high-volume use of social platforms and non-educational internet time can detract from focused study and lower academic achievement, illustrating dual effects of internet use on learning outcomes (Jacob & Centofanti, 2024).

Technology Acceptance Model (TAM)

The Technology Acceptance Model, developed by Davis (1989), explains how users come to adopt and use technology based on two key perceptions: perceived usefulness and perceived ease of use. In the context of technical education, TAM suggests that teachers and students are more likely to integrate internet-based media into teaching and learning when they believe it enhances instructional effectiveness and is easy to operate. Studies have shown that TAM can predict not only the frequency of technology use but also the quality of engagement, implying that students' learning outcomes improve when internet-based tools are accepted and actively utilized in classroom activities.

Constructivist Learning Theory

Constructivist Learning Theory, rooted in the work of Piaget and Vygotsky, posits that learners actively construct knowledge through experiences and social interactions rather than passively receiving information. In technical education, this theory supports the use of internet-based media such as simulations, virtual labs, and collaborative platforms, which allow learners to explore, experiment, and solve real-world problems. By promoting hands-on engagement and critical thinking, constructivist approaches ensure that digital tools enhance not just knowledge retention but also skill acquisition, thereby improving both cognitive and psychomotor learning outcomes.

Connectivism Theory

Connectivism, proposed by Siemens (2005), emphasizes learning as a networked process, where knowledge resides not only within individuals but across digital and social networks. Internet-based media enable learners in technical education to connect with peers, instructors, and online resources, fostering collaborative problem-solving and up-to-date knowledge acquisition. This theory highlights that effective learning occurs when students navigate and

make connections within complex information networks, implying that exposure to diverse digital media sources can predict better learning outcomes and more adaptable technical skills.

Cognitive Load Theory

Cognitive Load Theory, formulated by Sweller (1988), focuses on the limitations of working memory during learning. It distinguishes between intrinsic, extraneous, and germane cognitive load and argues that instructional materials should reduce unnecessary mental effort. In technical education, internet-based media can be designed to minimize extraneous load through clear instructions, visualizations, and interactive demonstrations, enabling students to focus on essential technical concepts and skill mastery. Properly structured digital content therefore improves comprehension and retention, ultimately enhancing learning outcomes.

Media Richness Theory (optional)

Media Richness Theory, introduced by Daft and Lengel (1986), suggests that communication media vary in their ability to convey information effectively, with richer media better suited for complex or ambiguous tasks. Applied to technical education, richer internet-based media such as videos, simulations, and interactive tutorials are more effective than text-based resources for conveying practical and procedural knowledge. This theory supports the predictive role of high-quality digital media in improving both teaching effectiveness and student learning outcomes, particularly in skill-intensive technical subjects.

Technology Acceptance Model (TAM): Recent studies applying TAM show that perceived usefulness and ease of use of digital tools (including social media and AI-assisted platforms) significantly shape learners' intentions to engage with online learning technologies, which in turn affect learning outcomes and resilience. For example, research on AI tool adoption among English learners found that positive acceptance of AI platforms boosted learning motivation and metacognitive strategies, which enhanced adaptive learning behaviors and resilience indicating that when users accept internet-based media, outcomes like engagement and academic persistence improve (Le Yao & Yantong Liu, 2025).

Constructivist Learning Theory: Current research underscores that constructivist approaches integrated with digital technologies enhance collaborative learning, student engagement,

interaction with peers and instructors, and satisfaction which in turn improves students' academic achievement online. Empirical studies (e.g., social media use during the pandemic) have shown that increased student engagement through online collaborative learning, grounded in constructivist principles, positively predicted online learning performance and academic success, demonstrating how constructivist theory explains why technology-rich environments can enhance learning outcomes (Abdullah, Ward, & Ahmed, 2024). Connectivism Theory: Connectivism's relevance in the digital age has been reinforced by recent literature showing it frames how knowledge is accessed, shared, and co-constructed across online networks and Web-based resources, influencing learning outcomes by promoting active engagement with diverse knowledge sources. Review studies highlight connectivism's role in formal and informal digital learning environments, suggesting improved adaptability, creativity, and innovation among learners engaging with networked technologies . (Alioon, & Delialioglu, 2025).

Cognitive Load Theory: Modern research integrating AI and multimedia within cognitive load frameworks demonstrates that well-designed digital learning materials that manage cognitive load can improve comprehension and retention*. For instance, frameworks that adjust content delivery dynamically based on learner needs (AI-mediated cognitive load management) help decrease extraneous load and support schema development, thereby enhancing learning effectiveness in online contexts (Schneider, Nebel, Beege, & Rey, 2025).

Media Richness Theory (optional but useful): Although not as widely studied empirically in the latest research as some other theories, media richness principles are reflected in studies showing that richer media formats (like videos, interactive simulations, and multimodal content) tend to yield better learning outcomes compared with leaner media, because they convey nuanced information more effectively especially for complex or practical tasks in online and blended learning environments. This aligns with broader evidence on how multimedia tools and interactive platforms enhance student engagement and achievement (Chen & Wu, 2025).

Methodology

This study employs a case study approach to investigate the role of internet-based media in technical education, focusing on Government Technical College, Oyo. The population comprises students and educators at the college, and a purposive sampling technique was used to select 100 participants, comprising 80 students and 20 educators, to ensure comprehensive

representation of key stakeholders. This approach highlights the diverse perspectives within the institution and provides a well-rounded analysis of the topic. To collect data, the study utilizes a combination of questionnaires, interviews, and observations. Questionnaires were distributed to students and educators to gather quantitative data on the availability, usage, and perceived impact of internet-based media. In addition, interviews were conducted with educators to obtain qualitative insights into the challenges and benefits associated with incorporating internet-based media into technical education. Classroom sessions were also observed to assess the practical integration of internet-based media into teaching practices. Descriptive statistics (frequency and percentage) were used to analyze the data and provide a comprehensive understanding of the role and effectiveness of internet-based media in enhancing technical education at the college

Results and Discussion of Findings

This section provides a detailed analysis of the study's objectives using data collected from Government Technical College, Oyo. The data was gathered through structured questionnaires, interviews with educators, and classroom observations.

Research question 1: To what extent are internet-based media available and utilized in Government Technical Colleges in Oyo State?

Table 1: Responses on Availability and Utilization of Internet-Based Media

Variable	Number Respondents (N=100)	of Frequency (%)
Availability of internet-based tools (e.g., e-learning platforms, multimedia resources)	72	72%
Frequency of usage by students	40	40%
Frequency of usage by educators	25	25%
Accessibility of reliable internet	35	35%
Availability of functional hardware (e.g., computers, projectors)	48	48%

Source: Author's Survey, 2025.

The data reveals that internet-based tools, such as e-learning platforms and multimedia resources, are moderately available, with 72% of respondents confirming their presence in

Government Technical College, Oyo. However, the frequency of usage is low, as only 40% of students and 25% of educators reported regularly utilizing these tools. This underutilization can be attributed to challenges such as unreliable internet connectivity, which only 35% of respondents deemed reliable, and insufficient functional hardware, such as computers and projectors, which were considered adequate by just 48% of respondents. This finding highlights a gap between the availability of resources and their effective utilization, suggesting that infrastructural improvements and increased awareness are needed to enhance the use of internet-based media in technical education. This aligns with the findings of Ajani (2025), which show that Learning Management System platforms (such as Canvas, Google Classroom, TalentLMS, Moodle, and Blackboard) are used by most students in this rural university, indicating moderate to high utilization. In contrast, Oyekunle et al. (2024) note insufficient digital literacy: only about 40% of educators feel confident using digital tools, and just 25% have received formal training. This reflects similar barriers faced by students and educators at Government Technical College, reinforcing the need for enhanced support and resources. However, research conducted by Ghavifekr and Rosdy (2015) shows that teachers who receive adequate training in ICT integration tend to facilitate better learning outcomes for students. Government Technical College may face challenges due to insufficient training and support provided to its educators.

The findings from Government Technical College underscore a critical gap between resource availability and effective utilization, primarily due to infrastructural challenges and lack of training. Supporting literature reinforces the notion that while internet-based tools hold significant potential for enhancing education, their impact is contingent upon overcoming existing barriers related to technology access, teacher preparedness, and institutional support.

Research question 2: How does the use of internet-based media impact students' skill acquisition and knowledge retention in Government Technical College, Oyo?

Table 2: Responses on How Internet-Based Media Impact students' skill acquisition and knowledge retention

Variable	Number of Respondents (N=80 students)	Improved (%)	No Improvement (%)
Understanding of technical concepts	58	72.5%	27.5%
Practical skill development	50	62.5%	37.5%
Retention of theoretical knowledge	62	77.5%	22.5%
Overall academic performance	55	68.7%	31.3%

Source: Author's Survey, 2025.

The findings indicate a strong positive impact of internet-based media on learning outcomes. A significant proportion of students (72.5%) reported improved understanding of technical concepts, while 62.5% noted better practical skill development. Additionally, 77.5% of respondents highlighted an improvement in their retention of theoretical knowledge, and 68.7% observed an overall enhancement in academic performance. Despite these positive outcomes, approximately 31.3% of students reported no significant change in their learning, suggesting that while internet-based media is effective for most learners, certain factors, such as limited access, lack of training, or personal engagement issues, might hinder its effectiveness for some students. The results highlight the capacity of internet-based media to improve technical education, especially by promoting better comprehension and long-term retention of knowledge. In a similar vein, Akintayo et al. (2024) conducted a systematic review which emphasizes that educational technologies substantially contribute to academic performance, knowledge retention, and the development of critical thinking skills. The review synthesizes findings from multiple studies, indicating that effective integration of digital tools leads to improved student engagement and performance, which resonates with the reported improvements in understanding technical concepts and retention of theoretical knowledge among students. However, while many students report positive outcomes, approximately 31.3% noted no significant change in their learning experiences. Taha and Abdulrahman (2023) argue that the impact of technology in education depends on both how users engage with it and the way educational tools are designed. This suggests that without proper training and engagement, some learners may not fully benefit

from these resources. The evidence supports the assertion that internet-based media positively impacts learning outcomes, particularly in enhancing understanding and retention in technical education. However, it also acknowledges limitations faced by certain students due to factors such as access issues and lack of training. This dual perspective underscores the necessity for comprehensive strategies that not only incorporate technology but also address the challenges faced by educators and learners alike.

Research question 3: What are the challenges encountered by educators and students in the adoption of internet-based media in Government Technical College, Oyo?

Table 3: Challenges in Adopting Internet-Based Media

Challenges	Number of Respondents (N=100)	Frequency (%)
Lack of digital literacy among educators	68	68%
Unreliable internet connectivity	60	60%
Insufficient functional hardware	52	52%
High cost of internet access	48	48%
Resistance to change from traditional teaching methods	35	35%

Source: Author's Survey, 2025.

The study identified several challenges that hinder the utilization of internet-based media in Government Technical College, Oyo. The primary obstacle identified was educators' limited digital literacy, noted by 68% of participants, highlighting an urgent need for training programs to provide teachers with the essential skills. Unreliable internet connectivity was the second most reported challenge, cited by 60% of respondents, followed by insufficient hardware resources, which 52% of participants identified as a barrier. High internet costs were also a concern, with 48% of respondents highlighting affordability issues. Additionally, 35% of respondents noted resistance to transitioning from traditional teaching methods to technology-based approaches. These challenges emphasize the importance of a holistic approach that tackles both infrastructural and human-related factors to facilitate the effective incorporation of internet-based media into teaching and learning. The finding that 68% of respondents identified a lack of digital literacy among educators as a significant barrier is consistent with literature indicating that

teacher proficiency in technology is crucial for successful integration. A study by Al-Hikmah University emphasizes that inadequate teacher training and digital skills significantly hinder the adoption of internet-based teaching methods in Nigeria, echoing the need for comprehensive training programs to enhance educators' capabilities (Ajani et al., 2022). Similarly, a research conducted by Olowo (2021), assessing e-learning in Oyo State highlights that while students show awareness and participation in e-learning programs, challenges such as inadequate power supply and high subscription costs hinder their effective use.

In line with this study, Udeze and Adesola (2024) found that inadequate internet bandwidth and weak infrastructure are major issues. The high cost of devices and limited technical support make it difficult for both teachers and students to fully engage with e-learning tools. Although numerous studies identify these obstacles, Ahmad et al. (2023) note that, with proper training and support, educators can successfully incorporate technology into their teaching practices, even in the face of initial resistance. For instance, research has indicated that positive experiences with technology can gradually shift attitudes towards its use in educational settings. The challenges identified in the study at Government Technical College reflect broader trends observed in educational technology adoption research. Addressing these barriers through targeted training programs, improving infrastructure, and fostering a culture open to technological change will be essential for enhancing the use of these media tools into teaching and learning practices.

Research question 4: What are the strategies for enhancing the effective utilization of internet-based media in Government Technical College, Oyo?

Table 4: Suggested Strategies for Improvement

Strategies	Number of Respondents (N=100)	Frequency (%)
Training programs for educators	78	78%
Investment in internet infrastructure	72	72%
Provision of affordable or free hardware	64	64%
Development of localized e-learning content	60	60%
Collaboration with private sector	55	55%

The respondents proposed several strategies to improve the utilization of internet-based media in technical education. Training programs for educators were the most frequently suggested solution, supported by 78% of respondents, reflecting the importance of equipping teachers with digital skills. Investment in internet infrastructure was another priority, with 72% of participants emphasizing the need for reliable connectivity. The provision of affordable or free hardware was suggested by 64% of respondents, indicating the necessity of addressing resource gaps. Additionally, 60% of participants recommended the development of localized e-learning content tailored to the specific needs of technical education, while 55% highlighted the importance of collaboration with the private sector to secure funding and resources. These strategies highlight the importance of a multi-stakeholder approach in addressing the barriers to adoption and optimizing the benefits of internet-based media in technical education. The suggested measures aim to enhance the integration of internet-based media at Government Technical College, Oyo, reflect a comprehensive approach supported by existing literature on educational technology. The emphasis on improving internet connectivity, supported by 72% of participants, is echoed in various studies that indicate reliable internet access is critical for effective e-learning. Research shows that enhancing digital infrastructure directly contributes to better educational experiences and outcomes, as it allows educators to utilize online resources without interruptions (Subrahmanyam, 2022). The strategies proposed by respondents at Government Technical College are well-supported by existing research on effective practices for integrating internet-based media into technical education. Emphasizing teacher training, infrastructure investment, localized content development, and private sector collaboration presents a multi-faceted approach to overcoming barriers and maximizing the benefits of digital tools in education. However, attention must also be given to potential challenges in implementation and guaranteeing that all learners have equal access to resources.

Discussion

The analysis confirms that internet-based media has significant capacity to improve teaching and learning outcomes in technical education. However, infrastructure, resource, and cultural barriers must be addressed to fully realize its benefits. Institutions like Government Technical College, Oyo, must prioritize training, resource allocation, and collaboration with stakeholders to ensure the effective integration of internet-based media. The analysis also demonstrates that its utilization is limited by infrastructural challenges, resource constraints, and

digital literacy gaps among educators. Despite these challenges, it has positively impacted students' learning outcomes, particularly in terms of skill acquisition and knowledge retention. This suggests that, with targeted interventions, internet-based media can play a transformative role in technical education. The proposed strategies, including educator training, infrastructure investment, and private-sector collaboration, provide actionable pathways for addressing these challenges and improving the integration of internet-based media in institutions like Government Technical College, Oyo. The study concludes that internet-based media significantly enhance teaching and learning outcomes in technical education. However, its impact is limited by infrastructural challenges and digital literacy gaps.

Recommendations

By addressing these following challenges, technical institutions like Government Technical College, Oyo, can fully leverage the benefits of internet-based media to prepare students for the demands of a technology-driven workforce:

1. Teachers should increase consistent use of available digital tools, engage in continuous ICT training, and integrate internet-based resources to enhance students' learning experiences.
2. College administrators should expand digital resources, ensure reliable access, and provide continuous staff training to maximize internet-based media's positive impact on students' learning outcomes.
3. Government should eliminate utilization barriers by upgrading connectivity, expanding ICT facilities, subsidizing internet access, and implementing intensive digital training for all technical educators.
4. Government and administrators should develop localized e-learning content, collaborate with the private sector to improve infrastructure, and provide affordable teacher resources.

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