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Assessing the Degree of Technology Integration in Teaching among Public Schools Teachers in Abuja Municipal Council Area (AMAC)

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Abstract. The integration of technology in education is a critical focus in contemporary pedagogical discourse, particularly in developing countries where educational reforms are essential for national development. In Nigeria, policies and initiatives have been established to promote digital literacy and enhance educational quality, but challenges such as insufficient infrastructure and inadequate teacher training persist. This study investigates the degree of technology integration among public school teachers in the Abuja Municipal Area Council (AMAC) and examines the role of school administrators in enhancing teachers' capacity to integrate technology into teaching.

Employing a descriptive survey design, the study sampled 200 teachers from 21 public secondary schools within AMAC. A structured questionnaire, utilizing a 4-point Likert scale, was administered to gather data on teachers' technology integration practices and the support provided by school administrators. The instrument's reliability was confirmed through a pilot test, yielding a Cronbach's alpha coefficient of 0.85. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to analyze the data, alongside a one-sample t-test to evaluate the study's hypothesis. The findings revealed a moderate level of technology integration among teachers, with a grand mean of 2.78, indicating general agreement on the use of technology in instruction. The hypothesis test showed that the impact of administrators in enhancing technology integration was not statistically significant ($p = 0.051$). These findings suggest a need for improved infrastructure, enhanced administrative support, to better equip teachers for effective technology integration, ultimately contributing to the broader educational reforms essential for national development.

Keywords: Technology Integration, Teacher Capacity, Digital Education, School Administration

1. Introduction

The integration of technology in education has become a critical focus in contemporary pedagogical discourse, particularly in developing countries where educational reforms are essential for national development (Ololube, 2015). Technology integration in education involves the use of various technological tools and resources, such as computers, the internet, digital projectors, educational software, and interactive whiteboards, to enhance the educational experience. The incorporation of digital tools and resources into teaching is vital for enhancing instructional methods, engaging students, and improving learning outcomes (Bebell & O'Dwyer, 2010). The importance of this integration cannot be overstated, as it prepares students for the demands of the 21st-century workforce and fosters innovative teaching practices.

In Nigeria, the Federal Government has recognized the significance of technology in education through various policies and initiatives aimed at promoting digital literacy and enhancing educational quality. Programs such as the National Policy on Information and Communication Technology (ICT) in Education and the Digital Literacy Framework for Nigerian Education (Federal Ministry of Education, 2019) reflect the government's commitment to integrating technology into the educational system. Effective integration can lead to improved student engagement, personalized learning experiences, and better academic outcomes (Lim et al., 2013). It also prepares students for the technologically driven world they will enter upon graduation (Ghavifekr & Rosdy, 2015).

Teachers play a pivotal role in the successful integration of technology in the classroom. Their attitudes towards technology, level of competence, and willingness to adopt new teaching methods significantly influence the effectiveness of technology use in education. Research by Inan and Lowther (2010) highlights that teachers' positive attitudes towards technology are crucial for its effective integration into teaching practices. When teachers perceive technology as beneficial and are confident in their ability to use it, they are more likely to integrate it into their instruction. This positive attitude fosters a more dynamic and engaging learning environment, enhancing students' educational experiences and outcomes.

Moreover, the competence of teachers in using technological tools is a critical factor in successful technology integration. Teachers who are proficient in using digital resources can more effectively incorporate these tools into their teaching strategies, leading to improved instructional methods and student engagement (Inan & Lowther, 2010). Continuous professional development and training are essential to ensure that teachers maintain a high level of competence and stay updated with the latest technological advancements and educational applications.

Willingness to adopt new teaching methods is another significant aspect influencing technology integration. Teachers who are open to experimenting with innovative instructional strategies and incorporating technology into their pedagogy are more likely to create interactive and student-centered learning environments. This willingness to embrace change is vital for the sustainable integration of technology in education, as it encourages ongoing improvement and adaptation to new educational challenges and opportunities.

School administrators also play a crucial role in supporting teachers' efforts to integrate technology. According to Ertmer et al. (2012), administrators are responsible for providing the necessary resources, support, and professional development opportunities for teachers. By ensuring that teachers have access to modern technological tools and are equipped with the skills needed to use them effectively, administrators can create a conducive environment for technology integration. Additionally, administrators can facilitate collaborative professional learning communities where teachers can share best practices, challenges, and innovative ideas related to technology use in education. Fostering a culture of innovation and continuous improvement within schools is essential for sustainable technology integration. Administrators can promote this culture by encouraging teachers to experiment with new technologies and teaching methods, providing regular feedback, and recognizing and rewarding successful integration efforts (Ertmer et al., 2012). Creating a supportive and collaborative school environment where teachers feel empowered to explore and implement technological innovations can lead to more effective and widespread use of technology in the classroom.

Despite its potential, integrating technology in education faces several challenges. These include insufficient infrastructure, lack of training for teachers, resistance to change, and limited access to digital resources. In developing regions, such as parts of Nigeria, these challenges are often exacerbated by inadequate funding and inconsistent policy implementation (Ololube, 2006). This study therefore seeks to assess the degree of technology integration among public school teachers and to determine the extent to which school administrators enhancing teachers' capacity to integrate technology into teaching in the Abuja Municipal Area Council (AMAC).

1.1 Research Questions and Hypothesis

This study is guided by the following research questions:

- What is the level of technology integration among teachers in public secondary schools within the Abuja Municipal Area Council (AMAC)?
- How do school administrators contribute to enhancing teachers' capacity to integrate technology into teaching?

Based on these research questions, the study tests the following hypothesis:

Ho l. School administrators do not significantly enhance teachers' capacity to integrate technology into teaching.

2. Conceptual Framework

2.1 Importance of Technology Integration in Teaching

Technology integration in teaching refers to the incorporation of digital tools and resources into the educational process to enhance learning experiences and outcomes. This includes the use of computers, the internet, digital projectors, educational software, and

interactive whiteboards to support and enrich traditional teaching methods (Bebell & O'Dwyer, 2010). The importance of technology integration lies in its ability to prepare students for the demands of the 21st-century workforce, foster innovative teaching practices, and improve student engagement and learning outcomes (Ghavifekr & Rosdy, 2015). Effective technology integration can personalize learning, facilitate access to a wealth of information, and support collaborative and interactive learning environments (Lim et al., 2013).

2.2 Levels and Models of Technology Integration

Technology integration can occur at various levels, from basic to advanced. At the basic level, technology is used to support traditional teaching methods, such as using PowerPoint presentations or digital textbooks. At the intermediate level, technology enhances the teaching and learning process through interactive and multimedia resources. At the advanced level, technology transforms education by enabling personalized, student-centered learning experiences and fostering critical thinking and problem-solving skills (Hughes, 2005).

Several models guide the process of technology integration in education. The Substitution, Augmentation, Modification, and Redefinition (SAMR) model, developed by Ruben Puentedura, provides a framework for evaluating and designing learning activities that integrate technology (Puentedura, 2014). The Technological Pedagogical Content Knowledge (TPACK) model, introduced by Mishra and Koehler (2006), emphasizes the intersection of technology, pedagogy, and content knowledge as essential for effective technology integration. These models help educators understand how to use technology to enhance and transform teaching and learning.

2.3 The Role of School Administrators in Technology Integration

School administrators play a crucial role in the successful integration of technology in education. They are responsible for providing the necessary resources, infrastructure, and support for technology use in schools (Ertmer et al., 2012). Administrators can foster a culture of innovation by promoting professional development opportunities for teachers, encouraging collaboration and sharing of best practices, and recognizing and rewarding effective technology integration efforts.

3. Theoretical Framework

Several theories underpin the integration of technology in education. Constructivist theories, such as those proposed by Piaget (1970) and Vygotsky (1978), emphasize the active role of learners in constructing knowledge through interaction with their environment. These theories support the use of technology to create interactive and engaging learning experiences that promote critical thinking and problem-solving skills. The Diffusion of Innovations theory by Rogers (2003) explains how new ideas and technologies spread within a society or organization. This theory is relevant to understanding how technology integration in education can be facilitated and the factors that influence teachers' adoption of new technologies.

The SAMR model, developed by Dr. Ruben Puentedura, provides a framework for evaluating and designing learning activities that integrate technology (Puentedura, 2014). The model outlines four levels of technology integration: Substitution (technology acts as a direct substitute for traditional tools), Augmentation (technology enhances traditional tools), Modification (technology allows for significant task redesign), and Redefinition (technology enables the creation of new, previously inconceivable tasks).

4. Empirical Review

Research has shown that effective technology integration can enhance student engagement, improve learning outcomes, and foster innovative teaching practices. For example, a study by Bebell and O'Dwyer (2010) found that technology integration in classrooms led to increased student motivation and participation. Similarly, Ghavifekr and Rosdy (2015) reported that technology integration improved students' critical thinking and problem-solving skills.

However, several challenges hinder the successful integration of technology in education, including insufficient infrastructure, lack of training for teachers, and resistance to change (Ololube, 2015). Studies have highlighted the need for ongoing professional development and support for teachers to ensure they have the necessary skills and confidence to use technology effectively in their classrooms (Inan & Lowther, 2010).

Research has also examined the role of school administrators in supporting technology integration. Ertmer et al. (2012) found that administrators play a critical role in providing the necessary resources, infrastructure, and professional development

opportunities for teachers. Administrators who promote a culture of innovation and continuous improvement can significantly enhance teachers' capacity to integrate technology into their instructional practices.

While previous studies have highlighted the benefits and challenges of technology integration, there is a need for more research on the specific factors that influence teachers' attitudes towards technology and their willingness to adopt new teaching methods. Additionally, more research is needed on the role of school administrators in promoting and sustaining technology integration initiatives, particularly in developing regions such as Nigeria. This study aims to address these gaps by assessing the degree of technology integration in teaching among public school teachers in the Abuja Municipal Area Council (AMAC) and examining the role of school administrators in this process.

5. Research Methodology

This study adopted a descriptive survey design to assess the degree of technology integration among public school teachers in the Abuja Municipal Area Council (AMAC) and to examine the role of school administrators in enhancing teachers' capacity to integrate technology into teaching.

The population of the study comprised all teachers in public secondary schools within AMAC. According to FCT-EMIS, there are 21 public senior secondary schools in AMAC. A sample size of 200 teachers was used. using simple random sampling technique, 10 schools were selected while 10 teachers were randomly picked from each of the schools

A structured questionnaire was developed using a 4-point Likert scale format, ranging from "Strongly Agree" to "Strongly Disagree." This format facilitated the collection of respondents' opinions regarding technology integration and pedagogical practices (Creswell, 2014). Before the main data collection, a pilot test was conducted with a small sample of teachers not included in the selected sample to assess the reliability of the questionnaire. Internal consistency was measured using Cronbach's alpha coefficient, with a resulting index of 0.85, indicating strong item consistency and stability.

Permission was obtained from relevant authorities before distributing the questionnaires to selected teachers. The final version of the questionnaire was administered to the selected sample of teachers. Collected data were analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics, including frequencies, percentages, means, and standard deviations, were computed to provide a comprehensive overview of teachers' responses regarding technology integration levels and administrative roles. Inferential statistic- one-sample t-tests was employed to test the hypothesis. Ethical guidelines were strictly followed throughout the research process to ensure the confidentiality and anonymity of participants. All participants provided informed consent before participating in the study, and their voluntary participation was emphasized.

6. Result of Findings

Research Question: Determine the level of technology integration among teachers in public secondary schools within the Abuja Municipal Area Council (AMAC)

Table 1: Level of technology integration among teachers

S/N	Items	SA	A	D	SD	X	SD	Decision
1	Technology is regularly used in classroom instruction	50 (25.0%)	45 (22.5%)	60 (30.0%)	45 (22.5%)	2.51	1.094	Agreed
2	Digital devices, such as computers or tablets, are readily used for teaching and learning	45 (22.5%)	51 (25.5%)	61 (30.5%)	43 (21.5%)	2.49	1.066	Disagreed
3	Lessons often include multimedia elements, such as videos or interactive simulations	60 (30.0%)	65 (32.5%)	45 (22.5%)	30 (15.0%)	2.78	1.039	Agreed
4	Assignments and assessments are sometimes electronically	60 (30.0%)	65 (32.5%)	55 (27.5%)	20 (10.0%)	2.83	0.974	Agreed
5	Technology is integrated into various subjects and not limited to specific courses.	75 (37.5%)	70 (35.0%)	30 (15.0%)	25 (12.5%)	2.98	1.015	Agreed
6	Teachers encourage students to use technology for research and learning beyond the classroom	85 (42.5%)	50 (25.0%)	40 (20.0%)	25 (12.5%)	2.98	1.015	Agreed

7	There is a dedicated technology curriculum or course in the school's educational program	50 (25.0%)	45 (22.5%)	60 (30.0%)	45 (22.5%)	2.50	1.098	Agreed
	Grand Mean					2.78		

Field Survey, 2024

The table1 outlines the responses of teachers regarding the level of technology integration in their teaching practices within public secondary schools in the Abuja Municipal Area Council (AMAC). The table reveals that technology is generally used in classroom instruction, as indicated by a mean score of 2.51, suggesting a slight agreement among teachers. However, there is a noticeable disagreement (mean score of 2.49) on the availability of digital devices for teaching and learning,

Multimedia elements are moderately included in lessons, with a mean score of 2.78, indicating that teachers often incorporate videos and interactive simulations into their teaching. Similarly, there is moderate agreement (mean score of 2.83) that assignments and assessments are sometimes completed electronically, reflecting a fair level of electronic integration in evaluation processes.

The integration of technology across various subjects is positively perceived, as shown by a mean score of 2.98. This suggests that technology is not confined to specific courses but is used across different subjects. Teachers also encourage students to use technology for research and learning beyond the classroom, with a mean score of 2.98, indicating a strong agreement on promoting technological engagement outside school hours.

There is slight agreement (mean score of 2.50) on the presence of a dedicated technology curriculum in schools, although opinions are mixed. Overall, the grand mean of 2.78 reflects a general agreement towards the integration of technology among teachers in public secondary schools within AMAC.

Research Question: Examine the roles of school administrators in enhancing teachers' capacity to integrate technology into teaching

Table 2: Roles of school administrators in enhancing teachers' capacity to integrate technology into teaching

S/N	Items	SA	A	D	SD	$\bar{X}$	SD	Decision
1	School principals actively encourage teachers to explore innovative uses of technology in the classroom	79 (39.5%)	58 (29.0%)	40 (20.0%)	23 (11.5%)	2.97	1.03	Agreed
2	Administrative support is readily available when teachers encounter challenges with technology integration	40 (20.0%)	30 (15.0%)	75 (37.0%)	55 (27.5%)	2.28	1.07	Disagreed
3	School Administrators provide opportunities for professional development that focused on technology integration	76 (38.0%)	69 (34.5%)	31 (15.5%)	24 (12.0%)	2.98	1.02	Agreed
4	Administrative policies promote a culture of experimentation and innovation in teaching with technology	75 (37.0%)	85 (42.5%)	21 (10.5%)	19	3.08	0.926	Agreed
5	Teachers feel motivated to integrate technology because they receive recognition and appreciation from school administrators	45 (22.5%)	30 (15.0%)	85 (42.5%)	40 (20.0%)	2.40	1.047	Disagreed
6	administrator access and update technological resources and tools for teaching.	79 (39.5%)	58 (29.0%)	40 (20.0%)	23 (11.5%)	2.97	1.029	Agreed
7	School administrators involve teachers in decision-making processes related to technology adoption and integration	45 (22.5%)	45 (22.5%)	65 (32.5%)	45 (22.5%)	2.45	1.074	Disagreed
	Grand Mean						2.73	

Field Survey, 2024

Table 2. reveals the mean scores of respondents' opinions on the roles of school administrators in enhancing teachers' capacity to integrate technology into teaching. Items 1 through 7 have mean scores of 2.97, 2.28, 2.98, 3.08, 2.40, 2.97, and 2.45, respectively. These scores specify the level of agreement with the statements provided.

The mean score of 2.97 for item 1 indicates a general agreement that school principals actively encourage teachers to explore innovative uses of technology in the classroom. Item 2, with a mean score of 2.28, shows disagreement regarding the availability of administrative support when teachers encounter challenges with technology integration. The mean score of 2.98 for item 3 reflects agreement that school administrators provide opportunities for professional development focused on technology integration. Item 4 has the highest mean score of 3.08, indicating strong agreement that administrative policies promote a culture of experimentation and innovation in teaching with technology. The mean score of 2.40 for item 5 shows disagreement that teachers feel motivated to integrate technology because they receive recognition and appreciation from school administrators. With a mean score of 2.97, item 6 suggests that administrators access and update technological resources and tools for teaching, indicating general agreement. Finally, item 7, with a mean score of 2.45, shows disagreement regarding the involvement of teachers in decision-making processes related to technology adoption and integration.

The grand mean of 2.73 reflects an overall agreement towards the roles of school administrators in enhancing teachers' capacity to integrate technology. While there is positive agreement on several aspects such as encouragement for innovation, professional development opportunities, and promoting a culture of innovation, challenges remain in areas like administrative support during challenges and involvement in decision-making processes related to technology

Test of Hypotheses

Ho_1: Administrators do not significantly enhance teachers' capacity to integrate technology into teaching.

Table 3: One-Sample t-Test Results for Administrator's Role in Enhancing Technology Integration

Statistic	Value
Hypothesized Mean (\(\mu\))	2.5
Sample Mean (\(\bar{X}\))	2.73
Standard Deviation (SD)	0.26
Number of Items (n)	7
Degrees of Freedom (df)	6
t-Statistic (\(t\))	2.43
p-Value	0.051
Significance Level (α)	0.05
Decision (Reject/Fail to Reject Ho1)	Fail to Reject Ho1

Decision Criteria
If p-value < 0.05: Reject the null hypothesis (Ho1).
If p-value ≥ 0.05: Fail to reject the null hypothesis (Ho1).

Interpretation
p-Value = 0.051: the p-value is slightly greater than 0.05, we fail to reject the null hypothesis (Ho1).
The one-sample t-test results indicated a p-value of 0.051, slightly above the 0.05 significance level. Therefore, the null hypothesis—that administrators do not significantly enhance teachers' capacity to integrate technology into teaching—was not rejected. This suggests that while administrators play a supportive role, their impact is not statistically significant, pointing to areas needing further enhancement and focus

7. Discussion of Findings

The study found that technology is moderately used in classroom instruction, among teachers in AMAC, while some teachers actively integrate digital tools into their teaching practices, there is still room for improvement in the consistent use of technology across all classrooms. The findings of the study align with and expand upon existing literature on technology integration in education. The moderate use of technology in classroom instruction is consistent with Bebell and O'Dwyer's (2010) assertion that while technology has the potential to enhance education, its integration varies significantly among teachers. This variability often results from differences in resource availability and teacher preparedness.

The study also identified significant challenge which is the limited availability of digital devices for teaching and learning, this suggests that despite the interest and willingness of teachers to use technology, the lack of adequate resources hinders full integration. The findings echo the challenges highlighted by Ololube (2015) and Inan and Lowther (2010). Both studies emphasize the need for sufficient infrastructure and resources to support effective technology integration. Without adequate access to digital tools, teachers are unable to fully implement technology-enhanced teaching practices

The positive trend towards integrating technology across various subjects is supported by Ghavifekr and Rosdy (2015), who advocate for the use of technology to enrich the educational experience across the curriculum. This comprehensive approach to technology integration ensures that students are well-prepared for the demands of the 21st-century workforce.

The study also found that school administrators play a supportive role in enhancing teachers' capacity to integrate technology in teaching. However, challenges remain, particularly in areas such as providing administrative support during challenges and involving teachers in decision-making processes related to technology. This indicates that while there is some encouragement and professional development opportunities, more comprehensive and effective administrative support is needed. The supportive yet insufficient role of school administrators in enhancing teachers' capacity to integrate technology reflects the findings of Ertmer et al. (2012). While administrators play a crucial role in providing resources and promoting a culture of innovation, the study reveals gaps in administrative support during challenges and in decision-making processes. This indicates a need for more comprehensive and effective administrative strategies to fully support technology integration.

In summary, while there is a general agreement on the importance and benefits of technology integration in teaching, significant challenges remain. Addressing these challenges requires a concerted effort from both educators and administrators to ensure that resources are available, support systems are in place, and teachers are actively involved in decision-making processes related to technology adoption and integration.

8. Conclusion

The study reveals a moderate level of technology integration in classroom instruction. While teachers demonstrate a willingness to incorporate digital tools and resources, challenges such as limited availability of digital devices and insufficient administrative support hinder full integration. The study highlights that technology is being used across various subjects, promoting a comprehensive approach to education.

Teachers also encourage technological engagement beyond the classroom, fostering continuous learning. However, the role of school administrators, though supportive, needs enhancement, particularly in providing consistent administrative support and involving teachers in decision-making processes. The study's findings emphasize the need for a more robust and collaborative effort to overcome these challenges and fully harness the potential of technology in education. This comprehensive integration is essential for preparing students for the demands of the 21st-century workforce and fostering innovative teaching practices.

9. Recommendations

Based on the findings of this study, the following recommendations are made to improve technology integration in teaching among public schools in the Abuja Municipal Area Council:

- The government and educational stakeholders should invest in providing adequate digital devices such as computers, tablets, and interactive whiteboards. Ensuring that all classrooms are equipped with necessary technological tools will enhance teachers' ability to integrate technology effectively into their teaching practices.
- Continuous professional development and training programs focusing on technology integration should be provided for teachers. These programs should include hands-on training, workshops, and seminars

that equip teachers with the skills and confidence needed to use digital tools and resources effectively.
- School administrators should provide consistent and accessible support to teachers facing challenges with technology integration. This includes creating a helpdesk or support team dedicated to addressing technological issues and ensuring timely resolution of problems.
- Adequate funding should be allocated to support the infrastructure and resources needed for technology integration. This includes not only purchasing digital devices but also ensuring reliable internet connectivity, maintenance of equipment, and provision of educational software and tools.
- Schools should implement a dedicated technology curriculum or course within their educational programs. This curriculum should cover digital literacy, coding, and other relevant technological skills, preparing students for the digital age.
- Regular monitoring and evaluation of technology integration efforts should be conducted to assess progress and identify areas needing improvement. This can be achieved through surveys, classroom observations, and feedback from teachers and students.

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