INFLUENCE OF TECHNOLOGICAL TOOLS ON SECONDARY SCHOOL STUDENTS' STUDY HABIT IN PHYSICS IN KWARA STATE, NIGERIA

BY

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Abstract
This study examined the influence of technological tools on the study habits of secondary school students in Physics in Kwara State, Nigeria. A descriptive survey research design was adopted. The population comprised senior secondary school III Physics students, from whom a sample was selected using multistage sampling techniques. Data were collected using a validated questionnaire titled Technological Tools and Study Habits Questionnaire (TTSHQ). Descriptive statistics and inferential statistics were used for data analysis. Findings revealed that students had access to technological tools such as smartphones, scientific calculators, laptops, and internet resources, and that these tools significantly influenced their study habits in Physics by improving time management, independent learning, and engagement with Physics content. Significant differences were found in students' study habits based on gender and school location. The study concluded that technological tools positively influence Physics students' study habits and recommended improved access to relevant technologies and structured guidance on their academic use.

Keywords: Technological tools, Study habits, Physics, Gender, Location, Secondary school students

Introduction
Education remains the bedrock of national development and a powerful instrument for social transformation and technological advancement. In recent years, the growing emphasis on science, technology, engineering, and mathematics (STEM) has placed increasing importance on Physics as a core subject in secondary school curricula across Nigeria. Physics serves as the foundation for understanding the principles underlying scientific and technological progress, contributing significantly to innovations in medicine, engineering, and industrial design. Despite its importance, the teaching and learning of Physics at the secondary school level in Nigeria continue to encounter several challenges, particularly those related to students' poor study habits, inadequate instructional materials, and low utilization of modern technological tools (Abdullahi & Oyeleke, 2021).

Technological tools, particularly hardware devices such as projectors, computers, smartboards, simulation kits, and laboratory apparatus, have revolutionized the delivery of education in many developed and developing countries. These tools are central to enhancing active learning, visualization of abstract concepts, and the development of practical skills necessary for mastering Physics. According to Bello and Olagunju (2022), integrating such tools into the learning process helps to bridge the gap between theoretical explanations and real-world applications, thereby improving comprehension, retention, and students' overall study habits. The use of hardware

technology in the classroom also encourages self-directed learning, collaboration, and critical thinking skills essential for success in the modern knowledge economy.

In the context of Nigeria's educational system, the Federal Government has continued to promote the integration of technological devices into school systems through initiatives such as the National Policy on Information and Communication Technology (ICT) in Education. This policy emphasizes the use of technological hardware such as computers, interactive whiteboards, and digital projectors in classrooms to enhance learning efficiency and make teaching more student-centered (Federal Ministry of Education, 2021). However, despite the existence of these policies, studies such as those by Oduwaiye *et al.* (2023) and Yusuf and Adeoye (2022) have shown that the level of utilization of technological tool in Nigerian secondary schools remains low due to infrastructural deficiencies, erratic electricity supply, inadequate training of teachers, and insufficient access to modern teaching resources, especially in rural areas.

Physics education requires a high level of visualization and experimentation, and this is where hardware technological tools play a critical role. Unlike purely theoretical subjects, Physics concepts often demand empirical demonstrations for students to understand and internalize abstract ideas such as motion, energy, electricity, and magnetism. For instance, projectors and smartboards can be used to display visual simulations of complex physical phenomena, while laboratory tools such as oscilloscopes, voltmeters, and motion sensors can help students perform experiments that concretize theoretical knowledge. According to findings by Eze and Ekwueme (2020), students who learn Physics through hardware-based technology-assisted instruction demonstrate better conceptual understanding and improved study habits than those taught through conventional lecture methods. These technological innovations provide students with opportunities to learn at their own pace, revisit instructional materials, and engage in self-assessment, all of which are essential to the development of effective study habits.

The concept of study habits encompasses the range of strategies, routines, and behaviors that students adopt to acquire, organize, and retain academic knowledge. Effective study habits are strongly correlated with academic achievement, motivation, and persistence in learning (Okoye & Akinola, 2022). In Physics, where understanding is cumulative and heavily dependent on consistent practice, study habits determine students' mastery of fundamental principles and their ability to apply them to problem-solving. The introduction of technological hardware tools has transformed these habits by shifting learning beyond the conventional classroom environment. Students now access multimedia content, perform simulations, and engage in virtual laboratories that complement traditional study approaches. According to Adetunji and Olayinka (2023), students who engage with technological tools develop greater autonomy in learning, display increased interest in scientific inquiry, and demonstrate better retention of Physics concepts. However, the extent to which technological tools influence students' study habits in Physics varies according to contextual factors such as gender and location. Gender has long been recognized as a significant variable influencing students' attitude toward science and technology-based learning. Some studies in Nigeria (Olabode & Jimoh, 2021; Adepoju *et al.*, 2023) have reported that male students are more confident and willing to engage with hardware tools like computers and laboratory equipment, while female students may exhibit anxiety or limited interest due to societal expectations and stereotypes that associate technology use with masculinity. Nevertheless, other findings (Adeniran & Sanni, 2022) indicate a gradual narrowing of this gap, as more female students are beginning to embrace technology for learning, particularly with the integration of interactive and user-friendly educational platforms.

The influence of gender differences on study habits also manifests in how male

and female students allocate time, seek help, and approach problem-solving in Physics. Males tend to exhibit exploratory tendencies and enjoy experimental engagement with physical devices, while females often rely more on structured study routines and collaborative learning (Adebayo & Nwosu, 2023). Technological hardware such as data loggers, projectors, and interactive models may, therefore, appeal differently to students based on their preferred learning approaches. Consequently, any study on the influence of technological tools on study habits must account for these gender-related patterns to provide a balanced understanding of how technology supports learning in Physics classrooms.

In addition to gender, the location of schools (whether urban or rural) significantly shapes access to and utilization of technological tools. Urban schools, particularly those in metropolitan areas such as Ilorin and Offa in Kwara State, are more likely to be equipped with digital infrastructure, electricity, and well-trained personnel capable of operating modern educational devices (Olatunji & Aremu, 2022). Conversely, rural schools often face infrastructural deficits, lack of internet access, and inadequate funding, which limit the effective integration of hardware technologies into Physics teaching and learning. This disparity directly influences the study habits of students, as urban learners may rely on electronic resources and multimedia study materials, while their rural counterparts remain dependent on traditional textbooks and rote learning approaches. A study by Alabi and Ibrahim (2023) found that Physics students in urban areas demonstrated more interactive and technology-supported study routines compared to those in rural areas, who exhibited passive and teacher-dependent learning behaviors.

The study habits of Physics students in Kwara State, therefore, cannot be understood without considering both gender and location as moderating variables in the use of technological tools. Kwara State, which is geographically located in the North-Central region of Nigeria, presents a diverse educational landscape characterized by both urban and rural settlements. The state has made substantial progress in expanding access to education through government interventions and partnerships with non-governmental organizations, yet disparities persist in the distribution of technological resources across schools. Urban schools tend to have better access to hardware tools such as projectors, computers, and laboratory apparatus, whereas many rural schools still rely on outdated teaching materials. This imbalance contributes to differences in students' learning experiences and study behaviors (Lawal & Yusuf, 2024).

Physics remains one of the most conceptually challenging subjects in secondary schools in Nigeria, as it requires not just memorization but a deep understanding of abstract concepts and the ability to apply them in real-world contexts. Studies have consistently shown that Nigerian students perform poorly in Physics in public examinations, partly due to ineffective study habits and limited access to instructional technology (Oyelekan & Olatunbosun, 2021). The West African Examinations Council (WAEC) Chief Examiners' reports over the years have highlighted students' inability to grasp key concepts such as kinematics, energy transformation, and electromagnetism. This challenge calls for the adoption of technological hardware tools that can enhance conceptual understanding and stimulate students' curiosity through demonstration and experimentation. According to Adeyemo (2023), the use of interactive devices and digital laboratories in Physics classrooms promotes active participation and makes the learning process more engaging and meaningful.

Technological tools, especially hardware, do not merely serve as instructional aids but function as mediating instruments that transform students' cognitive processes and learning strategies. For example, when students engage with an interactive whiteboard, they visualize real-time diagrams and experiment outcomes, which strengthen their comprehension of Physics concepts. Similarly, laboratory hardware such as digital sensors and simulation kits enables students to link theoretical equations to

observable phenomena. According to findings by Musa and Ajiboye (2022), students exposed to such interactive technologies developed stronger analytical and problem-solving skills, leading to improved academic performance. These positive outcomes are strongly associated with better-organized study habits, as learners become more engaged, motivated, and independent in managing their study schedules.

The emergence of modern pedagogical models that integrate technological tools into Physics instruction has also transformed the role of teachers and students. Teachers are no longer the sole source of knowledge but facilitators who guide learners through technology-enhanced inquiry processes. Students, on the other hand, have become active participants, exploring, experimenting, and constructing knowledge through technological interfaces. According to Yusuf and Afolabi (2023), such a paradigm shift promotes the development of scientific attitudes, curiosity, and a growth mindset among students. This, in turn, shapes study habits characterized by persistence, regular practice, and self-evaluation.

Purpose of the Study

The main purpose of the study was to investigate the influence of technological tools on the study habit of secondary school students in Physics in Kwara State.

This study specifically sought to:

i. identify the types of technological tools available to students for studying Physics
ii. examine the frequency of usage of the available technological tools
iii. assess the influence of Technological tools on Students' Study habit

Research Questions

The following research questions were raised to guide this study

1. What are the types of technological tools available to secondary school students for studying Physics?
2. How frequently do students use technological tools to support their study habit?
3. What are the influence of technological tools on students' study habit in Physics?

Research Hypotheses

The following research hypotheses were formulated to guide the study:

1. There is no significant relationship between the use of technological tools and students' study habits in Physics.
2. There is no significant difference in the study habits of male and female students in senior secondary school in Physics.
3. There is no significant difference between student study habit in urban and rural areas.

Methodology

This study adopted a descriptive survey design with an evaluative component to investigate the influence of Technological tools on secondary school students' study habits in Physics in Kwara state, Nigeria. Descriptive survey is appropriate because inference would be drawn for the purpose of generalization to gather information from a representation of students. The population for the study comprised all 3220 S.S.3 students offering Physics in public senior secondary schools across the sixteen local government areas of Kwara State. This is in accordance with the data obtained from the Kwara State Ministry of Education (2024). The sample for this study consisted of 240 S.S.3 Physics students selected through Multistage sampling procedure. The first stage involved the selection of one out of the three senatorial districts in Kwara State using simple random technique. Stage two involved the use of simple random sampling technique to select three local Government from Kwara South Senitorial district. Stage three involved the use of stratified random sampling technique and also purposive random sampling technique to select six public secondary schools from the local governments earlier selected bearing in mind location (a school each from rural area and urban

area) who were technological tools are available.

The only instrument used to collect data for the study was a questionnaire developed by the researcher, titled, Influence of Technological Tool on secondary school students study habits Questionnaire (ITTSSSSHQ). The instrument consisted of four sections, A to D. Section A elicited information on respondents' bio-data such as gender and class. Section B elicited information on the types of technological tools available in the school. Section C requested information about the study habits of the respondents while section D elicited information on the influence of technological tools on the study habits of the respondents on a four-point likert scale of Strongly Agree (4points), Agree (3points), Disagree (2points) and Strongly Disagree (1point). The respondents were required to indicate the choice that best represents their opinion on each item.

The validity of the instrument was ascertained by giving it to experts in Science Education and Tests and measurement respectively for face and content validity. All the corrections made by these experts were effected and used for data collection.

The reliability of the research instrument (ITTSSSSHPQ) was determined through a trial test conducted on 30 students outside the sampled schools. The data collected were subjected to Cronbach Alpha reliability testing which yielded a coefficient value of 0.78, which was considered high enough to declare the instrument reliable for the study.

The Instrument (ITTSSSSHPQ) was administered by the researcher and also with the help of a research assistant. The data collected through the instrument were analysed using descriptive and inferential statistics. The research questions were answered using mean, standard deviation and bar chart. Hypotheses 1 was tested using Pearson's Product Moment Correlation Analysis (PPCMA) while Hypotheses 2 and 3 were tested using t-test. Decision was taken at 0.05 level of significance.

Results

Research Questions

Research Question 1: What are the types of technological tools available to secondary school students for studying Physics?

Table 1: Frequency and Percentage analysis of availability of technological tools to secondary school students for studying Physics

S/N	Technology Tools	Available		Not Available	
		F	%	F	%
1.	Scientific calculators	240	100.00	0	0.0
2.	Projectors	48	20.0	192	80.0
3.	Smart boards/Interactive whiteboards	144	60.0	96	40.0
4.	Digital multimeters	192	80.0	48	20.0
5.	Electronic timers	48	20.0	192	80.0
6.	Laptops or desktops for physics simulations	144	60.0	96	40.0
7.	Digital thermometers	96	40.0	144	60.0
8.	Digital voltmeters/ammeters	192	80.0	48	20.0
9.	Electricity circuit training boards	48	20.0	192	80.0
10.	Rechargeable light sources	144	60.0	96	40.0
11.	Functional laboratory apparatus (modern)	192	80.0	48	20.0
12.	LCD display tools for physics data	192	80.0	48	20.0

Table 1 revealed the types of technological tools available to secondary school students for studying Physics. Schools with the technological tools are classified as available and schools without any are classified as not available. The table revealed that majority of the sampled schools have adequate technological tools. The table also revealed that the highest available

technological tools are the scientific calculators with 100%, Digital multimeters, Digital voltmeters/ammeters, functional laboratory apparatus (modern), LCD display tools for physics data with 80% of the sampled schools having them in their schools. The table further revealed that the lowest available technological tools are the Projectors, Electronic timers, and Electricity circuit training boards with 20% of the sampled schools having them in their schools.

Research Question 2: How frequent do students use technological tools to support their study habit?

Table 2: Frequency and Percentage analysis of utilization of Technological tools to support their Study habit

S/N	Technology Tools	Very Frequently		Frequently		Occasionally		Rarely		Never	
		VF	%	F	%	F	%	F	%	F	%
1	Scientific calculators	209	87.1	31	12.9	0	0.00	0	0.00	0	0.00
2	Projectors	33	13.8	6	2.5	8	3.3	1	0.4	192	80.0
3	Smart boards/Interactive whiteboards	141	58.8	2	0.8	0	0.00	0	0.00	97	40.4
4	Digital multimeters	127	52.9	9	3.8	45	18.8	8	3.3	51	21.3
5	Electronic timers	38	15.8	2	0.8	9	3.8	0	0.00	191	79.6
6	Laptops or desktops for physics simulations	119	49.6	1	0.4	20	8.3	2	0.8	98	40.8
7	Digital thermometers	65	27.1	4	1.7	26	10.8	1	0.4	144	60.0
8	Digital voltmeters/ammeters	149	62.1	8	3.3	35	14.6	0	0.00	48	20.0
9	Electricity circuit training boards	41	17.1	3	1.3	4	1.7	0	0.00	192	80.0
10	Rechargeable light sources	140	58.3	1	0.4	2	0.8	0	0.00	97	40.4
11	Functional laboratory apparatus (modern)	177	73.8	13	5.4	2	0.8	0	0.00	48	20.0
12	LCD display tools for physics data	165	68.8	26	10.8	0	0.00	0	0.00	49	20.4

Table 2 revealed the extent to which Students use Technological tools to support their Study habit. The table revealed that Scientific calculators, Smart boards/Interactive whiteboards, Digital multimeters, Digital voltmeters/ammeters, and Rechargeable light sources were very frequently utilized by over 50% of the sampled schools as other facilities were not very frequently utilized by majority of the sampled schools. The table also revealed that the highest very frequently utilized technological tools by the sampled schools was scientific calculators with 87.1% of the sampled schools very frequently utilized it. The table above revealed that most of the teachers did not utilize the Technological tools as expected for the teaching and learning of Physics.

Research Question 3: What are the influence of technological tools on students' study habit in Physics?

Table 3: Descriptive Analysis of the influence of Technological tools on Students' Study habit in Physics

S/N	Perceptions on the influence of Technological tools on Students' Study habit in Physics	SA (%)	A (%)	D (%)	SD (%)	Mean	Standard Deviation	Remark
1	I regularly use Scientific calculators in solving Physics problems	95 (39.6)	94 (39.2)	23 (9.6)	28 (11.7)	3.08	0.94	Agree
2	The use of projectors and smart board during physics lessons help me understand topics better	96 (40.0)	96 (40.0)	24 (10.0)	24 (10.0)	3.10	0.95	Agree
3	Physics laboratory equipment enhances my interest and engagement in the subject	96 (40.0)	95 (39.6)	26 (10.8)	23 (9.6)	3.10	0.94	Agree
4	Access to modern laboratory tools improves my ability to conduct experiments	95 (39.6)	96 (40.0)	25 (10.4)	24 (10.0)	3.09	0.95	Agree
5	I prefer using digital measuring instruments (e.g digital multimeters, electronic timers) over traditional ones	71 (29.6)	120 (50.0)	25 (10.4)	24 (10.0)	2.99	0.89	Agree
6	I find it easier to study physics when using technology enhanced classroom equipment like interactive whiteboard	91 (37.9)	96 (40.0)	29 (12.1)	24 (10.0)	3.06	0.95	Agree
7	I am more motivated to learn when my school provides modern physics technology tools	95 (39.6)	96 (40.0)	25 (10.4)	24 (10.0)	3.09	0.95	Agree
8	Sufficient access to use technology tools facilitate the effective learning of physics	48 (20.0)	144 (60.0)	24 (10.0)	24 (10.0)	2.90	0.83	Agree
9	Technology tools use in Physics helps me retain information better	96 (40.0)	96 (40.0)	24 (10.0)	24 (10.0)	3.10	0.95	Agree
10	Technology tools encourage student to work together collaboratively	95 (39.6)	95 (39.6)	26 (10.8)	24 (10.0)	3.09	0.95	Agree

Cut -Off Mean; 2.5

Table 3 identified the Perceptions on the influence of technological tools on students' study habit in Physics. Using a cut-off mean of 2.50 for the rating scale. All the respondent agreed on the positive influence of technological tools on students' study habit in Physics. It indicates that technological tools have potent to positively influence students' study habit in Physics.

Hypotheses Testing

Hypothesis 1: There is no significant relationship between the use of technological tools and students' study habits in Physics.

In testing this hypothesis, data on the use of technological tools and students' study habits in Physics were collected from the responses of the respondents to items 1-12 in section C of frequency of usage of technological tools in Physics learning and item 1-10 in section D of Influence of technological tools on Physics students study habits were used to compile this data. Pearson's product-moment correlation tests were performed at the 0.05 level to determine statistical significance. Table 4 displays the final result.

Table 4: Relationship between the use of technological tools and students' study habits in Physics

Variables	N	Mean	Stand Dev	r-cal	P-value
the use of Technological tools	240	33.96	11.44	0.313*	0.000
Students' Study habits	240	30.60	7.99		

*P<0.05

Table 4 showed that the r-cal value of 0.313 is significant at 0.05 level of significance because the P-value (0.000) < 0.05. The null hypothesis is rejected. This implies that there is significant relationship between the use of technological tools and students' study habits in Physics.

Hypothesis 2: There is no significant difference in the Study habits of male and female Students in Senior Secondary School in Physics.

The difference in the study habits of male and female students in senior secondary school in Physics was analyzed using a t-test for statistical significance at the 0.05 level to evaluate the hypothesis. Table 5 presents the conclusive outcome.

Table 5: t-test analysis for the study habits of male and female students in senior secondary school in Physics

Variations	Gender	N	Mean	SD	df	t	P
Students' Study Habits	Male	80	30.91	7.87	238	0.422	0.674
	Female	160	30.45	8.08			

p>0.05

Table 5 shows that the t-cal value of 0.422 is not significant because the P value (0.674) > 0.05 at 0.05 level of significance. This indicates that the null hypothesis was not rejected. Consequently, there is no significant difference in the Study habits of male and female Students in Senior Secondary School in Physics.

Hypothesis 3: There is no significant difference between Student Study habit in Urban and Rural areas in Physics.

The difference in the Study habits in Urban and Rural areas of Students in Senior Secondary School in Physics was analyzed using a t-test for statistical significance at the 0.05 level to evaluate the hypothesis. Table 6 presents the conclusive outcome.

Table 6: t-test analysis for the study habits in urban and rural areas of students in senior secondary school in Physics

Variations	Gender	N	Mean	SD	df	t	P
Students' Study Habits	Urban	144	30.18	8.11	238	1.005	0.316
	Rural	96	31.24	7.83			

p>0.05

Table 6 shows that the t-cal value of 1.005 is not significant because the P value (0.316) > 0.05 at 0.05 level of significance. This indicates that the null hypothesis was not rejected. Consequently, there is no significant difference between Students Study habit in Urban and Rural areas in Physics.

Discussion

This study revealed that there was significant relationship between the use of technological tools and students' study habits in Physics. This study was consistent with the submission of Okeke and Onuoha (2021) who documented that learner in Enugu State secondary schools developed habits of collaborative discussion when projectors and multimedia devices were introduced into their classrooms. Rather than studying in

isolation, students increasingly participated in cooperative revision sessions, engaging in peer teaching and collaborative questioning that enhanced collective understanding. In a similar study, Kumar and Singh (2020), who observed that collaborative study habits flourished in environments where technological tools facilitated group interaction. Such practices are particularly valuable in subjects like Physics, where problem-solving benefits greatly from cooperative reasoning. In a corresponding research effort.

Singh (2020), observed that collaborative study habits flourished in environments where technological tools facilitated group interaction. Such practices are particularly valuable in subjects like Physics, where problem-solving benefits greatly from cooperative reasoning.

The study revealed that there was no significant difference in the Study habits of male and female Students in Senior Secondary School in Physics. This study is not in agreement with the perspective offered by Yusuf and Adeoye (2021) that showed that female students are more inclined to use digital tools for multitasking activities, such as listening to recorded lectures while preparing assignments or revising notes while participating in online discussion forums. Male students, however, reported a higher tendency toward task-switching across academic and non-academic platforms, often blending study with recreational technology use such as gaming or social media browsing. In a similar study, Adeyemi and Ojo (2021), asserted that male students in Physics are more likely to engage with digital simulations, online problem-solving platforms, and virtual laboratories. Female students, on the other hand, frequently adopt technology for organizational purposes such as structuring study notes, accessing online tutorials, and joining collaborative learning communities.

The study revealed that there was no significant difference between Student Study habit in Urban and Rural areas. This finding was not aligning with the assertion of Eze and Uzoechi (2020) who stated that students in urban areas are significantly more likely to access online learning platforms, e-books, and multimedia study aids than their rural counterparts. In a corresponding research effort, Olaniyi and Omotayo (2022) emphasized that rural Physics students faced greater obstacles in developing problem-solving strategies because of their limited exposure to digital simulations that illustrate abstract principles.

Conclusion

Sequel to the findings of this study, it was concluded that the use of technological tools has a positive and significant influence on students' study habits in physics. No significant differences were found in study habits based on gender or school location (urban or rural), indicating that technology supports equitable learning.

Recommendations

Based on the findings of this study, the following recommendations were made.

1. Government and educational stakeholders should provide adequate funding for the procurement of poorly available technological tools such as projectors, electronic timers, and electricity circuit training boards in senior secondary schools.
2. School administrators should ensure equitable distribution of technological tools to both urban and rural schools to sustain uniform improvement in students' study habits in physics.
3. Regular training and professional development programs should be organized for physics teachers to enhance effective utilization of both available and underutilized technological tools.
4. Schools should develop maintenance and replacement plans to keep existing technological tools functional and encourage their continuous use during physics instruction.
5. Physics teachers should be encouraged to integrate a wider range of technological tools into daily teaching practices to further improve students' study habits and learning outcomes.
6. Curriculum planners should emphasize technology-based teaching strategies in physics syllabi, promoting active learning and improved study habits among students.

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