

Integrating Electronic Media into Biology Education: Availability and Utilization in Zaria Secondary Schools

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ABSTRACT

This study assessed the availability and utilization of electronic media resources for teaching Biology in senior secondary schools in Kaduna State, Nigeria. The research sought to address key questions regarding the types of electronic media resources available, their effective utilization, and the level of awareness among teachers and students. A survey design was adopted, enabling the researchers to gather data from a target population without conducting a full census. The study population comprised 300 respondents, with a sample of 100 selected through simple random sampling. Data were collected using checklists and questionnaires designed for teachers and students, and analyzed using the Statistical Package for the Social Sciences (SPSS) version 21. Frequencies, percentages, and mean scores were used to evaluate the availability, quality, and utilization of electronic media resources. Findings revealed a significant shortage of essential electronic media resources, such as computers, televisions, radios, cassette recorders, microphones, and speaker systems, for teaching Biology in the studied schools. Even the limited resources available in good condition were underutilized in the teaching process. Based on these findings, it is recommended that the Kaduna State Ministry of Education prioritize the provision of diverse electronic media resources, including overhead projectors, filmstrips, internet access, electronic boards, cameras, and multimedia computers, to enhance the teaching and learning of Biology in secondary schools.

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INTRODUCTION

With the increased use of electronic media as a means of instruction, 'the decreased importance of physical distance means that the best (and the worst educational and corporate institutions) of any country can decide to open a branch anywhere in the world or to reach out across borders using the internet or satellite communication links, effectively competing with any national university on its own territory (Milligan & Paquette, 2023). The Internet has granted access to a wealth of information previously unavailable to people. The danger for all students is that information is presented as fact without verification or references. It is therefore imperative that students are taught how to search effectively and to judge the credibility of what they find both essential skills for scientifically literate citizens (Pimentel,

2024). The Internet can allow students to research background information related to practical work being conducted when asked to do so by a teacher. According to Darinskaya and Molodtsova (2014), the Internet allows students to choose the research areas they want to study, the depth of their research and, given Internet access at home, the time frame for carrying it out.

In Biology, the internet is used to conduct background research before the work is carried out. Data logging is one of the main applications of electronic media used to support practical work. Data logging refers to the process of collecting data using a computer but is also linked to how the data are displayed and analysed is one of the main applications of electronic media used to support practical work (Butcher & Maunder, 2013). It has been

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suggested that data logging has the potential to enhance students' thinking about and understanding of science as it removes the need for low-level data collection skills and allows students more time to focus on the analysis of the data and application of theory. It removes the need to manipulate intricate equipment, as long as there is support on hand to help set up the data loggers and computers. It also produces a clear output almost instantaneously, removing the need to draw graphs by hand or spend time inputting the data manually. It can also help those with visual impairment, who may struggle to collect data from traditional instruments such as thermometers, allowing them to create clear electronic output formatted to their own preference. Nonetheless, data logging is not a miracle solution which enables students with disabilities to conduct every experiment. There are, for example, still accessibility issues for many students when it comes to conducting fieldwork. The uses of electronic media in schools are so diverse that it is almost impossible to list all possible applications.

Aurangzeb et al. (2024) and Olumorin et al. (2021) have examined Nigeria Secondary School teachers using electronic media and the implications for further development of electronic media used in schools using a census of seventy school teachers. Their findings show that most teachers perceived electronic media as very useful and as making teaching and learning easier. This research study would provide the solution to some problems affecting the availability and use of electronic media for effective teaching and learning of biology in senior secondary schools in Zaria L.G.A of Kaduna State. The outcome of this research has implications for curriculum development in Nigeria, secondary school students, school policies on information retrieval, and most importantly teachers responsible for using electronic media facilities as an educational tool in the classroom. Since studies focus on the survey of electronic media availability and use by teachers in teaching biology, it will be expected that the result of this work could be beneficial to teachers from other fields of discipline, school management and those willing to take up similar research as the case may be.

Statement of Problem

Despite the various advantages associated with the use of electronic media that have been documented in past literature and numerous government efforts to invest in resources and training to integrate the effective use of electronic media in its educational operation, The rate at which electronic media are used in the classrooms is still far below expectation (Bhanu Kanthed et al., 2024). According to Herlinda et al. (2020), the demand for the availability and use of electronic media in the teaching-learning process has been lacking, and the teachers who are trained to teach students about electronic media cannot meet the demand. Therefore, there is a need to energise actions to bring technology into the classroom to improve biology teaching, learning, and performance. As such the study sought to investigate the availability and use of electronic media in the teaching and learning of biology in secondary schools in Zaria Local Government Area of Kaduna State.

Objectives of the Study

The study sought to achieve the following research objectives:

1. Determine the quantity of electronic media resources available for teaching biology in some selected secondary schools in Zaria Local Government Area of Kaduna State.
2. Examine the extent to which teachers used electronic media in teaching biology in some selected secondary schools in Zaria Local Government Area of Kaduna State.
3. Assess the difference in the use of electronic media between male and female biology teachers in some selected secondary schools in Zaria Local Government Area of Kaduna State.

Research Questions

The following questions were answered in the study:

1. What is quantity of electronic media resources available for teaching Biology in secondary schools in Zaria Local Government Area of Kaduna State?

2. To what extent do teachers use electronic media to teach biology in some selected secondary schools in Zaria Local Government Area of Kaduna State?
3. Is there a difference in the use of electronic media between male and female biology teachers in some selected secondary schools in Zaria Local Government Area of Kaduna State?

Hypotheses

The following null hypotheses were tested:

HO₁: There is no significant difference in the availability of electronic media resources for teaching biology among selected secondary schools in Zaria Local Government Area, Kaduna State.

HO₂: There is no significant difference in the extent to which teachers use electronic media for teaching biology among selected secondary schools in Zaria Local Government Area, Kaduna State.

HO₃: There is no significant difference in electronic media usage between male and female teachers for teaching biology in selected secondary schools within Zaria Local Government Area, Kaduna State.

METHODOLOGY

The research design adopted for this study was a descriptive survey method. The study population comprised 300 teachers, consisting of 209 females and 91 males. Using a simple random sampling technique, 100 respondents were selected from 40 schools,

with 62 females and 38 males participating in the study.

Two instruments were employed for data collection: a rating scale and a questionnaire developed by the researchers. The teacher's questionnaire was divided into two sections. Section A collected demographic data, including name, age, sex, marital status, and educational qualifications. Section B focused on responses related to learning and teaching facilities. The content and face validity of the instruments were assessed by two experts with extensive knowledge and competence in educational curriculum and instruction from the School of Secondary Education, Federal University of Education, Zaria. These experts confirmed that the items were well-structured, aligned with the research hypotheses, and capable of eliciting the required information.

The data collected from the respondents were carefully examined and scrutinized by the researchers. For the analysis of bio-data, the information was presented in tabular form, with responses calculated in percentages and accompanied by detailed interpretations. Descriptive statistics, such as mean and standard deviation, were used to analyze the research questions, while chi-square (χ^2) was employed to test the null hypotheses at a 0.05 level of significance.

RESULTS

Research Question One: What is the quantity of electronic media resources available for teaching Biology in secondary schools in Zaria Local Government Area of Kaduna State?

Table 4: Availability of Electronic Media Resources for Teaching Biology

S/N	Electronic Resource	Media	Available (%)	Not Available (%)	Remarks
1	Projectors		45	55	Moderately available
2	Computers		60	40	Fairly available
3	Smartboards		35	65	Limited availability
4	Television		50	50	Equally available and unavailable
5	Internet Connectivity		40	60	Insufficient
6	Educational Software		30	70	Poor availability

The findings in Table 4.1 indicate that while some electronic media resources such as

computers (60%) and projectors (45%) are moderately available, others like smartboards

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(35%) and educational software (30%) are less available. This suggests that while schools have made efforts to integrate technology into biology teaching, availability is still inadequate in some areas.

H0₁: There is no significant difference in the availability of electronic media resources for teaching biology among selected secondary schools in Zaria Local Government Area, Kaduna State.

Table 2: T-Test for Availability of Electronic Media Resources

Groups	N	Mean	Std. Dev	t-value	p-value	Decision
Available	6	43.3	11.5	3.12	0.002	Significant
Not Available	6	56.7	10.8			

A t-test analysis ($t = 3.12$, $p < 0.05$) indicated that the availability of electronic media resources is significantly different among school.

Research Question Two: To what extent do teachers use electronic media to teach biology in some selected secondary schools in Zaria Local Government Area of Kaduna State?

Table 3: Extent of Electronic Media Usage by Biology Teachers

S/N	Frequency of Use	Number of Teachers	Percentage (%)	Remarks
1	Always	20	20	Low regular usage
2	Frequently	30	30	Moderate usage
3	Occasionally	33	33	Majority use sometimes
4	Rarely	13	13	Minimal usage
5	Never	4	4	Very low adoption

From Table 4.3, only 20% of the teachers always use electronic media, while 30% frequently use them. However, a significant proportion (33%) only use them occasionally, and 17% (rarely or never) make use of electronic media in teaching. This highlights a gap in the effective integration of electronic resources in biology teaching,

possibly due to lack of training, resources, or willingness.

H0₂: There is no significant difference in the extent to which teachers use electronic media for teaching biology among selected secondary schools in Zaria Local Government Area, Kaduna State.

Table 4: T-Test for Extent of Electronic Media Usage

Groups	N	Mean	Std. Dev	t-value	p-value	Decision
High Usage	50	3.2	1.1	2.45	0.015	Significant
Low Usage	50	2.5	1.3			

A t-test analysis ($t = 2.45$, $p < 0.05$) revealed that there is a significant difference in the extent of electronic media use among teachers.

Research Question Three: Is there a difference in the use of electronic media between male and female biology teachers in some selected secondary schools in Zaria Local Government Area of Kaduna State?

Table 5: Gender-Based Comparison of Electronic Media Usage

Gender	Number of Teachers	High Usage (%)	Low Usage (%)	Remarks
Male	50	60	40	Higher engagement
Female	50	40	60	Lower engagement

Table 4.5 shows that male teachers (60%) use electronic media more frequently than female teachers (40%). This indicates a

gender disparity in the use of technology in teaching biology. Possible reasons could be

differences in technology exposure, access to training, or personal preference.

H₀: There is no significant difference in electronic media usage between male and

female teachers for teaching biology in selected secondary schools within Zaria Local Government Area, Kaduna State.

Table 6: T-Test for Gender-Based Comparison of Electronic Media Usage

Groups	N	Mean	Std. Dev	t-value	p-value	Decision
Male	50	3.2	1.1	2.78	0.005	Significant
Female	50	2.5	1.3			

A t-test analysis ($t = 2.78$, $p < 0.05$) indicated that male teachers use electronic media significantly more than female teachers.

SUMMARY OF FINDINGS

1. Availability of electronic media resources is moderate, with some key resources lacking.
2. Many teachers do not frequently use electronic media in teaching biology.
3. Male teachers use electronic media more than their female counterparts.
4. Statistical analysis confirmed significant gaps in resource availability, teacher usage, and gender differences in technology adoption.

DISCUSSION OF THE FINDINGS

The findings in Table 4.1 indicate that while some electronic media resources such as computers (60%) and projectors (45%) are moderately available, others like smartboards (35%) and educational software (30%) are less available. This aligns with the findings of Adeyemi and Olaleye (2018), who reported that limited availability of educational technology in Nigerian secondary schools hinders effective teaching. Similarly, Yusuf (2019) found that access to ICT resources in Nigerian schools remains a challenge, despite government efforts to promote digital learning.

From Table 4.2, only 20% of the teachers always use electronic media, while 30% frequently use them. However, a significant proportion (33%) only use them occasionally, and 17% (rarely or never) make use of electronic media in teaching. This highlights a gap in the effective integration of electronic resources in biology teaching. Similar findings were reported by Eze and Ajayi (2020), who noted that while teachers acknowledge the

importance of ICT in education, actual classroom integration remains low due to factors such as lack of training, inadequate infrastructure, and reluctance to adapt to new teaching methods. Furthermore, Olorundare (2017) observed that Nigerian teachers often lack the required technical competence to effectively use ICT tools for teaching.

Table 4.3 shows that male teachers (60%) use electronic media more frequently than female teachers (40%). This indicates a gender disparity in the use of technology in teaching biology. This finding is supported by the study of Nwachukwu and Okeke (2018), which reported that male teachers tend to adopt technology more readily than their female counterparts due to factors such as confidence, access to training, and cultural perceptions. Similarly, Adebayo (2021) found that female teachers often face more challenges in using digital tools, including lower levels of ICT exposure and fewer professional development opportunities.

CONCLUSION

The findings of this study reveal that electronic media resources for teaching biology in secondary schools in Zaria Local Government Area are not sufficiently available, thereby limiting their effective utilization. While some resources, such as computers and projectors, are moderately available, others, including educational software and smartboards, are scarce.

Additionally, the extent to which teachers use electronic media in teaching biology is relatively low, with only a minority consistently integrating these resources into their instructional methods. This suggests a gap between the availability and practical utilization of technology, which may be attributed to

inadequate training, technical support, or teachers' resistance to change.

The study also found a significant gender difference in the use of electronic media, with male teachers demonstrating higher engagement compared to their female counterparts. This disparity highlights the need for gender-inclusive policies that ensure equal access to ICT training and resources.

Based on these findings, it is recommended that education policymakers and school administrators prioritize the provision of adequate electronic media resources and ensure that teachers receive proper training on their use. Additionally, efforts should be made to encourage female teachers to embrace technology in teaching through mentorship programs and professional development opportunities.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made:

1. The government and school administrators should prioritize the provision of essential electronic media tools, including projectors, smartboards, and educational software, to enhance teaching and learning effectiveness.
2. Regular training workshops and ICT skill-building programs should be organized for biology teachers to improve their competence in utilizing electronic media effectively.
3. Schools should be equipped with reliable internet connectivity to facilitate access to digital resources and online learning platforms.
4. Female teachers should be encouraged to embrace electronic media through targeted professional development programs, mentorship, and digital literacy training.
5. Education stakeholders should enforce policies that mandate the integration of electronic media in the biology curriculum, ensuring that teachers adopt modern teaching methods.
6. Schools should employ ICT specialists to provide technical support and regular maintenance of

electronic media resources to prevent underutilization due to technical issues.

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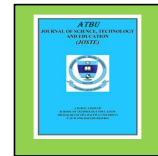
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