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Original Article

TECHNOLOGY - BASED PRACTICES AND TEACHERS' INSTRUCTIONAL EFFECTIVENESS IN AGRICULTURAL SCIENCE IN UPPER BASIC SCHOOLS IN ABIA STATE, NIGERIA

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Abstract This study examined influence of Technology-Based Practices and Teachers' Instructional Effectiveness in Agricultural Science in Upper Basic Schools in Abia State, Nigeria. The study adopted survey research design. Three specific objectives, research questions and Hypotheses guided the study. A population of 2176 male and female Agricultural Science teachers at Upper Basic School, made up of 937 male teachers and 1239 female teachers was used. The sample for this study was 253 Agricultural teachers which comprised 113 male teachers and 240 female teachers. Multi stage sampling procedure was used. The instruments for data collection were a 15-item researcher's developed questionnaire titled: Technology-Based Practices in Upper Basic Schools' Agricultural Science Questionnaire (TBPUBSASQ). The reliability of the instruments was determined using Cronbach alpha statistic which yielded an overall index value of .745. Mean values were used to analyze research questions, standard deviation measured data dispersion and a t-test examined null hypotheses at a 0.05 significance level. The results showed among others that teachers' use of classroom management systems, educational apps and technology-based practices influenced the teaching of Agricultural science Education in Upper Basic Schools in Abia State. It was recommended among others that school management should consider integrating more technology-based practices into Agricultural Science education instruction to enhance teachers' instructional effectiveness.

Keyword: Universal Basic Education, Agricultural Science, Technology- Based Practices.

INTRODUCTION

A virtual, audio, and internet -connected learning environment could improve students ' access to effective educational experiences. This is a result of digital revolution in education, which has made schools more competitive in terms of the sophistication of technology and the complex tasks teachers must complete to meet curriculum objectives (Igwe & Okafor, 2023). Education is the process through which learners acquire skills, attitudes and

competence. It is also, the springboard for socio-political, economic and cultural development that enhances the production of skilled manpower for national development (Onwumere, Modebelu, & Chukwuka, 2016). Currently, the educational system has gone beyond traditional practices (conventional lecture method) to that of technology -based practices (student participatory methods), given room for more sophisticated technological applications. The primary goal of schools is to help students achieve academic excellence. A school may have other peripheral objectives but emphasis is always placed on the sound learning. The Federal Republic of Nigeria (2013) in her National Policy on Education viewed education in Nigeria as an instrument "par excellence" and that which affects social change and development both for the individual and for the nation.

The Universal Basic Education (UBE) Programme is a nine (9) year basic educational programme, designed by the Federal government for Nigerian children. It covers six (6) years Primary Education, and three (3) years of Junior Secondary Education. This Education is typically for pupils and students 'between the ages of 5 and 15. This discourse will focus on the Upper Basic. Upper Basic Education is a term used to refer to the final three years of junior secondary school, which is typically for students 'between the ages of 12 and 15. It is pre-vocational, universal and compulsory for all Nigerian children. The goal of Upper Basic education is to enable students to acquire knowledge and skills which will prepare them for useful living within the society. In specific term, Upper Basic Education should give learners opportunity to discover and develop their potentials in life.

Agriculture is defined as a deliberate effort made by man to till the soil, cultivate crops and rear animals for food and other purposes (Inyama, 2021). Agricultural science embraces health, nutrition and food consumption, the use and conservation of land, water resources, and environmental characteristics of the food and fibre system. According to Okoye, (2021) Agricultural science is one of the core subjects in Nigerian junior and senior secondary schools and the subject covers topics such as crop production, animal husbandry, agricultural technology, and agricultural economics as in the curriculum.

Technology-based practices are educational tools and resources that leverage technology to facilitate learning and promote knowledge amplification. It is the processes of increasing and improving the action, storage and use of knowledge. According to Abrami et al (2022), Technology-based practices are educational tools and resources that use technology to facilitate teaching and learning, such as e-learning platforms, virtual classrooms, and educational software, learning management system, social media technologies, Information and Communication Technologies (ICT). Effectiveness of instructional process takes place as the learner acquires the planned or intended experiences, knowledge, skills, ideas and attitudes that are aimed towards enabling him/her to function effectively in the society (Okoro 2020).

Technology-based instructional practices are a set of pedagogical approaches that utilize technology to support, facilitate, or enhance learning activities. Several types of technology-based practices have been introduced into UBE levels to aid teaching and learning such as Projectors, Smart technology, Mimio boards, Calculators, Website and social media, Video conferencing, ICT, Learning Management System, Educational App and software, personalized learning, Online resources, among others (Hung et al ,2019, Karpicke, 2018).

Classroom management systems are software applications that are designed to assist teachers in managing their classrooms, including the delivery of course materials, communication with students and parents, and the collection and analysis of student data. It is a comprehensive tool that helps teachers plan, manage, and assess student learning (Sanders et al., 2020).

Educational apps are mobile software designed to improve learning and instruction in specific subject areas, such as mathematics, science, and language arts, by providing a variety of interactive activities, multimedia content, and assessment tools (Akimana,2020). Educational apps and software can take many forms, including Digital textbooks, Simulations, Assessment tools, Language learning

apps, Problem-solving apps, Quiz and trivia apps. Alhusen et al. (2021) posited that educational apps can support teachers in developing pedagogical knowledge, technological skills, and classroom management strategies such as:

1. **Providing access to technology:** One of the first steps is to ensure that schools have access to the necessary technology, such as computers, tablets, and internet connectivity (Kupoluyi, 2022).
2. **Training teachers in technology use:** This can include training teachers on the use of digital resources, designing technology-enhanced lessons, and integrating technology into existing curriculum (Okonkwo, 2023).
3. **Encouraging student engagement with technology:** This could be students using educational apps, playing educational games, or participating in online forums and discussion boards (Okafor, 2022).
4. **Integrating technology into existing curriculum:** The teacher using digital resources to supplement traditional instruction, or using online learning platforms to provide personalized learning experiences will encourage enhanced learning and knowledge amplification (Adeoye, 2021).
5. **Promoting digital literacy:** Schools should also promote digital literacy skills, such as internet safety, online research, and media literacy. This can help students to be better equipped to navigate the digital world and use technology effectively (Olaniyan, 2022).
6. **Assessing technology-based learning**: Formative and summative assessments can be used to evaluate the effectiveness of technology-based learning, stating that formative and summative assessments can provide valuable feedback on student progress and can help educators identify areas for improvement (Ibukun, 2023).

These poor utilization approach and inadequacy of implementing these devices seem to be factors that hamper instructional delivery by school teachers in Upper Basic schools' level. This gives rise to growing dissatisfaction among educational providers and stakeholders in venturing into technologically driven instructional activities and programmes. With all these challenges, it is uncertain on the level teachers have used technology-based practices to achieve instructional effectiveness in Agricultural Science in Upper Basic schools in Abia State, Nigeria. Therefore, purpose of this study is to examine the influence of Technology-Based Practices on Teachers' Instructional Effectiveness in Agricultural Science in Upper Basic Schools in Abia State. Specifically, the study sought to:

1. find out the extent the use of classroom management system influence teachers' instructional teachers' effectiveness
2. examine the extent the use of educational applications influences teachers' instructional effectiveness
3. examine the influence of technology-based practices in Upper Basic schools in Abia State, Nigeria

Research Questions

The following research questions were posed to guide the study

1. To what extent does use of classroom management system influence teachers' instructional effectiveness?
2. To what extent do the use of educational applications influence teachers' instructional effectiveness?
3. To what extent have technology-based practices influenced the teaching of Agricultural science Education in Upper Basic Schools in Abia State, Nigeria?

Hypotheses

The following null hypotheses are formulated and tested at 0.05 level of significance

$H0_1$: There is no significant difference between the mean responses of male and female teachers on the extent the use of classroom management system influence teachers' instructional effectiveness

$H0_2$: There is no significant difference between the mean responses of male and female teachers on the extent to which the use of educational applications influences teachers' instructional effectiveness

$H0_3$: There is no significant difference between the mean responses of male and female teachers on the extent to which technology-based practices influence Upper Basic schools in Abia State, Nigeria.

Methodology

The study employed a descriptive survey research design for this study. Nworgu (2015) explained that descriptive survey involves a systematic and comprehensive collection of information about the opinions, attitude, feelings, beliefs and behavior of people. The population of the study is 2176 comprising 937 male and 1249 female Agricultural Science teachers at Upper Basic School in the seventeen (17) Local Government Areas, across the three education zones in Abia State (Source: Universal Basic Education Management Board (UBEMB, 2021). Teachers were chosen as respondents because they are the major channel for classroom instructional delivery. The sample for this study was 253 Agricultural teachers which comprised 113 male teachers and 140 female teachers. The sample size 253 teachers were derived using the Taro Yarmane formular. n = $\frac{N}{(1+N\,(e)^2)}$. A multi-stage sampling procedure were used. In the first place, simple random sampling technique was used to select two out of the educational zones in Abia State. Purposive sampling technique was used to select three local government areas each from the selected two zones selected, making it 6 out of 17 Local Government Areas in Abia State.

The third stage involved the sampling of 30 secondary schools. The schools were selected using the proportionate stratified random sampling technique. In the fourth stage, the Proportionate sampling technique with the help of a sampling fraction was used to determine the number of teachers that were sampled in each of the 30 selected secondary schools drawn for the study which gave a total of 253 teachers. The researcher used a self-constructed questionnaire titled: "Technology-Based Practices in Upper Basic Schools' Agricultural Science Questionnaire (TBPUBSASQ)" as the instrument for collecting data. The reliability of the instrument was established with a trial test. Data collected for the study were analyzed using Pearson Product Moment Coefficient Correlation (PPMCC), which yielded overall stability reliability coefficient of 0.74 for the instrument. The internal consistency of the instrument was determined using PPMCC which yielded the overall internal consistency reliability coefficient of 0.85.

RESULTS

Research question 1: To what extent does use of classroom management system influence teachers' instructional effectiveness?

Table 1.1: Teachers mean score on the influence use of classroom management system on Teachers' instructional effectiveness

S/N	influence use of classroom management system on teachers instructional effectiveness	Male N= 113		Female N= 140		Overall N = 253		
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	Remark
1	Using a classroom management system enables me to effectively monitor student progress and adjust my instruction accordingly.	2.98	1.11	3.06	.998	3.03	1.04	High Extent
2	Using a classroom management system helps me create a positive and engaging learning environment for my students.	2.95	1.18	3.02	1.07	3.10	1.12	High Extent
3	Using a classroom management system enables me to manage my time and resources more effectively in the classroom.	2.83	1.14	3.10	1.05	3.00	1.09	High Extent
4	Using a classroom management system provides me with useful data and insights that help me better understand my students' learning needs.	3.83	1.14	2.90	1.08	2.85	1.11	High Extent

5	Using a classroom management system allows me to personalize my instruction to better meet the needs of each student.	2.93	1.11	3.08	1.04	3.02	1.07	High Extent
	Clusters Mean score	**3.14**	**1.14**	**3.03**	**1.05**	**3.00**	**1.09**	**High Extent**

Table 1.1 showed that the cluster mean of the items 1 - 5 was 3.14 for male teachers and 3.03 for female teachers with the overall cluster mean score of 3.00. Also, the cluster standard deviation of the items 1 – 5 was 1.14 for male teachers and 1.05 for female teachers with the overall standard deviation of 1.07. This implies that teachers use of classroom learning management system influence teachers' instructional effectiveness to a high extent (H.E).

A corresponding hypothesis formulated to further address the research question is

Hypothesis 1: There is no significant difference between the mean responses of male and female teachers on the extent the use of classroom learning management system influence teachers' instructional effectiveness.

Table 1.2: T-test Analysis on Mean Ratings of teachers on the extent the use of classroom learning management system influence teachers' instructional effectiveness.

Teachers	**N**	**$\bar{X}$**	**SD**	**DF**	**t-cal**	**P-value**	**Remarks**
Male	113	3.14	1.14				
				251	.759	.206	NS
Female	140	3.03	1.05				

The data in Table 1 indicates a t-calculated value of .759 and significant p-value of .206. Since the p-value of .206 is greater than 0.05 level of significant, the null hypothesis is therefore accepted. Hence, there is no significant difference in the mean ratings of male and female teachers on the extent the use of classroom learning management system influence teachers' instructional effectiveness.

Research question 2: To what extent does the use of educational apps influence teachers' instructional effectiveness?

Table 2.1: T-test Analysis on Mean Ratings of teachers on the use of educational apps influence teachers' instructional effectiveness

S/N	**Extent the use of educational apps influence teachers' instructional effectiveness**	**Male N= 113**		**Female N= 140**		**Overall N = 253**		
		$\bar{X}$	**SD**	**$\bar{X}$**	**SD**	**$\bar{X}$**	**SD**	**Remark**
1	Using educational apps in the classroom has improved my ability to individualize instruction for each student.	3.88	.528	3.87	.503	3.87	.512	High Extent
2	Using educational apps in the classroom has allowed me to provide timely feedback to students on their progress.	3.88	.528	3.87	.503	3.87	.512	High Extent
3	Using educational apps in the classroom has enhanced my ability to use	3.66	.630	3.66	.503	3.66	.613	High Extent

	multimedia content to engage students in the learning process.						
4	Using educational apps in the classroom has improved my ability to assess student understanding in real-time.	2.94	1.30	2.76	1.36	2.83	1.34	High Extent
5	Using educational apps in the classroom has allowed me to create more personalized learning experiences for each student.	3.89	.494	3.87	.503	3.88	.499	High Extent
	Cluster Mean score	**3.65**	**.696**	**3.07**	**.674**	**3.62**	**.695**	**High Extent**

Table 2.1 showed that the cluster mean of the items 1 - 5 was 3.65 for male teachers and 3.07 for female teachers with the overall cluster mean score of 3.62. This is above the mean bench mark of 2.50 of a 4-point rating scale. The Table also revealed that the cluster standard deviation of the items 1 – 5 was .696 for male teachers and .674 for female teachers with the overall standard deviation of 695.This implies that the use of educational apps influence teachers' instructional effectiveness to a high extent.

A corresponding hypothesis formulated to further address the research question is

Hypothesis 2: There is no significant difference in the mean ratings of male and female teachers on extent the use of educational apps influence teacher's instructional effectiveness

Table 2.2: T-test Analysis on Mean Ratings on educational apps influence teachers Instructional effectiveness

Teachers	N	$\bar{X}$	SD	DF	t-cal	P-value	Remarks
Male	113	3.65	.696				
				251	.274	.783	NS
Female	140	3.07	.674				

The data in Table 2.2 indicates a t-calculated value of .274 and significant p-value of .783. Since the p-value of .783 is greater than 0.05 level of significant, the null hypothesis is therefore accepted. Hence, there is no significant difference in the mean ratings of in the mean ratings of male and female teachers on the use of educational apps influence teachers' instructional effectiveness.

Research question 3: To what extent have technology-based practices influenced the teaching of Agricultural science Education in Upper Basic Schools in Abia State, Nigeria.

Table 3.1: Teachers mean score on the extent of influence of technology-based practices on the teaching of Agricultural science Education in Upper Basic Schools

S/N	Extent technology-based practices influence teachers' instructional effectiveness	Male N= 113		Female N= 140		Overall N = 253		
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	Remark
1	Increased professional development opportunities should be offered to teachers	3.40	1.08	3.31	1.19	3.34	1.15	High Extent

	to help them effectively integrate technology into their classroom instruction.							
2	School leadership should provide support and resources for teachers to adopt new technology-based teaching methods.	3.08	1.18	3.06	1.25	3.07	1.22	High Extent
3	A school-wide technology policy should be developed and implemented to ensure consistent and effective technology use.	3.22	.931	3.15	.962	3.18	.949	High Extent
4	Teachers should be encouraged to collaborate and share best practices for integrating technology in the classroom.	3.64	.822	3.57	.969	3.59	.915	High Extent
5	Technology-based learning tools and resources should be made more accessible and user-friendly for teachers.	3.48	1.07	3.38	1.18	3.42	1.14	High Extent
	Cluster Mean score	**3.36**	**1.02**	**3.29**	**1.11**	**3.32**	**1.07**	High Extent

Table 3.1 that the cluster mean of the items 1 - 5 was 3.36 for male teachers and 3.29 for female teachers with the overall cluster mean score of 3.32. This is above the mean bench mark of 2.50 of a 4-point rating scale. The Table also revealed that the cluster standard deviation of the items 1 – 5 was 1.02 for male teachers and 1.11 for female teachers with the overall standard deviation of 1.07. This implies that technology-based practices to a high extent influenced the teaching of Agricultural science Education in Upper Basic Schools in Abia State, Nigeria.

Hypothesis 3: There is a significant difference in the mean ratings of male and female teachers on the extent technology-based practices influence Upper Basic schools

Table 3.2: T-test Analysis on Mean Ratings of male and female teachers on the extent technology-based practices influence Upper Basic schools

Teachers	N	$\bar{X}$	SD	DF	t-cal	P-value	Remarks
Male.	113	3.36	1.02				
				251	.507	.617	NS
Female	140	3.29	1.11				

The data in Table 3.2 indicates a t-calculated value of .507 and significant p-value of .617. Since the p-value of .617 is greater than 0.05 level of significant, the null hypothesis is therefore accepted. Hence, there is no significant difference in the mean ratings of male and female teachers on the extent technology-based practices influence Upper Basic schools.

Discussions

The results in Table 1 revealed Teachers' use of classroom learning management system to a high extent influence instructional effectiveness in Upper Basic Schools in Abia State, Nigeria. The result corroborated with the findings of Reichert, Chen and Young (2023) whose study findings revealed that teachers who reported high use of classroom management systems also reported more frequent and positive interactions with students, particularly in terms of providing timely feedback and support. The results in table 2 showed that educational apps to a high extent influence teachers' instructional effectiveness in Upper Basic Schools in Abia State, Nigeria. This specifically means that both respondents agreed that personal use of educational apps to a high

extent influence teachers' instructional effectiveness in Upper Basic Schools.

Finally, it was found from the study that technology-based practices to a high extent influenced the teaching of Agricultural science Education in Upper Basic Schools in Abia State, Nigeria. This result aligned with the findings of Okoro (2013) whose study findings revealed that there is a statistically significant increase in the achievements and problem -solving skills of the students in the experimental group that received the computer-based science and technology instruction.

Conclusion

Technology-Based Practices had increasing influence on Teachers' Instructional Effectiveness in teaching Agricultural science in Upper Basic Schools. Also, the use of classroom management system, and educational apps influenced the teaching of Agricultural Science in Upper Basic Schools in Abia State, Nigeria.This indicates that the integration of technology into Agricultural Science instruction can enhance teachers' instructional practices, leading to improved students learning outcome and engagement.

Recommendations

1. Teachers should be provided with in -service training for professional development.
2. Administrators should allocate resources and support to help teachers implement technology-based practices in their classrooms.
3. Schools should develop policies and guidelines that support the effective use of technology in Agricultural Science instruction.
4. Schools should create opportunities for teachers to collaborate and share best practices for using technology with colleagues.
5. Schools should regularly evaluate and assess the impact of technology-based practices on teachers' instructional effectiveness and adjust as needed.

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