Teachers' Perception towards Integrating Technological Knowledge into Classroom Practices in Senior Secondary Schools in FCT, Abuja

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Abstract This ***study investigated senior secondary school teachers' perceptions of integrating technological knowledge into classroom practices within the Federal Capital Territory (FCT), Abuja. Employing a descriptive cross-sectional survey design, data were collected from a sample of 237 teachers selected through a multistage random sampling technique from both public and private schools across various area councils. A structured questionnaire, validated by experts in educational technology and measurement, was utilized to gather information on demographic characteristics and perceptions towards technology integration. The instrument demonstrated high reliability (r = 0.895) via the test-retest method. Descriptive statistics (percentages, means, standard deviations) and inferential analyses (t-test and ANOVA) at a 0.05 significance level were used to analyze the data. Findings revealed a generally positive perception among teachers regarding the benefits of technological integration for enhancing student engagement, learning effectiveness, and teacher skills, as indicated by a grand mean of 3.1 on a 4-point Likert scale. Despite these favorable perceptions, challenges such as inadequate technical support, poor infrastructure, and limited training were identified as barriers. Inferential statistics showed no significant differences in perceptions based on gender and age. However, significant differences were observed with respect to teachers' work experience, indicating that years of service influence perceptions toward technology use in the classroom. The study underscores the importance of addressing infrastructural and training gaps to optimize technology integration in senior secondary education, ultimately enhancing teaching and learning outcomes.***

Keywords: Teachers' perception, Technological knowledge, Classroom practices, Pedagogical knowledge, Educational Technology Word: 216

I. INTRODUCTION

In contemporary education, the integration of technological knowledge into classroom instruction has become both a global trend and a necessity, particularly at the senior secondary level. As education systems worldwide adapt to the demands of a knowledge-driven, digital society, Nigeria has also acknowledged the critical importance of embedding Information and Communication Technology (ICT) into its educational framework. The National Policy on Education (FRN, 2013) highlights ICT as a tool for enhancing learning outcomes and promoting quality teaching across all levels of education. Despite national policy directives and initiatives aimed at improving access to ICT infrastructure, the practical implementation of technology in Nigerian senior secondary schools remains inconsistent and underdeveloped. While some schools benefit from digital resources, many still grapple with limited access, poor infrastructure, and an overall lack of

strategic integration into teaching practices. Stakeholders must remain attuned to the examination of research concerns related to the application of technology in teaching and learning processes within secondary education throughout various states in the country. Scholars such as Yusuf et al. (2013) have observed that although ICT possesses transformative potential, its classroom usage often lacks depth, with teachers continuing to rely predominantly on conventional teaching methods that do not effectively support 21st-century learning skills such as digital literacy, critical thinking, and collaboration. Teachers, as the primary executors of the curriculum, play a decisive role in determining whether and how technology is incorporated into the classroom. Their perceptions, beliefs, and technological competencies significantly shape their willingness and ability to integrate digital tools into pedagogy. Okebukola (2015) and Adeniran (2018) both highlight that without adequate technological pedagogical content knowledge (TPACK), teachers are unlikely to blend ICT meaningfully with curriculum content and instructional strategies.

Although research has generally indicated that Nigerian teachers recognise the potential benefits of ICT, many lack the confidence, training, or institutional support needed to implement it effectively. For example, Eze et al. (2019) revealed in their study that while teachers in Enugu State appreciated the role of technology in education, they faced limitations in skills and systemic backing. Similarly, Salako and Adu (2020) reported that teachers in Abuja expressed favourable views towards ICT use but were hindered by factors such as unreliable electricity, insufficient digital infrastructure, and inadequate professional development opportunities. The gap between policy intent and classroom reality is further widened by systemic challenges. Despite efforts like the Computers for All Nigerians Initiative (CANi) and interventions by the National Information Technology Development Agency (NITDA), poor implementation, a lack of maintenance culture, and minimal teacher involvement have rendered many such programmes ineffective (Ololube, 2014). Moreover, pronounced disparities between urban and rural schools continue to limit equal access to digital learning tools, as noted by Aduwa-Ogiegbaen and Iyamu (2005). The rise of ICT in education is not unique to Nigeria. Across the globe, especially since the 1990s, countries have prioritised technology in education reforms as a means to broaden access and enhance learning quality. The global shift toward knowledge-based economies has only intensified the need for educational systems to develop learners' ability to apply knowledge in ever-evolving contexts (SchoolNet Africa, 2003). However, developing countries often encounter barriers such as limited access, untrained personnel, and inadequate policies, which constitute what Kozma (2012) term the “digital divide.”

Furthermore, the evolution of ICT; from early computing in the 1980s to the rise of the internet and mobile learning platforms has redefined the role of technology in education (Pelgrum & Law, 2001). Today, ICT is not only a tool for instruction but also a medium for delivering cost-effective, scalable, and high-quality education. Educational institutions increasingly use digital tools to improve teaching, learning, and administrative efficiency (Rodríguez-Rodríguez & Heras-González, 2020). Integrating technology into classroom practices involves more than merely introducing devices or software; it requires a holistic rethinking of instructional design, curriculum content, and teacher professional development. Grabe and Grabe (2007) note that successful technology adoption fundamentally transforms how societies learn, work, and engage with knowledge. Therefore, it is imperative for teachers to be adequately prepared not only in technical skills but also in pedagogical strategies that incorporate technology effectively. Teachers’ perceptions towards technology integration encompassing their beliefs about its usefulness, ease of use, and relevance to student achievement are therefore central to the success or failure of any ICT intervention in schools. As observed by Mintah et al (2023), debates persist over the efficacy of ICT in less economically developed nations. Yet, the undeniable role of education as a foundation for national growth and poverty alleviation reinforces the need to harness technology effectively (Srivatsava, 2012; UNESCO, 2005). In view of this, understanding teachers’ perceptions becomes a vital step in identifying both the enablers and barriers to successful technology use in classrooms. Research in this area provides essential insights for policymakers, educational planners, and school leaders to develop evidence-based

interventions that enhance teacher preparedness, improve infrastructure, and strengthen curriculum integration. The potential for utilizing learning materials in teaching is profoundly significant. Alongside the capacity to customize and individualize the educational experience, it also presents a chance to comprehend knowledge and address educational challenges. This study, therefore, seeks to explore the perceptions of senior secondary school teachers regarding the integration of technological knowledge into their instructional practices, with the goal of fostering a more responsive and future-ready education system in Nigeria.

The following research questions were raised to guide the study:

1. What is the level of teachers' perception towards integrating technological knowledge in classroom practices in senior secondary schools?

Also, to guide this study, the following hypotheses were generated:

$H_0$1: There is no significant gender difference in the level of teachers' perception towards integrating technological knowledge in classroom practices in senior secondary schools.

$H_0$2: There is no significant age difference in the level of teachers' perception towards integrating technological knowledge in classroom practices in senior secondary schools.

$H_0$3: There is no significant work experience difference in the level of teachers' perception towards integrating technological knowledge in classroom practices in senior secondary schools.

$H_0$4: There is no significant qualification difference in the level of teachers' perception towards integrating technological knowledge in classroom practices in senior secondary schools.

II. THEORETICAL FRAMEWORK

The Technology Acceptance Model (TAM) is a theoretical framework used to understand and predict the acceptance and adoption of new technologies. The Technology Acceptance Model (TAM), introduced by Davis (1989), offers additional insight into instructors' attitudes towards using technology. The Technology Acceptance Model (TAM) primarily considers two key elements that impact the acceptance and utilization of technology: Perceived Usefulness (PU) refers to the extent to which a teacher believes incorporating technology into their instruction will improve their effectiveness and Perceived Ease of Use (PEOU): The degree to which a teacher perceives that utilizing technology will require minimal effort. According to the Technology Acceptance Model (TAM), instructors are more likely to develop positive attitudes towards using technology if they consider it valuable and easy to use. Therefore, the Technology Acceptance Model (TAM) aids in comprehending how teachers' perspectives on the advantages and difficulties of technology influence their readiness to incorporate it into their classroom methodologies.

The Concerns-Based Adoption Model. The Concerns-Based Adoption Model (CBAM) is another framework used to understand and address individuals' concerns when adopting new practices or technologies. The CBAM offers valuable insights into how teachers adjust to change, specifically when adopting new technologies. CBAM posits that teachers experience a progression of concern when they incorporate new technologies into their teaching practices, starting from first awareness and culminating in complete adoption. The stages encompass:

Recognition: Teachers gain knowledge and understanding of the presence and availability of the technology. Teachers are actively seeking to gain more knowledge of technology.

Individual: Educators consider the personal and professional impact of technology on themselves.

Management: Teachers prioritize the operational aspects of utilizing the technology.

Consequences: Educators evaluate the influence of technology on students' academic progress.

Collaboration: Teachers engage in collaborative efforts with others to enhance the utilization of technology. Teachers are investigating methods to enhance and expand the utilization of technology.

CBAM elucidates teachers' changing attitudes and perceptions when they interact with novel technologies. It emphasizes the necessity of providing assistance and advanced training to answer teachers'

concerns at every stage, ultimately affecting their decision to incorporate technology into the classroom.

III. EMPIRICAL REVIEW

Ismail et al. (2023) found that senior high school teachers in Pekanbaru perceived their TPACK skills to be high, indicating confidence in integrating technology into teaching. Similarly, Abel et al. (2022) conducted a meta-ethnographic review of 22 qualitative studies to explore teachers' perceptions of ICT integration. The study found that both positive and negative attitudes exist and that teacher perceptions are shaped by local contexts, global trends, and the availability of professional development. Jordan (2013) found that while male and female teachers rated their TPACK knowledge highly, males consistently rated themselves higher especially in content and technological domains. This indicated that there are significand gender differences, in contrast, Koh and Sing (2011) in their study reported no significant differences by gender. On the other hand, Li et al. (2024) found that male high school teachers reported significantly higher TPACK levels than females, highlighting a gender gap in technology integration confidence. Likewise, Irwanto et al. (2022) found that while high school teachers rated their pedagogical knowledge highest and technology knowledge lowest, there were no significant TPACK differences by age or gender. Whereas, Muhaimin et al. (2019) found that there was a significant gap between TK and TPK in terms of age group. In Nigeria, Folorunsho (2019) found that secondary school science teachers in Ilorin had strong overall TPACK perceptions, though technological knowledge was their weakest area. Teachers with more experience showed higher confidence in integrating technology, while gender had no significant effect. Moreso, Antony et al. (2019) found that teacher qualifications and teaching experience significantly influenced biology teachers' TPACK levels.

IV. THE PERCEPTIONS OF TEACHERS IN THE INTEGRATION OF TECHNOLOGY

Whether or not technology is successfully incorporated into teaching methods mainly depends on the teachers' opinions. Teachers' perceptions toward technology—whether they see it as a helpful tool to improve student learning or as a diversion from conventional teaching methods—can either help or impede its adoption, according to research by Ertmer et al. (2012). Teachers are more inclined to adopt digital tools and incorporate them into their lesson plans if they believe that technology is a necessary part of today's education (Inan & Lowther, 2010). On the other hand, educators who think of technology as unappealing or burdensome would not want to use it, reducing its ability to improve student results. Koehler and Mishra (2009) established the technology Pedagogical Content expertise (TPACK) framework, which highlights the significance of instructors possessing technology expertise and the capacity to integrate this information with pedagogy and content. Instructors are more likely to feel comfortable utilizing technology when they believe it complements their lesson plans and subject matter (Chai et al., 2013). As a result, favourable opinions about the applicability and usefulness of technology can significantly increase its uptake in learning environments.

Educators' views on technology integration in educational environments illustrate a multifaceted landscape of optimism, obstacles, and shifting perspectives toward digital tools in the classroom. Recent studies indicate that educators predominantly have favorable views on technology integration, asserting that technology-enhanced instruction markedly enhances their teaching methodologies and renders learning more interesting and participatory for pupils. Educators acknowledge that the incorporation of technology facilitates the development of more engaging learning environments, enhancing student motivation and enabling tailored instruction to address varied learning requirements.

Notwithstanding these favorable sentiments, educators encounter several obstacles that affect their perceptions and application of technology. Infrastructure deficiencies, such as inadequate internet connectivity and limited access to devices, persist as substantial obstacles. Educators' express apprehensions regarding their digital proficiency and the necessity for continuous professional development to adeptly incorporate emerging technology. The swift advancement of technology imposes more demands on educators, who must consistently adjust to new tools while prioritizing pedagogical efficacy over the mere adoption of technology.

Recent studies demonstrate that teachers' perspectives are substantially affected by aspects such as their technological self-efficacy, administrative support, and the quality of professional development options available. The incorporation of artificial intelligence and other modern technology has altered teacher perspectives, with educators conveying both enthusiasm for prospective advantages and apprehensions around evolving roles and duties. The effective incorporation of technology relies significantly on educators' perceptions of its worth in improving student learning, their proficiency with digital tools, and their capacity to connect technology use with effective teaching methodologies.

V. ELEMENTS INFLUENCING TEACHERS' PERCEPTIONS OF TECHNOLOGY

Teachers' perceptions about incorporating technical knowledge into classroom practices are influenced by factors such as their technological competency, past technological experiences, chances for professional development, and institutional support.

Technological Proficiency and Confidence: Teachers' views toward technology are primarily influenced by their confidence level and competency with digital tools. Teachers comfortable integrating technology are more likely to feel optimistic about it (Teo, 2009). On the other hand, teachers who lack technological proficiency or find using digital tools overwhelming may grow hostile toward technology and fight its acceptance (Ertmer & Ottenbreit-Leftwich, 2010).

Previous Technology Experiences: Teachers' perspectives are also greatly influenced by their prior experiences with technology. Good attitudes can be reinforced by positive experiences with technology in the classroom, such as increased learning outcomes or better student engagement (Howard, 2013). On the other hand, unfavourable experiences like technical problems or the sense that there are no advantages for students might make people doubt the usefulness of technology in the classroom (Bingimlas, 2009).

Professional Development Opportunities: Teachers' attitudes regarding technology integration are greatly influenced by their ability to access continuing professional development (Ertmer et al., 2012). Educators will likely adopt positive attitudes with good perceptions and successfully incorporate technology into their lessons when they have received sufficient training on how to do so. According to Darling-Hammond et al. (2017), good professional development should emphasize how technology can improve teaching and student learning in addition to the technical elements of using digital technologies.

School Culture and Institutional Support: The degree of institutional support and the overall school culture surrounding technology also significantly impact teachers' feelings about technology. Positive attitudes among teachers are more likely to be fostered by schools that offer sufficient technological resources, technical support, and a collaborative culture surrounding technology use (Hew & Brush, 2007). On the other hand, teachers in schools with little funding or support for integrating technology could grow resentful of it and view it as a burden rather than a helpful tool.

VI. OBSTACLES TO THE EFFECTIVE ADOPTION OF TECHNOLOGY

Despite the possible advantages of incorporating technology into teaching methods, several obstacles may prevent its widespread adoption. These obstacles fall into two categories: internal and external causes.

a. External constraints: include the absence of suitable technical support, a lack of digital tool availability, and inadequate access to appropriate technology infrastructure (Bingimlas, 2009). Teachers may encounter difficulties like obsolete gear, erratic internet connections, and a shortage of software in many schools, especially in poor nations (Hew & Brush, 2007). Due to these outside obstacles, teachers may become frustrated and need help incorporating technology into their lessons.
b. Internal Obstacles: Teachers' attitudes, perceptions, beliefs, and confidence in using technology are considered internal hurdles. Teachers' perceptions regarding technology can significantly impact whether or not they are willing to use it, as previously mentioned. Instructors may be reluctant to include technology in their lesson plans if they are unconfident in using it or have doubts about its pedagogical benefits (Ertmer & Ottenbreit-Leftwich, 2010). Furthermore, educators who are used to conventional teaching approaches may need help to make the necessary adjustments to integrate

digital resources into their lessons (Howard, 2013).

VII. METHODOLOGY

The study adopted a descriptive cross-sectional survey design to examine teachers' perceptions of integrating technological knowledge into classroom practices in senior secondary schools within the Federal Capital Territory (FCT), Abuja. The population for the study comprised all senior secondary school teachers across public and private schools in the FCT. To determine an appropriate sample size, a multistage random sampling technique was employed. Firstly, schools were randomly selected from each area council, ensuring geographical representation. Within the selected schools, teachers were then randomly chosen to participate, yielding a final sample size of 237 teachers, which was deemed adequate for the generalisation of findings. A structured questionnaire containing thirty-five items served as the instrument for data collection. Instrument contain two (02) section A and B. Section A was based on demographic characteristics of the respondents, while section B was tagged "Teachers' perception towards integrating technological knowledge into classroom practices questionnaire". This instrument was carefully validated by specialists in educational technology and measurement and evaluation from the Faculty of Education at the National Open University of Nigeria, who assessed it for clarity, relevance, and coverage of the study constructs. The reliability of the instrument was established using the test-retest method, resulting in a high positive reliability coefficient of 0.895, which indicates that the instrument was consistent and dependable. Data collected were analysed using descriptive statistics, such as simple percentages, mean and standard deviation and inferential statistics of t-test and Analysis of variance (ANOVA) at 0.05 level.

VIII. RESULTS AND DISCUSSION PARAMETER DETAILS

Section One: Personal Data of the Respondents

Table I: Socio-demographic Attributes of the Respondents

Parameter Details	Demographic	Frequency (f)	Percentage (%)
Respondents' Gender	Male	119	50.2
	Female	118	49.8
	Total	237	100.0
Respondents'	20-30 years	69	29.1
Age Group	31-40 years	81	34.2
	41-50 years	50	21.1
	Above 50 years	37	15.6
	Total	237	100.0
Respondents'	N.C.E	86	36.3
Qualification	B.Ed/B.A	68	28.7
	M.Ed	45	19.0
	Ph.D	38	16.0
	Total	237	100.0
Respondents'	1-5 years	78	32.9
Work Experience	6-10 years	101	42.6
	11-15 years	23	9.7
	16-20 years	10	4.2
	Above 20 years	25	10.5
	Total	237	100.0

Table I above shows the distribution of sampled respondents by their gender. The table showed that the male respondents were in the majority and they constituted 50.2% while the female respondents constituted 49.8%. Also, the above shows the distribution of sampled respondents by their age. The

table showed that the 31-40-year-old respondents were in the majority and constituted 34.2% of the respondents of the study. The 20-30 years old constituted 29.1%. 41-50 years old constituted 21.1, while those above 50 years old constituted only 15.6%. The above shows the distribution of sampled respondents by their work experience. The table showed that the 6-10 years' work experience group were in the majority and constituted 42.6% of the respondents of the study. The 1-5 years' work experience group of respondents constituted 32.9%. above 20 years work experience constituted 10.5%. 11-15 years' work experience constituted 9.7%. while the 16-20 years' work experience of the respondent constituted only 4.2%.

Lastly, the above shows the distribution of sampled respondents by their qualifications. The table showed that the NCE respondents were in the majority and constituted 36.3% of the respondents of the study. The B.Ed./B. A constituted 28.7% of the respondents. M.Ed. constituted 19.0%. While the Ph.D. respondents constituted only 16.0%.

Research Question One: What is the level of teachers' perception towards integrating technological knowledge in classroom practices in senior secondary schools?

Table II: Level of Teachers' Perception towards Integrating Technological Knowledge in Classroom Practices in Senior Secondary Schools

s/n	Items	SD(%)	D(%)	A(%)	SA(%)	Mean	SD
1	My perception towards integration of technological knowledge in classroom practices is that it is a major tool to increase the levels of students' engagement as well as the teachers'.	5(2.1)	13(5.5)	85(35.9)	134(56.5)	3.47	0.698
2	As far as my views are concerned both traditional and integration of technological knowledge in classroom practices are helpful for learners.	4(1.7)	49(20.7)	115(48.5)	69(29.1)	3.05	0.752
3	Integrating technological knowledge in classroom practices can increase learning power of students.	3(1.3)	14(5.9)	115(48.5)	105(44.3)	3.36	0.653
4	Integrating technological knowledge in classroom practices helps students to learn effectively.	12(5.1)	21(8.9)	141(59.5)	63(26.3)	3.08	0.744
5	Integrating technological knowledge in classroom practices is helpful to teachers.	7(3.0)	12(5.1)	85(35.9)	133(56.1)	3.45	0.727
6	Integration of technological knowledge can only be used as teaching aid to make lesson effective.	26(11.0)	43(18.1)	98(41.1)	70(29.5)	2.89	0.953
7	Lack of technical support and ICT-training are major problems of integrating technological knowledge in education process.	24(10.1)	13(5.5)	91(38.4)	109(46.0)	3.20	0.9391
8	Poor infrastructure, limited funds, lack of enthusiasm and motivation prove as barriers to integrating technological knowledge in classroom practices.	12(5.1)	27(11.4)	120(50.6)	78(32.9)	3.11	0.797
9	Integrating technological knowledge in classroom practices make effective teaching learning process.	5(5.1)	27(11.4)	120(50.6)	78(32.9)	3.41	0.662
10	Integration of technological knowledge in classroom practices has influenced the education process and it has proved a boon in educational practices.	187(7.6)	43(18.1)	105(44.3)	71(30.0)	2.97	0.887
11	A teacher needs to be technologically literate in order to take full benefit of integration of technological knowledge in relation to education.	9(3.8)	36(15.2)	102(43.0)	89(37.6)	3.15	0.814
12	Integration of technological knowledge can only assist in teaching and learning process; it cannot replace teacher.	13(5.5)	56(23.6)	90(38.0)	78(32.9)	2.98	0.888
13	Integration of technological knowledge has brought changes in the field of education.	0(0.0)	19(8.0)	111(46.8)	107(45.1)	3.37	0.629
14	Integration of technological knowledge in classroom practices is wastage of time and resources.	35(4.8)	48(20.3)	102(43.0)	52(21.9)	2.72	0.969
15	It is an amazing process to integrate technological knowledge to learning process.	8(3.4)	19(8.0)	120(50.6)	90(38.0)	3.23	0.737

s/n	Items	SD(%)	D(%)	A(%)	SA(%)	Mean	SD
16	I hardly integrate technological knowledge to learning process. I think traditional methods are more effective for the students.	47(19.8)	67(28.3)	68(28.7)	54(22.8)	2.55	1.053
17	Integration of technological knowledge in classroom practices makes learning permanent to the students as well as increases the teaching skills of the teachers.	2(0.8)	31(13.1)	127(53.6)	77(32.5)	3.18	0.678
18	Integration of technological knowledge in classroom practices increases the teaching skills of the teachers.	6(2.5)	50(21.1)	106(44.7)	75(31.6)	3.05	0.793
19	I think every teacher should be able to integrate technological knowledge to learning process.	0(0.0)	39(16.5)	111(46.8)	87(36.7)	3.20	0.702
20	Integration of technological knowledge really makes classroom environment interesting and make teaching learning process successful.	8(3.4)	17(7.2)	112(47.3)	100(42.2)	3.28	0.742
21	Integration of technological knowledge in classroom practices promotes students' learning autonomy and self-directed learning.	6(2.5)	12(5.1)	120(50.6)	99(41.8)	3.32	0.687
22	Integration of technological knowledge in classroom practices promotes student-centered approaches.	9(3.8)	29(12.2)	118(49.8)	81(34.2)	3.14	0.773
23	Integration of technological knowledge in classroom practices ensures higher degrees of interaction and promotes teachers' satisfaction and confidence.	3(1.3)	21(8.9)	121(51.1)	92(38.8)	3.27	0.674
	Grand Mean			3.10			

Table II presents the level of teachers' perception towards integrating technological knowledge in classroom practices. The results show a generally favourable disposition, as the majority of responses to the 23 items fall above the 2.50 benchmark on the Likert scale. With a grand mean of 3.1, teachers largely perceive technology integration as beneficial for improving student engagement, teaching effectiveness, learning autonomy, and classroom interaction. However, a few responses suggest lingering concerns over technical support, infrastructure, and preference for traditional methods, indicating areas where further support and training may be needed.

Hypothesis One: There is no significant gender difference in the level of teachers' perception towards integrating technological knowledge in classroom practices in senior secondary schools.

Table III: T-test Analysis of Gender Differences in the Level of Teachers' Perception towards Integrating Technological Knowledge in Classroom Practices in Senior Secondary Schools

Gender	N	Mean	Std. Dev.	T	Df	Sig. (2-tailed)
Male	119	71.6639	6.43649	-1.891	235	0.060
Female	118	73.1949	6.01886			

Table III presents the t-test analysis of gender differences in teachers' perception towards integrating technological knowledge in classroom practices. The result shows that male teachers had a mean score of 71.66 while their female counterparts had a slightly higher mean of 73.19. However, the calculated p-value of 0.060 is greater than the 0.05 level of significance. This indicates that the observed difference is not statistically significant. Therefore, the null hypothesis is retained, suggesting that gender does not significantly influence teachers' perception of technology integration in classroom practices.

Hypothesis Two: There is no significant age difference in the level of teachers' perception towards integrating technological knowledge in classroom practices in senior secondary schools

Table IV: ANOVA Showing Significant Differences by Age Group

Perception	Sum of Squares	Df	Mean Square	F	p-Value
Between Groups	370.903	4	92.726	2.418	0.05
Within Groups	8895.055	232	38.341		
Total	9265.958	236			

Table IV presents the analysis of variance (ANOVA) results used to test the second hypothesis, which states that there is no significant age difference in teachers' perception towards integrating technological knowledge in classroom

practices. The table shows an F-value of 2.418 and a p-value of 0.05. Since the p-value is equal to the 0.05 level of significance, the result is borderline. However, based on conventional interpretation, this suggests that age has no statistically significant effect on teachers' perception, and the null hypothesis is retained.

Hypothesis Three: There is no significant work experience difference in the level of teachers' perception towards integrating technological knowledge in classroom practices in senior secondary schools.

Table V: ANOVA Showing Significant Difference by Work Experience

Perception	Sum of Squares	Df	Mean Square	F	p-Value
Between Groups	529.710	3	176.570	4.709	0.003
Within Groups	8736.247	233	37.495		
Total	9265.958	236			

Table V presents the ANOVA result used to test Hypothesis Three, which states that there is no significant difference in teachers' perception based on work experience. The result shows an F-value of 4.709 with a corresponding p-value of 0.003. Since the p-value is less than the 0.05 level of significance, the null hypothesis is rejected. This indicates that there are statistically significant differences in teachers' perception towards integrating technological knowledge in classroom practices based on their years of work experience.

Table IV: Multiple Comparison of Different Work Experience and how they Affected Teachers' Perception towards Integrating Technological Knowledge in Classroom Practices in Senior Secondary Schools

(I) Work Exp.	(J) Work Exp.	Mean Difference (I-J)	P-Value
1-5 years	6-10 years	1.07933	0.433
	11-15 years	0.82664	0.924
	16-20 years	-0.58205	0.994
	Above 20 years	3.09795	0.010
6-10 years	1-5 years	-1.07933	0.433
	11-15 years	-0.25269	0.999
	16-20 years	-1.66139	0.759
	Above 20 years	2.01861	0.196
11-15 years	1-5 years	-0.82664	0.924
	6-10 years	0.25269	0.999
	16-20 years	-1.40870	0.905
	Above 20 years	2.27130	0.333
16-20 years	1-5 years	0.58205	0.994
	6-10 years	1.66139	0.759
	11-15 years	1.40870	0.905
	Above 20 years	3.68000	0.129
Above 20 years	1-5 years	-3.09795	0.010
	6-10 years	-2.01861	0.196
	11-15 years	-2.27130	0.333
	16-20 years	-3.68000	0.129

Table IV presents the post-hoc multiple comparisons of teachers' perception based on years of work experience. The results indicate that most pairwise comparisons between groups were not statistically significant, as shown by their high p-values (greater than 0.05). However, a significant difference was found between teachers with 1–5 years and those with above 20 years of experience (mean difference = -3.09795, p = 0.010). This suggests that more experienced teachers (above 20 years) significantly differ in their perception compared to those with the least experience, favoring greater integration of technological knowledge.

Hypothesis Four: There is no significant qualification difference in the level of teachers' perception towards integrating technological knowledge in classroom practices in senior secondary schools.

Table VII: ANOVA Showing Significant Differences by Teachers Qualifications

Perception	Sum of Squares	Df	Mean Square	F	p-Value
Between Groups	208.506	4	52.126	3.887	0.004
Within Groups	3111.073	232	13.410		
Total	3319.578	236			

Table VII presents the results of the ANOVA analysis used to test Hypothesis Four, which states that there is no significant qualification difference in the level of teachers' perception towards integrating technological knowledge in classroom practices in senior secondary schools. The analysis shows a statistically significant difference among teachers based on their qualifications, with an F-value of 3.887 and a p-value of 0.004 ($p < 0.05$). This result leads to the rejection of the null hypothesis, indicating that teachers' academic qualifications significantly influence their perception of integrating technological knowledge into classroom practices.

Table VIII: Multiple Comparison of Differences in Teachers' Perception towards Integrating Technological Knowledge in Classroom Practices in Senior Secondary Schools across their Qualifications.

(I) Qualifications	(J) Qualifications	Mean Difference(I-J)	P-Value
NCE	B.Ed/B.A	2.22230	0.179
	M.Ed	2.46021	0.197
	Ph.D	3.57834	0.033
B.Ed/B.A	NCE	-2.22230	0.179
	M.Ed	0.23791	0.998
	Ph.D	1.35604	0.758
M.Ed	NCE	-2.46021	0.197
	B.Ed/B.A	-0.23791	0.998
	Ph.D	1.11813	0.878
Ph.D	NCE	-3.57834	0.033
	B.Ed/B.A	-1.35604	0.758
	M.Ed	-1.11813	0.878

Table VIII presents the results of the multiple comparisons analysis, which examined the differences in teachers' perceptions towards integrating technological knowledge in classroom practices across various qualification levels. The analysis reveals that the only statistically significant difference is between teachers with a Ph.D. and those with an NCE qualification, with a mean difference of 3.58 and a p-value of 0.033 ($p < 0.05$). This indicates that teachers holding a Ph.D. have a significantly higher perception towards integrating technological knowledge compared to those with an NCE qualification. No other comparisons between qualification groups (B.Ed/B. A, M.Ed, and Ph.D) showed significant differences, suggesting that perceptions among these groups are relatively similar.

IX.DISCUSSION OF FINDINGS

Findings based on Research Question One revealed that teachers generally had a positive perception of integrating technological knowledge into classroom practices. This finding corroborates the study of Ismail et al. (2023), which reported that senior high school teachers in Pekanbaru perceived their TPACK skills to be high and demonstrated confidence in using technology in teaching. It also aligns with Abel et al. (2022), who found both positive and negative attitudes among teachers regarding ICT integration, but emphasized that positive attitudes were linked to context and availability of professional development. Similarly, Folorunsho (2019) in Nigeria confirmed that science teachers in Ilorin had positive perceptions of their TPACK, though technological knowledge remained the weakest component. With regard to Hypothesis One, which showed no significant difference in perception based on gender, the findings are in line with Koh and Sing (2011), and Irwanto et al. (2022), both of whom reported no significant

gender-based differences in TPACK levels among teachers. Likewise, Folorunsho (2019) supported this finding by concluding that gender had no significant influence on secondary school science teachers' confidence in technology integration. However, the result contrasts with Jordan (2013) and Li et al. (2024), who both found that male teachers rated their technological and content knowledge higher than female teachers, indicating significant gender differences. Also, findings were in line with that of Pamuk and Peker (2009) who found no substantial gender differences in teachers' attitudes toward technology, suggesting that male and female teachers are equally open to incorporating digital tools into their teaching. This finding suggests that both male and female teachers have similar views and willingness to incorporate technology into their teaching practices.

For hypothesis two, which found no significant difference in perception across different age groups, the result is consistent with Irwanto et al. (2022), who observed no significant age-related variation in TPACK levels. Similarly, Abel et al. (2022) suggested that perception is shaped more by contextual and institutional support rather than demographic factors like age. On the contrary, Muhaimin et al. (2019) found a significant difference in technological knowledge and pedagogical knowledge among different age groups, suggesting that age may still play a nuanced role in how teachers engage with technology. Findings from hypothesis three indicated a significant difference in perception based on teaching experience, with more experienced teachers expressing stronger confidence in integrating technology. This correlates with the findings of Folorunsho (2019), who reported that teachers with more years of teaching had higher confidence in using technology. It also aligns with Antony et al. (2019), who found that teaching experience significantly influenced teachers' TPACK levels, especially in science subjects. This finding is also consistent with research by Inan and Lowther (2010) and Ertmer and Ottenbreit-Leftwich (2010), which highlight that younger teachers tend to have more positive attitudes toward technology integration.

Lastly, hypothesis four revealed that teachers' academic qualifications significantly influenced their perception of technology integration. Teachers with higher degrees, especially Ph.Ds., showed more favourable perceptions. This agrees with the findings of Antony et al. (2019), who observed that teacher qualifications significantly impacted TPACK development. The result further corroborates Abel et al. (2022), who noted that access to training and advanced education positively shapes teachers' attitudes and readiness for technology integration. Likewise, study findings were in line with that of Bingimlas (2009) who suggests that while qualifications may enhance content knowledge, they do not necessarily predict teachers' attitudes toward the adoption of technology. Instead, ongoing professional development and institutional support play a more critical role.

X.CONCLUSION

It is clear from the results that instructors have generally good opinions about integrating technology into the classroom, albeit these opinions vary depending on experience and educational background. This implies that although educators are becoming more receptive to technology, long-term and meaningful integration hinges not just on tool availability but also on the extent of exposure and professional development teachers receive over time. Crucially, the lack of notable variations in perception between age and gender groups suggests a general level of preparedness across demographics, highlighting the necessity of inclusive and expandable training programs. Therefore, closing the remaining gaps and improving the caliber of technology-enhanced teaching and learning would require bolstering institutional support and encouraging a culture of ongoing learning among educators. This study investigated educators' opinions regarding the incorporation of technical knowledge into classroom practices in senior secondary schools, uncovering critical insights into the determinants of technology adoption in education.

The results indicate that instructors predominantly hold a positive view of technology integration, with an overall mean of 3.10 reflecting perceptions that above the benchmark criterion. Educators acknowledge technology as an essential instrument for augmenting student involvement, fostering learning autonomy, and enhancing educational efficacy. Nonetheless, apprehensions remain about technical support, infrastructural constraints, and a preference for

conventional pedagogical approaches in certain circumstances.

The hypotheses testing of the study uncovered significant demographic trends. Although gender did not significantly affect instructors' judgments ($p = 0.060$), job experience and academic credentials were identified as significant determinants. Educators with over 20 years of experience exhibited markedly more favorable perceptions than those with 1-5 years of experience ($p = 0.010$), indicating that extensive teaching experience may enhance understanding for the educational advantages of technology. Teachers possessing Ph.D. qualifications exhibited markedly more favorable judgments than those with NCE qualifications ($p = 0.033$), suggesting that greater academic preparation may improve attitudes toward technology integration.

The findings indicate that professional development programmes must to be customized to accommodate varying levels of expertise and qualifications, particularly focusing on assisting novice educators and individuals with lesser academic credentials. Educational institutions must prioritize resolving infrastructure difficulties and provide extensive technical support to enable effective technology integration in classroom activities.

XI.RECOMMENDATIONS

By implementing these underlisted recommendations, schools are expected to create an enabling environment that supports the effective integration of technology into classroom practices, ultimately leading to improved teaching and learning outcomes. Based on the findings, the following recommendations are proposed:

1. Teachers should be provided with continuous professional development opportunities which will focus on enhancing teachers' technological proficiency and confidence. These training programmes should be tailored to address the needs of teachers at different stages of their careers, offering advanced training for younger teachers and more foundational support for older or less experienced educators.
2. Educators should engage in ongoing training and collaborative learning in order to enhance their abilities and self-assurance in using technology for instruction.
3. The government should make investments in ICT infrastructure and implement laws that mandate all instructors to have digital literacy training.
4. School administrators should support efficient use of technology in the classroom by offering resources, frequent training, and rewards.
5. Technology integration classes should be incorporated into teacher education programs to better prepare aspiring educators.
6. Particularly in underprivileged areas, NGOs and business partners should partner in order to provide schools with digital tools, resources, and training.

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