



ICT integration in teaching and learning: Perceptions and practices in Ghanaian college of education

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Abstract

This research study investigates the perceptions and practices of Information and Communication Technology (ICT) integration in teaching and learning within Ghanaian Colleges of Education. With the increasing recognition of ICT as a valuable tool in education, it is crucial to understand how these technologies are being utilized in the context of teacher training institutions, specifically in Ghana. The research employs a qualitative data collection method. Semi-structured interviews were conducted to gather comprehensive insights into the perceptions and practices of ICT integration among college faculty and students. The participants include teacher educators, and pre-service teachers in Ghanaian College of Education. Through thematic analysis, the qualitative data provide a deeper understanding of various stakeholders' attitudes, beliefs, and perceptions toward ICT integration. The findings of this study contribute to the existing body of knowledge on ICT integration in teaching and learning in Ghanaian College of Education. It will shed light on the current practices, challenges faced, and potential opportunities for improvement. The research outcome can inform policy decisions, curriculum development, and professional development initiatives to enhance ICT integration within teacher training programs in Ghana. By addressing the perceptions and practices surrounding ICT integration, this study aspires to support the transformation of teacher education, leading to more proficient and technologically equipped educators prepared for the 21st-century classroom challenges.

Keywords:

Information and communication technology
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1. Introduction

Integrating Information and Communication Technologies (ICTs) in teaching and learning has grown more common in recent years, notably in Ghanaian Colleges of Education. ICT integration has the potential to help both tutors and students by increasing access to information, improving communication and collaboration, and increasing student engagement and motivation. The success of ICT integration in teaching and learning, however, is dependent on a variety of factors, including tutors' and students' views of ICTs, attitudes toward their usage in the classroom, and the extent to which ICTs are incorporated into instructional periods.

In recent years, research at Ghanaian colleges of education has investigated many aspects of ICT integration in teaching and learning, such as tutors' and students' perceptions and practices. [Owusu-Acheaw and Larson \(2016\)](#), for example, investigated the factors influencing ICT adoption in teaching and learning in a Ghanaian College of Education, while [Sakyi and Boateng \(2019\)](#) investigated the challenges and opportunities of ICT adoption in teaching and learning in Ghanaian Colleges of Education. These and other studies have emphasized the necessity of knowing tutors' and students' attitudes and practices about ICTs to effectively integrate them into teaching and learning.

As a result, this study investigates tutors' and students' perceptions and practices of ICT integration in teaching and learning at a Ghanaian college of education. The study's findings will add to existing research on ICT integration in teaching and learning in Ghana, as well as providing useful insights into how to best promote successful ICT integration in the classroom.

2. Literature Review

Information and Communication Technology (ICT) integration in teaching and learning has gained significant attention in the education sector worldwide, including Ghana. As technology advances, there is a growing recognition of the potential benefits that ICT can bring to educational practices. This literature review explores the perceptions and practices of ICT integration in teaching and learning, specifically within Ghanaian College of Education settings.

2.1. Trends in ICT Integration

The literature suggests several noteworthy trends in the integration of ICT in higher education. First, there has been a shift from traditional face-to-face instructional methods towards blended and online learning environments enabled by ICT tools ([Dabbagh & Kitsantas, 2012](#)). This trend has been driven by technological advancements, increased internet access, and the need to cater to diverse learner needs. Second, there is an increased emphasis on using learning management systems (LMS) as a central platform for course delivery, content management, and student engagement ([Garrison & Vaughan, 2008](#)).

LMS platforms provide a range of features such as online discussions, assignment submissions, and grade management, promoting interaction and collaboration among students and instructors. Third, the emergence of mobile learning and the proliferation of smartphones and tablets have expanded opportunities for any-time, anywhere learning ([Traxler, 2018](#)). Mobile devices and applications offer new avenues for accessing educational resources, engaging in collaborative activities, and enhancing communication between students and instructors.

2.2. Benefits of ICT Integration

The literature review highlights several potential benefits of ICT integration in higher education. First and foremost, ICT tools enable personalized and student-centered learning experiences ([Means, Toyama, Murphy, Bakia, & Jones, 2010](#)). Adaptive learning systems, intelligent tutoring systems, and online resources provide students with individualized learning pathways, tailored feedback, and opportunities for self-paced learning. Second, ICT integration enhances student engagement and active learning ([Kuh, 2009](#)).

Online discussions, multimedia content, gamified elements, and collaborative projects facilitate interactive learning experiences, promoting higher levels of student involvement. Third, integrating ICT supports the development of digital literacy and 21st-century skills necessary for students' future careers ([Selwyn, 2016](#)). By using ICT tools, students gain proficiency in information retrieval, critical thinking, problem-solving, and communication, preparing them for the demands of the digital age.

2.3. Challenges and Considerations

The literature identifies challenges and considerations in ICT integration within higher education despite the potential benefits. Faculty resistance and the need for adequate technological skills are common barriers to effective ICT integration ([Dennen & Burner, 2008](#)). In addition, faculty members may face challenges in adapting their teaching approaches to online environments and may require professional development and support to enhance their technological pedagogical knowledge. Additionally, the digital divide and unequal access to technology and the internet among students can exacerbate educational inequalities ([Warschauer, 2013](#)).

Educational institutions must address affordability, connectivity, and digital literacy issues to ensure equitable access to ICT resources and opportunities for all students. Finally, privacy, security, and copyright issues pose ethical and legal challenges in using ICT tools and digital content within educational settings (Mason & Rennie, 2014). In addition, institutions must implement appropriate policies and safeguards to protect student data and ensure compliance with copyright laws.

Several studies have explored students' perceptions of ICT integration and its effects on their learning experiences. For instance, Johnson (2015) conducted interviews with undergraduate students. He discovered that students valued the flexibility and accessibility provided by ICT tools, which allowed them to learn at their own pace and collaborate with peers more effectively. These findings suggest that students perceive ICT integration positively, acknowledging its potential to enhance learning outcomes.

However, some studies have also identified challenges and concerns expressed by students, revealing that students reported feelings of distraction and reduced focus due to the presence of ICT tools during class. Moreover, students raised concerns about technical issues and difficulties navigating complex digital platforms. These mixed perceptions indicate the need for careful implementation strategies to maximize the benefits of ICT integration while addressing potential drawbacks.

2.4. Perception of Tutors

The perceptions and attitudes of tutors toward ICT integration play a crucial role in its effective implementation. A study by Anderson and Maninger (2007) highlighted that tutors often positively perceive ICT integration, recognizing its potential to improve teaching and student engagement. Tutors expressed enthusiasm about the ease of accessing digital resources and the ability to customize learning experiences. Additionally, tutors appreciated ICT tools' collaborative opportunities, enabling them to share resources and communicate with students more efficiently.

On the other hand, several studies have highlighted challenges tutors face when integrating ICT into their teaching practices. For instance, Perkmen (2014) found that tutors experienced difficulties managing technology-related issues, such as troubleshooting and software compatibility. Additionally, tutors expressed concerns about the time required for technology integration and the need for ongoing professional development to use ICT tools effectively. These findings emphasize the importance of providing adequate support and training to tutors to enhance their confidence and competence in utilizing ICT effectively.

2.5. Pedagogical Approaches to the Integration of ICT in Education

Several pedagogical approaches have been proposed for the integration of ICT in education. One approach is the constructivist approach, which emphasizes student-centered learning and active participation in learning (Howland, Jonassen, & Marra, 2012). Another approach is using Web 2.0 tools, which enable collaboration and interaction among students and between students and teachers (Den Exter, Rowe, Boyd, & Lloyd, 2012). The flipped classroom approach, which involves students watching instructional videos outside the classroom and engaging in hands-on activities during class time, has also gained popularity recently (Strayer, 2012).

2.6. Models of ICT Integration

Educators and researchers have explored various models and frameworks to understand the effective integration of ICT tools and resources in teaching and learning environments. The next session will discuss the various models that promote ICT integration in teaching and learning.

2.7. Technological Pedagogical Content Knowledge (TPACK) Model

One widely recognized model is the Technological Pedagogical Content Knowledge (TPACK) framework proposed by Mishra and Koehler (2006). TPACK emphasizes the intersection of technological, pedagogical, and content knowledge. Several studies have utilized the TPACK framework to explore the integration of ICT in various educational contexts (Angeli & Valanides, 2009; Mishra & Koehler, 2006). In addition, researchers have found that the TPACK model provides a comprehensive understanding of how technology can be effectively used to enhance teaching and learning processes.

2.8. SAMR Model

The SAMR (Substitution, Augmentation, Modification, Redefinition) model, introduced by Puentedura (2006), offers a hierarchical structure for assessing the extent of technology integration in the classroom. This model suggests that teachers progress from using technology as a substitute for traditional instructional methods to transforming the learning experience through technology. Researchers have examined the application of the SAMR model in various educational settings, indicating its usefulness in guiding educators toward more innovative uses of technology (Hamilton, Rosenberg, & Akcaoglu, 2016; Wu & Chen, 2018).

2.9. TPI Model

The Technology Pedagogy and Content Knowledge (TPACK) framework is extended by the Technological Pedagogical Instruction (TPI) model proposed by Archambault and Crippen (2009). The TPI

model integrates three key components: technological knowledge, pedagogical knowledge, and instructional decision-making. Studies utilizing the TPI model have highlighted its effectiveness in guiding teacher educators and instructional designers to develop technology-rich learning environments (Archambault & Crippen, 2009; Van Es & Sherin, 2010).

2.10. RAT Model

The RAT (Replacement, Amplification, Transformation) model, introduced by Hughes, Thomas, and Scharber (2006), focuses on the transformative potential of ICT integration in education. This model classifies the extent of technology integration based on its purpose and impact on teaching and learning practices. Researchers have explored the RAT model's application in various educational contexts, emphasizing the importance of the transformative use of technology to enhance student engagement and learning outcomes (Almekhlafi & Almeqdadi, 2010; Wiggins, 2017).

These models help educators and policymakers make informed decisions regarding the effective use of technology in teaching and learning. Further research is needed to explore the long-term effects of ICT integration models and to develop comprehensive frameworks that consider the evolving nature of technology and its impact on education.

3. Methodology

This research employed the qualitative approach to provide a comprehensive understanding of the topic by using qualitative data. The study involved ten (10) tutors and forty (40) students within the Mampong Municipality Colleges of Education and used interviews to gather data. This section outlines the research design, participants, data collection procedures, and data analysis techniques for this study.

3.1. Research Design

The research design for this study will utilize a qualitative approach to explore the perceptions and practices of ICT integration in teaching and learning among tutors and students in a Ghanaian College of Education. The qualitative approach is suitable for understanding individuals' subjective experiences, attitudes, and behaviours in their natural settings.

3.2. Participants

The study used a purposive sampling technique to select ten (10) tutors and forty (40) students from the selected College of Education in the Mampong Municipality of the Ashanti Region of Ghana. In addition, participants were selected based on their experience and involvement in teaching and learning activities using ICT.

4. Data Collection Procedures

4.1. Qualitative Data Collection

Semi-structured interviews were conducted with a subset of participants, including tutors and students. The interviews explored participants' experiences, attitudes, and challenges related to ICT integration in teaching and learning. Open-ended questions were used to encourage participants to provide detailed responses.

5. Data Analysis

5.1. Qualitative Data Analysis

Thematic analysis was conducted to analyze the qualitative data obtained from the interviews. Transcripts from the interviews were coded and organized into themes and categories. This process involved identifying patterns, similarities, and differences in participants' perceptions and practices. NVivo software was used to assist in organizing and analyzing the qualitative data.

5.2. Ethical Considerations

Ethical guidelines were followed throughout the research process. Informed consent was obtained from all participants, and their confidentiality and privacy were ensured. In addition, the study complied with ethical standards and regulations set by the Ghanaian College of Education and all relevant institutional review boards.

5.3. Limitations

It is essential to acknowledge some potential limitations of this study. For example, the findings may be limited to the specific context of the Ghanaian College of Education selected for the study and may need to be generalizable to other institutions or educational settings. Additionally, the sample size may only represent some of the population, which could affect the external validity of the findings.

6. Findings Presentation and Discussion

6.1. Theme 1: Perceptions of ICT Integration

Positive Attitudes towards ICT Integration: Most tutors and students expressed positive attitudes towards ICT integration in teaching and learning. They acknowledged its potential to enhance engagement, improve access to information, and foster critical thinking skills. One participant agrees that he uses ICT to teach because using ICT tools in the classroom makes teaching and learning enjoyable. He said:

Participant 1 (Tutor): *"ICT tools make teaching and learning more interesting and interactive. They can facilitate student-centered learning and promote collaboration among students."*

Aside from making teaching and learning exciting and interactive, another participant said that she has a positive attitude toward ICT integration, so she allows her students to use their smartphones to search for information to support what they are learning. She says:

Participant 6 (Tutor): *"I allow my students to use their smartphones to search for information on terminologies that are difficult for students to understand."*

Most students also showed that they know ICT integration. A student participant said that some of their tutors use PowerPoint to teach, which helps them understand the concept better than those who teach without PowerPoint presentations. He stated that:

Participant 18 (Student): *"Some of our tutors prepare power point presentations and use them to teach us. This makes the teaching and learning more interactive, and students understand it better than lessons not taught with the PowerPoint presentation."*

The responses above imply that tutors and students have positive knowledge about the use of ICTs and its benefits in teaching and learning. For example, researchers have emphasized that individuals with positive attitudes toward ICT are likelier to adopt and effectively use technology daily (Agudo-Peregrina, Hernández-García, & Pascual-Miguel, 2014). Therefore, The finding supports a study by Ertmer (2005) which highlighted that positive attitudes toward technology positively influence the acceptance and adoption of ICT among educators, leading to more effective integration in educational settings.

Challenges and Concerns: However, participants also highlighted several challenges and concerns. Both tutors and students complained of challenges hindering ICT's effective classroom integration. They mentioned challenges such as limited access to ICT infrastructure, inadequate training, and a lack of technical support as significant barriers to effective ICT integration. Participant 9 (tutor) stated that:

Participant 9 (Tutor): *We face many challenges using technology in the classroom. My college has smartboards in the classroom, but tutors have not been trained to use them, so a few tutors who know their usage use them to teach."*

Participant 10 (Tutor) added, *"Tutors should be trained to integrate technology effectively in their teaching and learning process."*

While some tutors requested training, others complained of lacking technical support. A tutor participant said during the interview that some tutors are old and need to learn to use modern technologies. Therefore, he suggested that colleges employ technical assistants to support tutors in the classroom when using ICTs. For instance, participant 2 (tutor) said:

Participant 2 (Tutor): *"Some of us tutors example is, me, are old and do not have in-depth knowledge on how some of the ICT tools are used, so I think the college should employ technical assistants to assist tutors who find it difficult to use ICTs in the classroom."*

Some students also complained of challenges that make the integration of ICT in the classroom difficult for both tutors and students. For example, participant 21 (student) mentioned the limited ICT infrastructure in her college that prevents tutors from using ICTs in their teaching. She said:

Participant 21 (Student): *"We have minimal access to computers and the internet. It becomes challenging to utilize ICT in our learning process fully."*

Moreover, another student participant iterated that his college has few computers, which prevents students from having a one-to-one use of computers to learn. He mentioned that:

Participant 30 (Student): *"In my college, there are computers, but there are very few. The number of students in a class outnumbers the computers we have. This makes tutors group about five students to one computer."*

Technology integration in the teaching and learning process at the college level faces several challenges that need to be considered if ICT integration is expected to be at a higher level. For example, the study finding aligns with Chen (2017) who said that availability of reliable and high-speed internet infrastructure and other ICT resources is pivotal for implementing ICT initiatives.

6.2. Theme 2: Current Practices of ICT Integration

Limited Integration in Classroom Instruction: The study revealed minimal ICT integration in classroom instruction. Tutors primarily used ICT tools for presentations or demonstrations rather than integrating them into daily lessons. The participants indicated a need for more confidence and expertise in using ICT tools effectively. Participant 3 (tutor) said:

Participant 3 (Tutor): *"I use PowerPoint occasionally but do not feel comfortable using other ICT tools. I need more training and support to integrate them properly."*

While Participant 3 (tutor) feels uncomfortable using ICTs, participant 8 (tutor) added that he feels students will laugh at him if he uses the technology. He is not able to use it as expected of him. He said:

Participant 8(tutor): *"Most students have been using modern technology, so I feel that students will laugh and mock me if I try using the ICT tools and I'm not able to use them perfectly. This prevents me from using the ICTs but goes ahead with my lecture teaching method to avoid disgrace."*

It is revealed that tutors lack self-confidence and self-esteem to use ICTs in their teaching. This situation may be linked to a need for more training on using ICTs in teaching and learning.

Promoting ICT Skills through Extracurricular Activities: Some students mentioned developing ICT skills through extracurricular activities such as computer clubs and competitions. These activities provided an opportunity for hands-on learning and enhanced their technological proficiency. Interview participants 38 (student) stated the need for all students to join ICT clubs to acquire ICT skills and knowledge. He said:

Participant 4 (Student): *"Joining the computer club has helped me improve my ICT skills. We learn practical applications, and it is more engaging than regular classes. I entreat all my colleagues in various colleges to join the ICT club or establish one if they do not have one in their college. It helps."*

The student believes that some of his colleagues are good at using various ICTs, so he supports the idea that students should establish ICT clubs in the colleges to help those with less knowledge and skill in ICT to learn from others. Because of this, another participant (student) also added the need for students to buy laptops to practice outside the classroom. She stated that:

Participant 12 (Student): *"I think it will be necessary that students buy their own laptops since the computers are not many at college lab. This will help students practice on their laptops independently during free time and also be able to type their assignments to avoid errors and mistakes we encounter when those at the printing presses make when typing the assignments for us."*

Participant 17 (Student) also believes that students should be assigned to the computer lab and given assistance from IT officers to help them learn how to use the computer during free periods and weekends. He said:

Participant 17 (Student): *"Some of us students lack the skills in using computers, so it becomes difficult for us to use them during class hours. Therefore, I wish the college could put us into groups and assign us to the computer lab. I am hopeful that if we are assigned to the lab in groups and given tutorials on how to use the computers by the technical assistants, we will acquire the skill to use the computer effectively during teaching and learning."*

In line with the above statements, a tutor participant supported asking students to acquire laptops and giving weekend tutorials. He said:

Participant 9 (Tutor): *"It will be prudent to allow students to buy their laptops and bring them to school. I believe that if most of the students have their laptops, the pressure on the computers at the lab will be reduced, and IT technical assistants could also give tutorials to them on how to use the computers in teaching and learning."*

Research studies have highlighted the positive impact of extracurricular activities on ICT skill development. For instance, the study finding matched a study conducted by [Smith and Hill \(2019\)](#), who found that participation in a coding club enhanced students' coding skills, digital literacy, and computational thinking abilities. Therefore, students should be given private training on using computers and other ICT-related devices to promote effective ICT integration through extracurricular activities.

6.3. Theme 3: Strategies for Improving ICT Integration

Enhanced Infrastructure and Access: Tutors and students emphasized improved infrastructure and increased access to ICT resources. They called for more computers, reliable internet connectivity, and access to relevant educational software and online resources. The participants believe that tutors will integrate technology into their teaching and learning process when ICT infrastructure is enhanced in college education. For example, Participant 3 (tutor) said that it would be easier to effectively integrate technology in teaching and learning with the availability of ICT infrastructure. She says:

Participant 3 (Tutor): *"Without adequate infrastructure, it is challenging to integrate ICT into our teaching effectively. We need more computers and reliable internet connectivity."*

Most participants support the improvement of ICT integration in the colleges of education and believe that effective strategic plans could promote effective integration in the classroom. For instance, participant 2 (tutor) believes that college management should draft an ICT integration policy or make it available to tutors if it already exists to bind tutors to use ICTs in their teaching. He said:

Participant 2 (Tutor): *"I do not know if the college has an ICT integration policy because I have not seen it yet, but if it exists, it will be necessary that management makes it available to both tutors and students. In that case, tutors and students will know that ICT integration is backed by policy, making it a prerequisite to teaching and learning in the college."*

Another participant also suggested a strategy that could promote the effective integration of ICT in the classroom. Interview participant 10 (Tutor) mentioned that college management could buy ICT resources such as laptops for tutors to motivate them to use technology in the classroom since some tutors complain that they do not have laptops to prepare PowerPoint presentations for their lessons. He says:

Participant 10 (Tutor): *"Tutors usually complain that they do not integrate technology in their lessons because they do not have laptops. Because of that, management could buy laptops and distribute them to tutors in each department for ICT training and when preparing presentations for effective lesson delivery with ICT."*

Moreover, a student participant also gave a strategy that could help integrate ICT effectively in teaching and learning. He said:

Participant 21 (Student): *College management could create practical ICT lessons which are non-scoring on students' timetables to enhance students' ICT skills, which would be transferred to classroom learning.*

The responses from the participants highlight the need for college leadership to develop strategies that could promote effective ICT integration. For example, an ICT integration policy should be known and made available to tutors and students to enforce the use of ICT in teaching and learning. The respondents also suggest that college leadership could purchase laptops for tutors to motivate them to use ICT in their teaching. If tutors have laptops, they will be better positioned to prepare PowerPoint presentations that employ pictures, videos, and audio to enhance the understanding of concepts taught by tutors. This finding supports (Rahim, 2018), who emphasize the need for accessible ICT infrastructure, including assistive technologies, adaptive interfaces, and inclusive design principles. It is, therefore, necessary for college leadership to strategize ways that could be implemented to promote effective ICT integration in colleges of education. The next session will present findings on continuous professional development as a strategy to promote effective ICT integration.

Continuous Professional Development: The participants emphasized the importance of continuous professional development programs to enhance tutors' ICT competencies. They suggested that training programs should be hands-on, practical, and tailored to their needs. For example, interview participant 1(tutor) stated the need for tutors to regularly receive ICT training to be updated with current technology and use it in their teaching. She says:

Participant 1(Tutor): *"Due to the development of new technologies day-in, day-out, tutors should be taken through ICT professional development training to equip them to be abreast with current technology and how they are used in teaching and learning."*

In addition to the response given by Participant 1, another tutor participant also stated that tutors should receive regular training to keep them up with the latest technology. He said that:

Participant 6 (Tutor): *"Tutors should receive regular training to keep up with the latest technologies. We need tutors who are confident and skilled in using ICT tools."*

Finally, participant 10 (tutor) also supported the responses given by earlier respondents on giving tutors regular training. He believes tutors must develop their self-esteem and self-efficacy through continuous ICT professional development training. He says:

Participant 10 (Tutor): *"Continuous ICT professional development for college tutors is a must since it could develop tutors' self-esteem and self-efficacy to use ICT tools without any fear of making mistakes."*

The above responses describe the need for college leadership to organize ICT professional development training for tutors. Through professional development, tutors could acquire the required skills and knowledge to use ICTs in teaching and learning, enhancing tutors' practice with ICT and improving students' learning outcomes. As Johnson et al. (2013) highlighted, ICT integration demands a continuous learning process as technology rapidly evolves. Moreover, literature by Heeks (2021) points out the significance of digital skills and capacity building. To fully capitalize on the potential of ICT, individuals must be equipped with the necessary skills and knowledge.

7. Conclusion and Recommendations

In conclusion, this research study examined the perceptions and practices regarding ICT integration among Ghanaian Colleges of Education faculty members in teaching and learning. The findings revealed that while there is a positive attitude towards using ICT in education, several challenges hinder its effective integration. These challenges include limited access to ICT resources, inadequate training and professional development opportunities, and a need for more institutional support.

Despite these challenges, there are also notable examples of good practices in ICT integration among some faculty members. These individuals have demonstrated innovative approaches to incorporating ICT tools and resources in their teaching, resulting in enhanced student engagement and improved learning outcomes.

Based on the findings of this study, several recommendations can be made to promote the effective integration of ICT in teaching and learning in Ghanaian Colleges of Education. Firstly, it is crucial to address the issue of limited access to ICT resources by providing adequate infrastructure, such as computers, internet connectivity, and educational software, to facilitate the use of ICT in classrooms. This can be achieved through partnerships with government agencies, non-profit organizations, and the private sector.

Secondly, tutors should receive regular and comprehensive training on ICT tools and pedagogical approaches. Finally, professional development programs and workshops can be organized to enhance tutors' ICT skills and knowledge, enabling them to integrate technology into their teaching practices effectively.

Additionally, institutional support is vital in promoting ICT integration. College administration should recognize the importance of ICT in education and allocate sufficient resources for its implementation. It includes creating policies prioritizing ICT integration, establishing support structures, and fostering a culture of innovation and experimentation among faculty members.

Furthermore, collaboration and knowledge-sharing among educators can be encouraged by forming communities of practice or online platforms where teachers can exchange ideas, resources, and best practices related to ICT integration in teaching and learning.

It is important to note that the recommendations provided are not exhaustive and should be adapted to the specific context of each College of Education in Ghana. Future research should focus on evaluating the impact of implementing these recommendations and identifying additional strategies to overcome the challenges faced in ICT integration.

By addressing the challenges and implementing the recommended strategies, Ghanaian Colleges of Education can foster a positive and effective ICT integration in teaching and learning, ultimately improving the quality of education and preparing students for the digital age.

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