Original Research Article

Teachers' Competence on Information and Communication Technology and Its Influence on Students' Performance in Gezawa, Nigeria

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Abstract

Many countries around the world have fully integrated Information and Communication Technology (ICT) into their educational systems. The expansion of ICT use in educational settings has sparked a rush of research work examining the link between ICT and academic performance. In Nigeria's education sector, ICT is integrated in secondary school's syllabus. However, their use in teaching and learning has remained sporadic. This paper sought to determine teachers' competence on ICT in teaching and learning and their influence on students' performance. The hypothesis tested was there is no significant relationship between teachers' competence on ICT in teaching and learning and students' performance. The Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh, Davis, and Morris (2003) was used to guide the study. The sample size consisted of 152 teachers and 297 students from 16 schools. Questionnaires for teachers and document analysis for students were used to collect data in this study. Descriptive statistics included frequency counts, percentages, means and standard deviation, whereas inferential statistics involved Pearson Product Moment correlation coefficient, factor and multiple regression analysis. The results of the study revealed a weak negative relationship (r=-.021, p>.05) between teachers' competence on ICT and students' performance. It can be concluded that teacher's competences among the ICT users in the studied schools are generally limited especially to the staff members of older age, and the connection between teachers' competences on ICT and students' performance were negative. It is recommended that teacher training colleges should incorporate computer education and training on how to integrate ICT in education in the curriculum so that pre-service teachers leave the college being well prepared with ICT skills. This would enhance and maintain teachers' ICT passion for effective ICT integration in teaching and learning for better student's performance in secondary schools.
Keywords: Integration, ICT, competence, teachers, performance.

1.1 INTRODUCTION

Information communication technologies (ICT) have the power to significantly improve education, accelerate skill development, engage, fascinate, and motivate students in the learning process, help them connect their school experiences to their work habits, contribute to the economic viability of tomorrow's workforce, improve teaching and course design, and provide opportunities for students to engage with the world in all its forms (Davis & Tearle, 2019). ICTs may boost a school's efficiency and productivity, resulting in a variety of tools to assist and elevate the professional actions and activities of teachers and instructors (Kirschner & Woperies, 2013). Culp, Honey, and

Mandinach (2013) proposed that technology is typically used as (a) a tool to address problems in teaching, learning, and instruction, (b) a catalyst for transformation, and (c) a key driver for competitiveness in the marketplace and economy.

In Nigeria's education sector, there have been some changes indicating that ICT is being employed in secondary schools. However, despite enormous investment in resources and training, secondary schools are still far behind the curve in using ICTs for science teaching, learning, and instruction (Machin, McNally, & Silva, 2017; Eteokleous, 2018). This paper sought to determine teachers' competence in ICT and their

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influence on students' performance in public secondary schools in the Gezawa area of Kano State, Nigeria.

1.2 Statement of the Problem

Several studies have highlighted the limited integration of ICT in teaching and learning among teachers in African countries (Tedla, 2012). In Nigeria, despite efforts to foster technological advancement, outcomes have been varied, with some initiatives yielding unsatisfactory results while others show promise (Adedayo, 2018). Notably, substantial investments by both Federal and State governments in ICT-driven projects like "school net" (Okebukola, 2014; Adomi, 2016), along with contributions from non-governmental organizations to Nigerian secondary schools, have not resulted in widespread ICT adoption in education.

Research suggests that when ICT is effectively incorporated into education, students benefit from enhanced independent learning and academic performance (Valasidou & Bousiou, 2015). However, contrary viewpoints exist. For instance, Cuban (2001) contends that there's insufficient evidence to support a positive correlation between increased educational ICT use and students' academic outcomes, citing consistently negative or marginally significant relationships between ICT use and student performance. Moreover, the availability of ICT might lead some students to prioritize leisure activities over studying, further complicating the relationship between ICT and academic achievement.

Given these conflicting perspectives, this paper delves into the proficiency of teachers in utilizing ICT for educational purposes and its impact on students' academic achievements in public secondary schools within the Gezawa Area of Kano State, Nigeria.

1.3 Theoretical Framework

Venkatesh et al. (2003) elucidate Performance Expectancy (PEx) as the conviction held by individuals that utilizing a system will enhance their performance and subsequently improve job quality. The attributes of this theory were leveraged in our study to elucidate why certain educators incorporate ICT into their teaching and learning practices while others refrain. UTAUT theory facilitates the examination of factors that either facilitate or impede the integration of ICT in secondary school teaching and learning. Furthermore, it assists educators in pinpointing attributes that render ICT integration in teaching and learning more appealing to users. Comin and Mestieri (2013) observed that the rate of adoption of a novel technology is contingent upon the communication channels utilized to disseminate information about it and the societal context. This theory was selected for our research because it underscores perspectives and factors influencing ICT integration in secondary school teaching and learning.
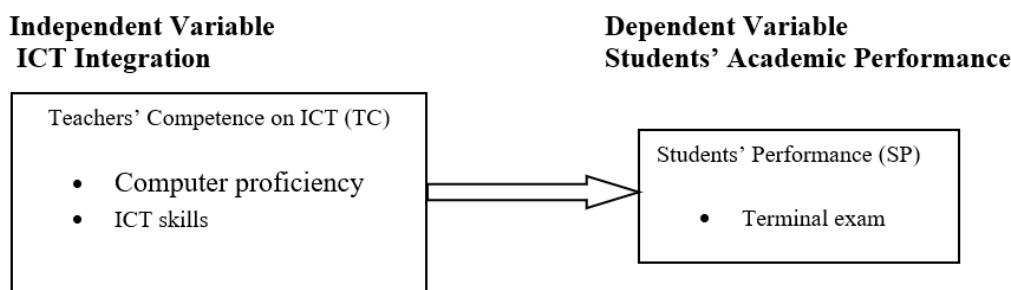
1.4 Conceptual Framework

Figure 1.1: Conceptual Framework showing the relationship between independent and dependent variable

2.0 LITERATURE REVIEW

2.1 Teachers' Competence on ICT

The integration of Information and Communication Technology (ICT) into classroom settings is closely linked to the computer proficiency of teachers (Amuko, Miheso, & Ndethiu, 2015). Evidence suggests that teachers who hold negative or neutral views toward ICT likely lack the necessary knowledge and skills to make informed decisions regarding its use in teaching and learning processes (Amuko *et al.,* 2015). Moreover, teachers' abilities and attitudes toward utilizing modern technology, particularly in mathematics education, play a pivotal role in the successful integration of ICT into the classroom (Amuko *et al.,* 2015).

Lim and Pannen (2012) found a correlation between ICT proficiency and pedagogical considerations when analyzing teacher education programs. However, they noted that deeply ingrained ideas may hinder the necessary shift in pedagogy, emphasizing the importance of significant modifications (Lim & Chai, 2008). For effective integration of ICT in teaching and learning, teachers must be adept users of ICT to enhance both their professional development and productivity (Amuko *et al.,* 2015).

In science education, effective teacher preparation and competency are deemed essential for the successful integration and sustainability of ICT (Jimoyiannis *et al.,* 2013). Girgin, Kurt, and Odabasi (2011) underscored the significance of technical

competency as a predictor of ICT integration, emphasizing the importance of instructional strategies alongside technical skills. However, they noted a tendency for ICT teacher professional development activities to focus primarily on technological features rather than pedagogical concerns.

Scheg (2014) highlighted the limitations of current technological instruction for instructors, which often concentrate on basic computer literacy rather than pedagogical utilization of technology. Despite these challenges, the integration of ICT in education has become a global phenomenon, aiding educators in aligning their instruction with international best practices (Ghavifekr, 2015).

Studies conducted in various countries further underscore the importance of teacher proficiency in ICT integration. Samuel and Zaitun (2007) found that Malaysian teachers require adequate ICT integration skills for effective teaching and learning processes. Similarly, Ghavifekr (2015) identified teacher proficiency in ICT integration as a key determinant of success in technology-based teaching and learning.

Amuko (2015) conducted a descriptive survey in Kenya, revealing the challenges faced by teachers in integrating ICT into teaching and learning. Similarly, Moluayonge and Innwoo's (2017) study in Cameroon highlighted issues such as inadequate infrastructure and low teacher competence as barriers to ICT adoption in education.

In Ghana, Agyei and Voogt (2012) reported low levels of technology integration among practicing and student math teachers due to restricted access and competency issues. Agyei (2013) identified institutional factors and a lack of qualified human resources as additional challenges to ICT integration in teacher education in Ghana.

2.2 Influence of Teacher's ICT Competence on Student Performance
A plethora of research on ICT integration in educational settings has consistently highlighted challenges stemming from instructors' deficiencies in knowledge, expertise, and skills concerning such integration (Hennessy *et al.*, 2015). This underscores the persistent hurdles in integrating ICT-supported educational resources into classroom settings. Selwein (2011) posited that the adoption and implementation of information technology by instructors pose a more intricate and time-consuming endeavor compared to other instructional technologies. It was concluded that comprehending ICT integration in school settings hinges on teachers' perspectives and attitudes toward ICT skills and competencies. For effective classroom technology use, teachers must harbor positive attitudes toward technology and undergo training in contemporary educational technologies.

Research indicates that although 50% of teachers with classroom computers use them, only two-thirds feel comfortable utilizing ICT in the classroom. This discrepancy underscores that effective computer utilization in classrooms relies not only on computer availability but also on teacher preparedness and competency, supported by encouraging programs and policies.

Following ICT training, a majority of instructors in a study involving 23 primary school teachers in Cyprus reported either a shift in their attitudes toward technology or acquisition of fundamental skills (Kang, Heo, & Kim, 2011). However, the study found no substantial evidence of ICT training significantly affecting ICT use in the learning process. Notably, training methodologies appeared to have a notable impact on instructors' attitudes only when participants overcame apprehensions through technology usage, feeling personally empowered by its potential.

Evaluation of the World Links program (2014) revealed that acquiring new computer skills and teaching techniques through the program fostered more favorable attitudes toward technology and instruction among teachers, with significant implications for students' performance. The program posits that ICT usage fundamentally alters classroom teaching, a notion substantiated by school surveys across 26 nations and numerous case studies conducted in Europe, Asia, North America, South America, and Africa. The comprehensive teacher training provided by the World Links program resulted in changes in both instructional strategies and acquisition of new skills among instructors. These methods included conducting research projects, data compilation and evaluation, collaboration with students from different nations, and engagement with parents and community members.

The imperative nature of teachers' skills and competencies for ICT integration in Kano secondary schools is evident. However, the current state of secondary school teachers' competency in integrating ICT in the classroom remains unknown. Thus, the study was motivated to investigate this issue, aiming to discern teachers' competences in ICT and their impact on student performance in the Gezawa Area.

3.0 MATERIALS AND METHODS
3.1 Research Design
Research design is an outline of the research being carried out from the beginning to the end, it is a plan which the research follows (Moore, 2006). The descriptive survey research design was adopted for this study, through which views and opinion were collected from the sample. The quantitative research approach was adopted for its execution and post positivist philosophical assumption guided the study which recognizes that we cannot be absolutely positive about our claims of knowledge when studying the behavior and

action of humans, this worldview is deterministic, as such, the study was carried out to determine teachers' attitude on ICT integration in teaching and learning and its influence on students' performance.

3.2 Study Location
The study was carried out in Gezawa local government area of Kano State, Nigeria. Gezawa local government area was formally established in the year 1976 during the military regime of General Murtala Ramat Muhammad. Gezawa is a local government area in Kano state.

3.3 Study Population
The study population was the entire teachers in public secondary schools of Gezawa local government which comprise of 16 schools, 245 teachers and 1,340 S.S 2 students. Teachers were chosen because they are directly involved in the teaching and assessment of students and S.S 2 students were targeted because it is at this level that the content starts to become more difficult and abstract.

3.4 Sampling
Krejcie and Morgan (1970) table was used to determine the actual sample size from the population of the study. A total of 152 teachers and 297 students were sampled using proportional simple random sampling from the participants of the study.

3.5 Data Collection Instruments
3.5.1 Questionnaire
The researcher administered one questionnaire namely: Questionnaire for Teachers (QFT) which consists of scale on teachers' attitude towards integration of ICT in teaching and learning. The reliability of the questionnaire means the ability of the questionnaire to gather the same data consistently under similar conditions (Kimberlin & Winterstein, 2008). Validity is a measure of the degree to which a research instrument measures what it is meant to measure.

3.5.2 Document Analysis
Document analysis was used to obtain records of students' performance for individual students' average scores in their terminal examinations for 2021/2022 academic session which consist of three terms.

3.6 Model and Analysis
Descriptive and inferential statistics were used for the analysis procedure. The data from the survey was analyzed using frequencies, percentages, and Pearson's product moment correlation.

4.0 RESULTS AND DISCUSSION
4.1 Descriptive Analysis
The study sought to establish teachers' competence on ICT and their influence on students' performance. Statements of some common ICT competence skills were provided, and teachers were asked to indicate their level of agreement. A five-point Likert scale was used by the researcher to rate respondents' opinions. This was rated on a scale of; (5) = Strongly Agree (4) = Agree, (3) = Not sure (2) = Disagree (1) = Strongly Disagree. In data analysis, reference was made to the five-point Likert scale. Thus, the mean score $1.0 - 2.0$ = SD; $2.1 - 2.9$ = D; 3.0 = NS; $3.1 - 4.0$ = A, and $4.1 - 5.0$ = SA. The standard deviation (S.D) below 1.0 implies high agreement of the respondents as well as reasonable validity of the reported mean values. The S.D which is high (above 1.0) shows high variations in responses about the items asked.

Table 4.1: Teachers' Competence on ICT

Tested items	SD	D	N	A	SA	Mean	SD
I can install education software in a computer	5 3.5%	15 10.4%	15 10.4%	68 47.2%	41 28.5%	3.87	1.053
I can download materials from the internet	5 3.5%	6 4.2%	10 6.9%	64 44.4%	59 41.0%	4.15	0.970
I can produce PowerPoint presentations	5 3.5%	23 16.0%	23 16.0%	67 46.5%	26 18.1%	3.60	1.066
I can take photos using digital devices and show them to students in the computer	8 5.6%	16 11.1%	37 25.7%	45 31.3%	38 26.4%	3.62	1.153
I can comfortably locate and retrieve curriculum resources in the internet	12 8.3%	34 23.6%	35 24.3%	33 22.9%	30 20.8%	3.24	1.259
I can prepare lesson that involve the use of ICT	7 4.9%	15 10.4%	25 17.4%	55 38.2%	42 29.2%	3.76	1.128
I can use computer spreadsheets to assess and evaluate my students	14 9.7%	20 13.9%	39 27.1%	48 33.3%	23 16.0%	3.32	1.186
I can file documents in electronic folders in the computer	4 2.8%	9 6.3%	5 3.5%	64 44.4%	62 43.1%	4.19	0.968
I can send electronic mail via the internet	5 3.5%	8 5.6%	7 4.9%	51 35.4%	73 50.7%	4.24	1.019
I can produce simulations and use them in teaching	15 10.4%	32 22.2%	34 23.6%	35 24.3%	28 19.4%	3.20	1.277

As presented in table 4.4, most of the respondents 68 (47.2%) agreed and 41 (28.5%) strongly agreed that they can install education software in a computer. On the other hand, only 15 (10.4%) disagreed, and 5 (3.5%) strongly disagreed with the statement, while 15 (10.4%) were neutral. The results indicate that on average, the majority of the respondents agreed with the statement. The corresponding mean value obtained was 3.87 which reflects general agreement with the statement while the standard deviation of 1.053 shows that there were high variations in responses. This means that while most of the respondents agreed that they were competent in installing education software in a computer, some percentage disagreed with the statement.

The study found that most respondents 64 (44.4%) agreed that they can download materials from the internet and 59 (41.0%) strongly agreed. However, few respondents 6 (4.2%) disagreed and 5 (3.5%) strongly disagreed with the statement, while 10 (6.9%) were neutral to that. The results show that overall, the majority of the respondents were in agreement with the statement. The findings were justified with a corresponding mean score of 4.15 which is above average and a standard deviation of 0.970 which reflects low variations in responses. This implies that generally, respondents consented that they can download materials from the internet.

On whether respondents can produce PowerPoint presentations, 26 (18.1%) of the respondents strongly agreed. They were seconded by 67 (46.5%) who agreed, however, 23 (16.0%) were neutral, 23 (16.0%) disagreed with the statement and 5 (3.5%) strongly disagreed with it. The findings were further supported with a mean response of 3.60 which is above average, implying that the majority respondents were in agreement with the statement, and a standard deviation of 1.066 which reflects high variation in responses. Whereas the mean score implies that generally, respondents concurred with the statement that they can produce PowerPoint presentation, the high standard deviation implies high variations in responses meaning that some good number disagreed with the statement.

With regard to I can take photos using digital devices and show them to students in the computer, most of the respondents 45 (31.3%) agreed and 38 (26.4%) strongly agreed with the statement, 37 (25.7%) were neutral, 16 (11.1%) disagreed with the statement and 8 (5.6%) strongly disagreed. The findings show that on average, the majority of the respondents were in agreement with the statement. The corresponding mean score of 3.62 indicates that majority of the respondents consented with the statement while a standard deviation of 1.153 means that there were high variations in responses. This high variation could mean that respondents were most varied on the statement which implies that much as the majority agreed with the statement, others disagreed.

The study found that 30 (20.8%) of the respondents strongly agreed that they can comfortably locate and retrieve curriculum resources in the internet and 33 (22.9%) agreed with the statement. However, 35 (24.3%) of the respondents were neutral to that, also, 34 (23.6%) disagreed, and 12 (8.3%) strongly disagreed with the statement. The findings were verified with a mean score of 3.24 indicating that the majority of the respondents agreed with the statement. The corresponding standard deviation of 1.259 reflects high variations in responses in the obtained results. This implies that whereas majority of the respondents agreed with the idea that they can comfortably locate and retrieve curriculum resources in the internet, some percentage disagreed.

On the statement, "I can prepare lesson that involve the use of ICT" most of the respondents 55 (38.2%) agreed and 42 (29.2%) strongly agreed. A few respondents 15 (10.4%) disagreed with the statement and 7 (4.9%) strongly disagreed with it. However, 25 (17.4%) were neutral with a corresponding mean value of 3.76, which indicates that generally, respondents were in agreement with the statement while the standard deviation of 1.128 shows high variations in responses. This implies that the majority of the respondents held that they can prepare lesson that involve the use of ICT and some others disagreed.

With regard to "I can use computer spreadsheets to assess and evaluate my students" 23 (16.0%) of the respondents strongly agreed with the statement and 48 (33.3%) agreed, 39 (27.1%) were neutral, 20 (13.9%) disagreed with it and 14 (9.7%) strongly disagreed. The findings show that on average, the majority of the respondents were in agreement with the statement. The corresponding mean score of 3.32 indicates that majority of the respondents consented with the statement while a standard deviation of 1.186 means that there were high variations in responses. Thus, the findings reflect general agreement, which implies that the majority of the respondents can use computer spreadsheets to assess and evaluate students

The study found that most of the respondents 64 (44.4%) agreed and 62 (43.1%) strongly agreed that they can file documents in electronic folders in the computer, while 5 (3.5%) were neutral, a very few of 9 (6.3%) disagreed and 4 (2.8%) strongly disagreed. The results show that on average, respondents generally agreed with the statement. The corresponding mean score of 4.19 reflects general agreement with the statement while a standard deviation of 0.968 indicates low variations in responses. This implies that overall, respondents consented that they can file documents in electronic folders in the computer.

With regard to "I can send electronic mail via internet" majority of the respondents representing 73 (50.7%) strongly agreed with the statement and 51

(35.4%) agreed, 7 (4.9%) were neutral, 8 (5.6%) disagreed with the statement and 5 (3.5%) strongly disagreed. The results show that overall, the majority of respondents were in agreement with the statement. The findings were justified with a corresponding mean score of 4.24 which is above average and a standard deviation of 1.019 which reflects high variations in responses. This implies that while most of the respondents indicated that they can send electronic mail via internet, some others disagreed.

On the statement, "I can produce simulations and use them in teaching", 28 (19.4%) of the respondents strongly agreed, they were seconded by 35 (24.3%) who agreed, however, 34 (23.6%) were neutral, 32 (22.2%) disagreed with the statement, and 15 (10.4%) strongly disagreed with it. The results show that on average, the majority of the respondents agreed with the statement. The obtained mean value of 3.20 was corresponding to respondents agreeing with the statement and a standard deviation of 1.277 shows high variations in the responses obtained. The results therefore indicate that much as the majority of the respondents agreed with the statement, others were also in disagreement which was indicated by a high standard deviation.

4.2 Correlation Analysis
Correlation analysis was done to determine the relationship between the study variables. Pearson product moment correlation coefficient test showed that there was a weak negative correlation between teacher's competence on ICT and student's performance ($r=-.021$, $p>.05$) as shown in Table 4.2.

Table 4.2: Correlation Coefficients

Variable	Student's performance	
	Correlation Coefficient	Sig. Value
Teacher's competence	-.021	.807

4.3 DISCUSSION
Findings of the study revealed that most of the respondents have competence skills on ICT despite lack of ICT infrastructures in the study area. Majority of the resondents have some common competence skills on ICT like installing education software in a computer, downloading materials from the internet, producing PowerPoint presentations, preparing lesson that involve the use of ICT, filing documents in electronic folders in the computer and sending electronic mail via the internet. The study was consistent with that of Samuel & Zaitun (2007), who discovered that many English teachers possessed the required ICT abilities despite the fact that Malaysian schools' use of the resources was far from optimal. A study in Kenya by Michael et al. (2016) is also in agreement with current study, the results showed that the majority of respondents had ICT training up to the reading level, and that they had confidence in their ability to use ICT for the teaching and learning process. On the other hand, findings of the current study are contrary to the study conducted by Amuko (2015) in Kenya which revealed that teachers confront numerous difficulties, including learning technical skills and information on their own and undergoing self-training for using ICTs in their instruction. It is also contrary to the findings of Moluayonge and Innwoo (2017) which indicated that insufficient ICT infrastructure and teachers low level competence skills on ICT in secondary schools in Cameroon is to blame for the limited adoption of ICT in teaching and learning.

Teachers need to be skilled ICT users in order to successfully integrate ICT into both teaching and learning, as well as to promote their own professional productivity and development as well as their student's performance. Findings of this study revealed a weak negative correlation between teachers' competence on ICT and student's performance. Thus, teachers' competence on ICT has no influence on student's performance. The teacher's opinion of the significance of an application and their level of expertise with it are more significant obstacles to computer use (Sorgo, Vercknovnik and Kocijancic, 2010). Harrison and Rainer (2012) found that participants with poor computer skills were less likely to embrace and adapt to technology than those with favorable views, who also had better computer skills. According to Nyaga (2016), although not all teachers or students were able to access or use digital content competently, it had a favorable impact on students' assessments and academic performance in the sampled secondary schools.

5.0 CONCLUSIONS AND RECOMMENDATIONS
5.1 Conclusions
Based on the findings of the study, it can be concluded that;
1. Teachers have a very good competency on some common ICT skills like, installing education software in a computer, downloading materials from the internet, preparing lesson that involve the use of ICT, filing documents in a computer and sending mail via the internet.
2. Teacher's competence on ICT have a negative effect on student's performance. The connection between teacher's competence on ICT and student's performance were negative in public secondary schools of Gezawa Area, Kano State Nigeria.
3. Teacher's competences among the ICT users in the studied schools are generally limited especially to the staff members of older age. Most staff members had inadequate and limited ICT skills to integrate ICT in teaching and learning in secondary schools.

5.2 Recommendations

Based on the conclusion of the study, the following recommendations are suggested:

1. Teacher training colleges should incorporate computer education and training on how to integrate ICT in education in the curriculum so that pre-service teachers leave the college being well prepared with ICT competency uniformly.
2. The government of Nigeria through the Ministry of Education should consider organizing more in-service and on job training in retooling of school-based ICT users for effective ICT integration in teaching and learning for better students' performance.
3. The school heads should always act timely in responding to teachers' and other staffs' needs concerning ICT usage to enhance and maintain their ICT passion for effective ICT integration in teaching and learning for better student's performance in secondary schools.

Conflict of Interest

The authors declare no conflicts of interest.

About the Authors

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