

AN APPRAISAL OF PRIVATE PRIMARY SCHOOL TEACHERS'
TPACK ON PUPILS' PERFORMANCE IN COMPUTER STUDIES IN OSUN STATE
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Abstract

The study focused on appraisal of Teachers' Technological, Pedagogical, and Content Knowledge (TPACK) on pupils' performance in Computer Studies in Osun State private primary schools. The study also investigated the nexus between teachers' content knowledge and pupils' achievement in computer studies, teachers' pedagogical knowledge and pupils' achievement in computer studies, as well as teachers' technological knowledge and pupils' achievement in computer studies. All private primary schools pupils and teachers in Osun State constituted population for the study and out of this, a sample of 15 teachers and 300 pupils were selected using multistage sampling procedures. A verified TPACK scale was used to elicit data from the teachers while Primary Three Computer Studies Test (PTCST) was used to determine the pupils' achievement test. The reliability coefficient of 0.89 was obtained from PTCST using Cronbach alpha. The findings revealed a significant relationship between teachers' Technological Knowledge and pupils' academic performance in computer studies ($F = 7.596$, $p < 0.05$). It further discovered a significant relationship between teachers' pedagogical knowledge and pupils' academic performance in computer studies ($F = 4.396$, $p < 0.05$). Likewise, there was a significant combined relationship between teachers' TPACK and pupils' academic performance in computer studies in private primary schools in the study area ($F = 5.634$; $p < 0.05$; $R^2 = 0.054$). However, there existed no significant relationship between teachers' content knowledge and the pupils' academic performance in computer studies in the study area ($F = 0.564$, $p > 0.05$). The study concluded that teachers' technological and pedagogical knowledge as well as combined TPACK influenced pupils' academic achievement

in computer studies. This implies that teachers technological, pedagogical and TPACK should be developed more so that pupils' performance in computer studies can improve more in the selected private primary schools in the state.

Keywords: TPACK, computer studies, teachers, pupils, performances, private primary school

Introduction

The Technological, Pedagogical and Content Knowledge (TPACK) of teachers in Nigerian primary schools in computer studies is gaining attention. TPACK is an instructional model used to describe the knowledge required for effective teaching with technology (Koehler, Mishra, & Cain, 2013). It is a combination of three knowledge domains: technological knowledge, pedagogical knowledge, and content knowledge (Afari, Eksail, Khine, & Alaam, 2023). Technological knowledge describes the understanding of how technology works, how to use it, and how to create new tools using technology. Pedagogical knowledge describes the understanding of how to teach effectively, including the ability to design, implement and evaluate instructional activities. Content knowledge is the understanding of the subject matter that is being taught (Koehler & Mishra, 2009).

In general, TPACK is about the need for teachers to effectively blend knowledge and skills in content, pedagogy and technology required in developing and presenting school subjects (Brouns et al., 2022). TPACK is important to consider when designing technology-rich instruction, because without a clear understanding of how to use technology to enhance learning, teachers risk creating activities that are not effective in helping students learn.

Furthermore, teachers need to understand how to use technology to help students learn the subject matter being taught, which requires a strong understanding of both the technology and the subject. Without TPACK, teachers may be unable to develop instructional activities that take advantage of the capabilities of technology, or they may create activities that are ineffective in helping students learn. In addition, the teachers' TPACK is indirectly needful in building skills for the nation. Based on one of the objectives of primary school in the Federal Republic of Nigeria (FRN) National Policy on Education, teachers' TPACK could aid laying "a sound basis for scientific, critical and reflective thinking" in pupils (Federal Republic of Nigeria, 2014). For this objective to be achieved, the curriculum for primary one to six shall include the pedagogy of information technology. This information technology in the policy document could refer to computer studies subject being taught in the Nigerian primary schools.

Computer studies is one of the recent compulsory key subjects to be taught in Nigerian primary schools. Computer studies is an important field of study for primary school students as it provides the foundation for digital literacy, which is essential in today's digital world. Through the study of computer studies, pupils could develop important skills like problem solving, critical thinking, and communication. By learning how to use computers and other digital technologies, pupils gain the ability to find, evaluate, and use digital information to their advantage. In Nigerian context, computer studies are subsumed under Basic Science and Technology (Federal Republic of Nigeria, 2014). According to the document, specialist teachers shall be provided for subjects like Basic Science, Basic Technology and others but not too clear about the teaching of information technology (computer studies).

Teaching computer studies, only 62.9% of the teachers in Nigeria secondary school are trained to teach the subject (Onifade, 2018). However, observation showed that there are few computer experts to teach computer studies in primary schools (Brenda, Odili, & Osadebe, 2023). Based on this fact, it could then be argued that, with what knowledge would majority of the primary school

teachers teach computer studies since the subject is compulsory and limited experts teach the subject? With this question, it will be necessary to investigate the technological, pedagogical and content knowledge with which private primary school teachers engage Nigerian pupils in teaching computer studies in classroom.

There is limited research on primary school teachers' TPACK in computer studies, especially in Nigeria. However, in other field like religious studies, Owusu (2015) and Amuah (2022) revealed a weak positive association existed between teachers' technological knowledge and pupils' academic achievement. Similarly, the study by Owusu (2015) found a weak positive relationship between teachers' content knowledge and pupils' academic achievement in religious and moral education. Amuah (2022) however concluded that there was no evidence that the teachers had adequate technological knowledge to teach pupils religious and moral studies in the schools.

Furthermore, the study by Luzon (2022) found that teachers' technological knowledge significantly interrelated with both pedagogical and content knowledge. This means that there exists a correlation among the three knowledge. This is similar to Luo, Berson, Berson, and Park (2022) who found that the three major components of TPAC, TK, TPK, and PK significantly associated. However, Luzon (2022)'s study further showed that teachers' TPACK does not significantly influence students' academic achievement. While Olaniran, Folajimi, and Aladeboyeje (2022) found Ondo State secondary school teachers with average TPACK level in computer studies.

Framework for the Study

This paper adopted technological, pedagogical and content knowledge (TPACK) framework developed by Koehler and Mishra (Koehler & Mishra, 2009; Koehler et al., 2013) to guide formulation of objectives, data gathering and interpretation of findings. The framework extended the study of Lee Shulman's variable known as pedagogical content knowledge (PCK) by including technology knowledge. As earlier mentioned, the constructs of TPACK could be

used to explain teachers' effective utilization of technology to teach.

There are seven constructs in the framework (Koehler et al., 2013), namely: Content knowledge (CK), this means knowledge of the subject matter (computer studies) or topic being taught in the subject; Pedagogical knowledge (PK), this implies the knowledge of how to effectively teach computer studies or topics in the subject; Technology knowledge (TK), this means productive utilization of technological devices both in theories as well as in practices. It also refers to teacher's knowledge of computers, software, and other technological devices, as well as the ability to use and troubleshoot it; Pedagogical content knowledge (PCK), this implies is the knowledge required of a teacher to effectively teach a particular topic or subject. It involves an understanding of the content of a subject, how to teach it, and how to assess student learning. PCK is based on a combination of subject-specific knowledge, teaching strategies, and an understanding of the learning process. It is not just a combination of knowledge and pedagogical strategies, but also an understanding of how to interact with students, create and maintain a positive learning environment, and use resources effectively.

Additionally, Technological content knowledge (TCK), this is the knowledge and skills related to the use of technology for teaching and learning. This includes knowledge of the various types of digital tools available, how to use them effectively, how to integrate them into instruction, and how to assess student learning. It also includes an understanding of how technology can be used to enhance instruction, facilitate collaboration, and improve Pupils learning outcomes; Technological pedagogical knowledge (TPK), this means skill on how to drive pedagogical practices with or without a particular technology; as well as Technological pedagogical and content knowledge (TPCK), this means the complete technology integration that resulted out of intersection of content, pedagogy, as well as technology knowledge. Koehler et al. (2013) posited that TPACK is fundamental to the foundation of facilitating learning with technology. This then requires an adequate

acquisition of the pedagogical strategies that deploy technology in constructive content delivery.

Statement of the Problem

Average Nigerian primary schools' pupils see every technological related device as toy and would want to do everything humanly possible to explore its usability. This curiosity in the pupils ought to be explored and sustained through their learning in schools to develop "critical and reflective thinking" in the learners (Federal Republic of Nigeria, 2014). Far above these, the pupils have to be prepared to uptake the subject at higher level of learning. Moreso, failure to adequately prepare the learners at the elementary stage of cognitive development might expose them to danger of poor performance in the subject. It is also necessary to note that the primary school teachers play major roles in the pupils' preparation. However, it appeared that the teachers who teach computer studies at the primary schools do not to have the necessary requisite knowledge to develop the pupils in this subject. Since there is limited research in this area, this study intended to investigate the private primary school teachers' technological, pedagogical and content knowledge (TPACK) in computer studies. This is also to determine the influence of the teachers TPACK on the pupils' performances in the computer studies in some schools in Osun State, Nigeria.

Objective of the Study

Four specific objectives guided this study, they are to;

- i. determine the nexus between teachers' Technological Knowledge (TK) and pupils' academic performance in computer studies in private primary schools in Osun East Senatorial District,
- ii. investigate the relationship between teachers' Content Knowledge (CK) in computer studies and pupils' academic performance in computer studies in the study area,
- iii. examine association between teachers' Pedagogical Knowledge (PK) in computer studies and pupils' academic performance in computer studies in the selected primary schools, and
- iv. compare the collective connexion between

teachers' Technological, Pedagogical and Content Knowledge (TPCK) in computer studies and pupils' academic performance in computer studies in the study area.

Hypotheses

- i. There is no significant relationship between teachers' Technological Knowledge (TK) in computer studies and pupils' academic performance in computer studies in primary schools
- ii. There is no significant relationship between teachers' Content Knowledge (CK) in computer studies and pupils' academic performance in computer studies in lower primary schools.
- iii. There is no significant relationship between teachers' Pedagogical Knowledge (PK) in computer studies and pupils' academic performance in computer studies in lower primary schools.
- iv. There is no significant combined relationship between teachers' Technological, Pedagogical and Content Knowledge (TPCK) in computer studies and pupils' academic performance in computer studies in lower primary schools.

Results

H₀₁: There is no significant relationship between teachers' Technological Knowledge (TK) in computer studies and pupils' academic performance in computer studies in primary schools.

In order to test this hypothesis, data collected on teachers' Technological Knowledge (TK) in computer studies and pupils' academic performance in computer studies in lower primary schools were subjected to linear regression analysis and the results are presented in Table 1

Table 1: Regression analysis of the relationship between teachers' Technological Knowledge in computer studies and pupils' academic performance in computer studies

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	120.469	1	120.469	7.596	.006 ^b
Residual	4726.488	298	15.861		
Total	4846.917	299			
R = 0.158 ^a , R Square = 0.025, Adjusted R Square = -0.022					

(F = 7.596, p < 0.05)

Results in Table 1 showed that there is significant relationship between teachers' Technological Knowledge in computer studies and pupils'

Methodology

The study adopted a correlational research design. This is with an intent of assessing TPACK variables in relation to teachers in selected Private Primary schools. All primary school teachers and pupils in Osun State constituted the population for this study. From the selected senatorial district, three Local Government Areas (LGAs), Ife Central, Ife East and Ife North were selected randomly. Out of these LGAs, 15 private primary school teachers and 300 pupils were drawn using multistage sampling procedures as study sample. Five private primary schools were randomly selected from each LGA. While one private primary three class with 20 pupils and a teacher were selected from each LGA using convenient sampling technique. Two research instruments were used for data collection, namely: Questionnaire for Assessing Teachers Pedagogical and Content Knowledge in Computer Studies in Primary Schools (QA'TPCK'CSPS) and Questionnaire on the Assessment of Pupils Performance in Computer Studies (QAPPCS) for Pupils. Kuder-Richardson was used to determine the reliability of the instruments with a coefficient value of 0.71 and 0.72. The data gathered were analysed using Linear and Multiple regression analysis.

academic performance in computer studies in the study area (F = 7.596, p < 0.05). Hence, the null hypothesis that states that there is no significant

relationship between teachers' Technological Knowledge in computer studies and pupils' academic performance in computer studies is hereby rejected. The R Square value of 0.158^a indicated a high degree of correlation between teachers' Technological Knowledge in computer

studies and pupils' academic performance in computer studies in the study area. Also, the R Square value of 0.025 accounted for a high variation of 2.5% in teachers' Technological Knowledge in computer studies and pupils' academic performance in computer studies.

H₀2: There is no significant relationship between teachers' Content Knowledge (CK) in computer studies and pupils' academic performance in computer studies in lower primary schools.

In order to test this hypothesis, data collected on teachers' Content Knowledge (CK) in computer studies and pupils' academic performance in computer studies in lower primary schools were subjected to linear regression analysis and the results are presented in Table 2.

Table 2: Regression analysis of the relationship between teachers' content knowledge in computer

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	9.157	1	9.157	0.564	.453 ^b
Residual	4837.760	298	16.234		
Total	4846.917	299			
R = 0.043 ^a , R Square = 0.002, Adjusted R Square = -0.001					

Note: R = ; a = ..., b =
(F = 0.564, p > 0.05)

Results in Table 2 showed that there is no significant relationship between teachers' content knowledge in computer studies and pupils' academic performance in computer studies in the study area (F = 0.564, p > 0.05). Hence, the null hypothesis that states that there is no significant relationship between teachers' content Knowledge in computer studies and pupils' academic performance in computer studies is

hereby accepted. The R Square value of 0.002^a indicated a low degree of correlation between teachers' content Knowledge in computer studies and pupils' academic performance in computer studies in the study area. Also, the R Square value of -0.001 accounted for a low variation of 0.01% in teachers' content Knowledge in computer studies and pupils' academic performance in computer studies.

H₀3: There is no significant relationship between teachers' Pedagogical Knowledge (PK) in computer studies and pupils' academic performance in computer studies in lower primary schools.

In order to test this hypothesis, data collected on teachers' Pedagogical Knowledge (PK) in computer studies and pupils' academic performance in computer studies in lower primary schools were subjected to linear regression analysis and the results are presented in Table 3.

Table 3: Regression analysis of the relationship between teachers' pedagogical knowledge in computer studies and pupils' academic performance in computer studies

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	143.161	1	143.161	4.396	.037 ^b
Residual	9704.839	298	32.567		
Total	9848.000	299			
R = 0.121 ^a , R Square = 0.015, Adjusted R Square = 0.011					

(F = 4.396, p < 0.05)

Results in Table 3 showed that there is significant relationship between teachers' pedagogical knowledge in computer studies and pupils' academic performance in computer studies in the study area ($F = 4.396$, $p < 0.05$). Hence, the null hypothesis that stated that there is no significant relationship between teachers' pedagogical knowledge in computer studies and pupils' academic performance in computer studies is

hereby rejected. The R Square value of 0.15^a indicated a high degree of correlation between teachers' pedagogical knowledge in computer studies and pupils' academic performance in computer studies in the study area. Also, the R Square value of 0.015 accounted for a high variation of 1.5% in teachers' pedagogical knowledge in computer studies and pupils' academic performance in computer studies.

H_{04} : There is no significant combined relationship between teachers' Technological, Pedagogical and Content Knowledge (TPCK) in computer studies and pupils' academic performance in computer studies in lower primary schools.

In order to test this hypothesis, data collected on teachers' technological, pedagogical and their content knowledge (independent variables) and pupils' academic performance (dependent variable) in computer studies were subjected to multiple regression analysis and the results are presented in Table 4.

Table 4: Multiple regression analysis of the relationship of teachers' technological, pedagogical and their content knowledge and pupils' performance in Computer studies in primary schools in the study area

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	261.815	3	87.272	5.634	.001 ^b
Residual	4585.101	296	15.490		
Total	4846.917	299			
R = 0.232 ^a , R Square = 0.054, Adjusted R Square = 0.044					

Note: ($F = 5.634$, $p < 0.05$)

a. Dependent Variable: Pupils' Academic Performance

b. Predictors: (Constant), Teachers' Technological, Pedagogical and Content Knowledge (TPCK)

Results in Table 4 showed that there was significant combined relationship of teachers' technological, pedagogical and content knowledge (TPCK) in computer studies on pupils' academic performance in computer studies in lower primary schools in the study area ($F = 5.634$; $p < 0.05$; $R^2 = 0.054$). Hence, the null hypothesis that stated that there is no significant combined relationship of teachers' technological, pedagogical and content knowledge (TPCK) in computer studies on pupils' academic performance in computer studies in lower primary schools in the study area is hereby rejected. The results implied that teachers' technological, pedagogical and content knowledge all added statically significantly to the prediction of pupils' academic performance in computer studies in lower primary schools in the study area, $p < 0.05$.

Discussion of Findings

This paper focused on assessment of teachers' technological, pedagogical, and content knowledge (TPACK) on pupils' performance in Computer Studies in Osun East Senatorial District. The findings of this paper revealed that the null hypothesis that states that there is no significant relationship between teachers' Technological Knowledge in computer studies and pupils' academic performance in computer studies is hereby rejected. This is slightly in line with findings of Owusu (2015) and Amuah (2022) who both revealed a weak positive nexus existed between teachers' technological knowledge and pupils' academic achievement in religious studies. However, Luzon (2022) found a significant link between teachers' technological knowledge and content knowledge.

It was surprising to note that in this current paper, that the null hypothesis that stated that there is no significant relationship between teachers' content Knowledge in computer studies and pupils' academic performance in computer studies is accepted. This may likely be based on the facts that the pupils belong to Generation Z who might have better understanding of computer whither their teachers are skilled or not, it does not affect them. They are digital native whose language is computer. However, Iddrisu et al. (2023) found that teachers content knowledge has impact on students' mathematical performance.

The findings of this paper revealed that the null hypothesis that stated that there is no significant relationship between teachers' pedagogical knowledge in computer studies and pupils' academic performance in computer studies is hereby rejected. The findings of Nzoka, Kaugi, and Katam (2021) confirmed the result in this paper that teachers' pedagogical skills in ICT integration positively improve learners' academic achievement in mathematics. Similarly, Elugbadebo and Johnson (2020) argued that the pedagogical knowledge of teachers in computer knowledge will positively improve learners' academic achievement.

The findings of this paper revealed that the null hypothesis that stated that there is no significant combined relationship of teachers' technological, pedagogical and content knowledge (TPCK) in computer studies on pupils' academic performance in computer studies in lower primary schools in the study area is hereby rejected. The results implied that teachers' technological, pedagogical and content knowledge all added statically significantly to the prediction of pupils' academic performance in computer studies in private primary schools. This result however contrasted the findings of Luzon (2022) who found that teachers' TPACK did not significantly influence students' academic achievement. In a study by Olasunkanmi et al. (2022) in some selected secondary schools in Ondo State, found computer studies' teachers with average level of TPACK. This means that the teachers' TPACK in Ondo State may only impact computer studies performance of the students

averagely and this might not adequately influence learners ICT learning.

Conclusion

In summary, teachers combined Technological, Pedagogical, and Content knowledge (TPACK) statistically and significantly the selected private primary school pupils' performance in computer studies in Osun East Senatorial District. It also concluded that the private primary school teachers' technological as well as pedagogical knowledge in computer studies influenced their pupils' academic performance in the subject. However, the teachers' content knowledge of the did not have statistical influence the pupils' performances in computer studies.

Recommendations

It is suggested that:

1. The private primary school teachers' content knowledge in the study area should be developed by organizing workshop for the teachers in this area so that some of the pupils will not get confuse at a point.
2. The proprietors of schools in the state should encourage the teachers teaching the pupils to undergo part-time developmental programme to improve teachers content knowledge in computer studies.

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