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THE EFFECT OF WAKELET-BASED INSTRUCTION ON SECONDARY SCHOOL STUDENTS' ACADEMIC PERFORMANCE IN BIOLOGY: A QUASI-EXPERIMENTAL STUDY

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ABSTRACT

This study investigated the effect of Wakelet-based instruction on the academic performance of secondary school students in Biology in the Uyo Local Government Area. Three research questions and three null hypotheses were formulated to guide the study. The research adopted a quasi-experimental design using a pretest-posttest non-randomized control group approach. The population comprised 3,427 SS II students offering Biology during the 2025/2026 academic session across 15 public secondary schools in Uyo LGA. A sample of 202 students was drawn from four intact classes in two purposively selected schools. The experimental groups received instruction using a Wakelet instructional package, while the control groups were taught using the expository method. Data were collected using a researcher-developed Biology Performance Test (BPT), which was validated for face and content by three experts from the Faculty of Education, University of Uyo. Reliability analysis using the test-retest method yielded a coefficient of 0.92. Data analysis involved mean and standard deviation to address the research questions, while analysis of covariance (ANCOVA) was employed to test the hypotheses at a 0.05 level of significance. The findings revealed a significant difference in the performance of students taught with Wakelet technology compared to those taught using the expository method. Additionally, there was no significant difference between male and female students and between urban and rural students taught using Wakelet technology. Based on these results, it was concluded that Wakelet-based instruction is more effective than the expository method for teaching biology. It is recommended that school administrators and curriculum planners provide adequate training and infrastructure support to enable Biology teachers to implement Wakelet technology effectively, ensuring that all students benefit from interactive and technology-enhanced learning experiences.

KEYWORDS: Wakelet instruction, Biology performance, secondary students, technology-enhanced learning.

INTRODUCTION

A significant advantage of technology in education is its role in improving access to information and resources. The internet provides students with unlimited access to a wide variety of learning materials beyond the textbook, from academic journals to instructional videos and interactive content. This expansive access enables students to explore subjects in greater depth and engage in self-directed learning. Research has shown that when students have access to technology, they can participate more actively in their education and develop

critical 21st-century skills, such as digital literacy, collaboration, and problem-solving (Nguyen and Trinh, 2022). These skills are crucial for success in the modern workforce; integrating technology in the teaching-learning process in secondary schools is a vital component for preparing students for the future. According to research by Liu et al. (2021), technology integration allows teachers to quickly assess learning gaps and adjust their teaching strategies, ultimately improving overall educational outcomes. Digital platforms enable educators to track and assess student performance, fostering continuous improvement and ensuring that no student falls behind.

The global push for integrating technology in education aligns with the Sustainable Development Goal (SDG), which calls for inclusive and equitable quality education and lifelong learning opportunities for all. As such, incorporating technology in secondary school education is not only beneficial for individual learning but also a crucial strategy for achieving broader educational goals. In Nigeria, the National Policy on Education (2013) emphasizes the integration of technology in education to improve access to quality education, especially in rural and underserved areas. Thus, embracing technology in education is essential for the advancement of secondary school education and the preparation of students for success in an increasingly digital world. One of these technologies is Wakelet technology.

Wakelet was founded in 2013 by Zain and Ali with the aim of providing a simple and user-friendly tool for content curation and sharing (Wakelet, 2023). Initially, Wakelet focused on helping users collect and share their favorite articles and videos from the web. Over the years, the platform has evolved to include a wide range of tools for educational purposes, enabling teachers and students to use it as a space for organizing, presenting, and collaborating on learning materials. Today, Wakelet has expanded its use beyond content curation and is widely recognized for its potential to enhance engagement and learning outcomes in various educational contexts. Wakelet is a digital curation platform that enables users to organize, save, and share content such as articles, videos, images, links, and PDFs in an interactive and visually appealing way. This platform is particularly popular in educational settings, where it allows teachers to create rich, multimedia-based resource collections and share them with students.

In addition to individual content curation, Wakelet facilitates collaborative learning, allowing students to co-create and organize materials in real-time. It is especially valuable in blended learning environments where resources from both in-class instruction and online platforms can be integrated into one unified space. By fostering an engaging and flexible learning environment, Wakelet supports different learning styles and helps improve students' digital literacy (Wakelet, 2023). As an intuitive tool, Wakelet enables educators to compile and organize various types of content—such as articles, videos, and lesson plans—into one accessible resource. This makes it easier for students to access information and engage with the learning materials in a dynamic way, as opposed to static, textbook-based learning.

According to a study by McQuaid (2021), Wakelet has been particularly effective in enhancing student collaboration and engagement, as it provides a visually compelling and easily navigable way to present educational content. The ability to curate content on a platform that promotes interaction and engagement offers a unique approach to learning, where students can actively contribute to the materials they are studying. Pebsrikova and Akhiriyah (2024) posited that Wakelet technology improves students' performance when used for Biology instruction. By integrating Wakelet into secondary school education, educators can enhance the learning experience, making it more accessible and engaging, and provide students with a more organized, efficient way of interacting with complex subject matter such as biology. Biology, as a fundamental branch of

science, plays an essential role in secondary education by equipping students with knowledge about the natural world, living organisms, and the environment. It not only enhances students' understanding of biological processes but also fosters critical thinking, analytical skills, and an appreciation for the interconnectedness of life. The study of Biology has significant implications for numerous sectors, including medicine, environmental conservation, biotechnology, and public health, thus preparing students for a wide range of career opportunities. The study of Biology contributes to developing scientific literacy, which is essential for understanding the biological challenges and advances that shape the modern world. By studying topics such as cell biology, genetics, evolution, and ecology, students gain insights into how life works at various levels, from the molecular to the ecological scale.

According to Hewson and Jenson (2020), a strong foundation in Biology is essential for developing a well-rounded scientific understanding, enabling students to grasp key concepts in other scientific disciplines such as chemistry and physics. As such, Biology acts as the gateway to other STEM (Science, Technology, Engineering, and Mathematics) subjects, making it indispensable in preparing students for careers in science and technology fields. In addition to its role in preparing students for careers in the sciences, Biology plays a crucial role in cultivating awareness of critical global issues such as climate change, biodiversity loss, and public health crises. Through the study of environmental biology, for example, students learn about ecosystems, the impact of human activity on the environment, and the importance of sustainable living. As highlighted by McKinney et al. (2021), this knowledge is crucial for fostering a generation of individuals who are informed and responsible stewards of the environment. Similarly, the study of human biology provides students with an understanding of health, disease prevention, and the body's systems, which is vital in promoting public health and well-being. According to Smith et al. (2019), active engagement in experimental biology encourages students to develop critical thinking and reasoning skills, which are transferable to a variety of professions. These skills are increasingly important in a rapidly changing world where complex problems, such as pandemics and environmental degradation, require innovative solutions.

Despite the fundamental role that Biology plays in secondary education, it is often one of the subjects in which students experience significant challenges and poor performance. Several factors contribute to these challenges, which can be understood in the context of the importance of Biology as a science subject. While the study of Biology is essential for developing critical thinking, scientific literacy, and an understanding of key global issues, students' poor performance in the subject often stems from difficulties in grasping complex concepts, a lack of effective teaching methods, and insufficient engagement with the content.

Students' poor performance in Biology is often linked to the expository method of teaching, a traditional instructional approach in which teachers primarily deliver content through lectures while students passively receive information. Although the expository method allows teachers to cover large portions of the curriculum within limited time, it has been criticized for its limited engagement of students in the learning process. Research by Ema *et al*. (2025) indicates that this method encourages rote memorization rather than critical thinking, problem-solving, and application of concepts, which are essential in Biology (Obi and Eze, 2020). Students taught predominantly through expository lectures may struggle to understand complex biological processes, such as cellular metabolism, genetics, and ecological interactions, because they are not actively involved in exploring or experimenting with these concepts. Studies in Nigerian secondary schools have shown that overreliance on the expository method correlates with low motivation and reduced interest in learning Biology (Akpan and Nwosu, 2019). When students perceive lessons as monotonous and teacher-centered, they are less likely to engage with the material outside the classroom or

participate in discussions. This lack of engagement further reinforces poor academic outcomes, as students are not given the opportunity to internalize and apply the knowledge in meaningful ways. For students' attention to be sustained, there is a need to integrate technology in the teaching-learning process because of its ability to foster greater student engagement. Digital technology such as Wakelet makes learning more dynamic and immersive. According to Kumi-Yeboah (2021), the use of technology in education has been linked to increased student motivation and participation, as it allows for real-time interactions with content, enabling students to learn at their own pace and according to their preferences. Furthermore, technology can bridge the gap for students with diverse learning needs by providing alternative methods for engaging with materials, such as audio and visual aids or interactive platforms that support personalized learning. Hussin and Karim (2022) posited that the use of Wakelet technology in teaching Biology enhances students' performance more than the expository method. Integrating interactive and technology-enhanced approaches, such as Wakelet, can help mitigate these challenges. By allowing students to collaborate on curated collections of multimedia content, engage with lessons at their own pace, and participate in problem-solving activities. According to Syafaah (2021), Wakelet provides a more inclusive learning environment, and students' performance in Biology is enhanced when taught with Wakelet technology. Wakelet, because of its interactive engagement, benefits both male and female students, enabling equitable access to learning resources and fostering improved performance regardless of gender. Therefore, addressing students' poor performance in Biology requires not only a shift from passive teaching methods but also the consideration of gender as a sub-variable in designing effective instructional strategies.

Gender in educational research refers to the social roles, behaviours, expectations, and identities linked with being male or female. It differs from biological sex because it reflects cultural norms and social expectations that shape students' learning experiences, confidence, subject preference, classroom participation, and access to learning resources (UNESCO, 2019). In secondary school biology, gender may influence students' engagement with practical, visual, and analytical learning tasks, as well as their use of digital learning tools (Adamu et al. 2022). Thus, gender was considered a sub-variable to determine whether Wakelet-based instruction affected male and female students differently. Research by Uma (2022) revealed no significant difference, while research by Okeke and Eze (2021) and Adewale and Nwosu (2023) showed a significant difference in favour of female students in biology achievement.

'School location' refers to the geographical position of a school, usually classified as 'urban' or 'rural'. It can influence the learning environment, availability of teaching resources, teacher quality, laboratory facilities, and access to internet services. Urban schools often have better infrastructure and exposure to educational innovations, while rural schools may experience shortages of instructional materials, weak internet connectivity, and fewer trained teachers (Adamu et al. 2022). In technology-enhanced biology instruction, school location may affect students' access to devices, online resources, and the support needed to use Wakelet effectively (Eno et al. 2023). Research by Bello and Yusuf (2022), Akinola and Adebayo (2020), and Onyema and Eze (2021) reported significant differences in biology performance in favour of urban students due to environmental and locational factors.

It is against this background that the researchers conducted this study to ascertain if Wakelet technology can be used as a teaching strategy in secondary schools to enhance students' performance in biology.

Statement of the Problem

In recent years, secondary school students have increasingly used electronic devices for entertainment activities such as social media, gaming, and video streaming. Although technology can support learning, its frequent use for non-academic purposes may reduce the time, attention, and concentration students give to their studies. Biology requires regular engagement, practical application, and critical thinking for students to understand and retain scientific concepts. As observed by the researchers, many students rely heavily on electronic devices for entertainment instead of academic learning, and this may contribute to their poor performance in biology, especially in the West African Senior School Certificate Examination.

The continued use of traditional teaching methods, especially the expository method, may also limit students' active participation and reduce their understanding of biology concepts. In response to this problem, there is a need to use technology in a more purposeful and educational manner. Wakelet provides teachers with the opportunity to organize multimedia learning materials and allows students to interact with content in a more collaborative and engaging way. Therefore, this study investigates the effect of Wakelet technology on the academic performance of secondary school students in biology in the Uyo Local Government Area.

Purpose of the Study

The purpose of this study is to examine the effect of Wakelet technology on students' academic performance in Biology in secondary schools in Uyo Local Government Area. Specifically, the objectives of this study were:

i. to determine the difference in the academic performance of SS II Biology students taught with Wakelet technology and those taught with expository method in Uyo LGA.

ii. to examine the difference in academic performance of male and female SS II Biology students taught with Wakelet technology in Uyo LGA.

iii. to examine the difference in academic performance of urban and rural SS II Biology students taught with Wakelet technology in Uyo LGA.

Research Questions

The following research questions were raised to guide the study:

i. What is the difference in the academic performance of SS II Biology students taught with Wakelet technology and those taught with expository method in Uyo LGA?

ii. what is the difference in academic performance of male and female SS II Biology students taught with Wakelet technology in Uyo LGA?

iii. what is the difference in academic performance of urban and rural SS II Biology students taught with Wakelet technology in Uyo LGA?

Research Hypotheses

The following null hypotheses were formulated to guide the study and were tested at 0.05 level of significance.

i. There is no significant difference in the academic performance of SS II Biology students taught with Wakelet technology and those taught with expository method in Uyo LGA.

ii. There is no significant difference in the academic performance of male and female SS II Biology students taught with Wakelet technology in Uyo LGA.

iii. There is no significant difference in academic performance of urban and rural SS II Biology students taught with Wakelet technology in Uyo LGA.

Methodology

This study adopted a quasi-experimental pre-test–post-test non-randomized control group design. The study was carried out in the Uyo Local Government Area of Akwa Ibom State, Nigeria, using selected public secondary schools offering biology at the SS II level. Uyo was considered suitable for the study because it has both urban and rural school settings, which allowed the researchers to examine the effect of Wakelet-based instruction across different learning environments. The population comprised 3,427 SS II Biology students enrolled in all 15 public secondary schools within Uyo Local Government Area of Akwa Ibom State during the 2025/2026 academic session. The sample consisted of 202 students (102 female and 100 male respondents) selected using a purposive sampling technique based on some stated criteria, which include the following: schools must be coeducational and schools must have a computer laboratory with at least 30 functional computers with internet connectivity.

Out of the five schools that met the selection criteria (three urban and two rural), one urban and one rural school were chosen using the simple random sampling technique (hat and draw method). Within these selected schools, four intact classes were used for the study. Both the urban and rural schools had equal representation of experimental and control groups. The researchers developed an instrument called the Biology Performance Test (BPT). The BPT was designed on the topic "Basic Ecological Concepts and Feeding Relationships" and comprised 20 multiple-choice items, each with four options (A–D) and only one correct answer. Each correct response was awarded 5 marks, making the total possible score 100 marks. The BPT was administered to assess students' performance in both the pre-test and post-test. The instrument was face- and content-validated by three lecturers at the University of Uyo. The researchers then incorporated all corrections and suggestions to produce the final version of the BPT, which was administered to the respondents. Additionally, the researcher prepared the instructional packages for both the experimental and expository groups based on the concept of 'Basic Ecological Concepts and Feeding Relationships.' The experimental groups were taught using the Wakelet instructional package, while the control groups were taught using the expository method. The package was designed using the ASSURE instructional model.

The test-retest method of reliability was employed, and a reliability coefficient of 0.92 was obtained using Pearson product-moment correlation. Based on the obtained reliability coefficient, the instrument was deemed to have high internal consistency and was therefore considered suitable for data collection in the study. Descriptive statistics of mean and

standard deviation were used in answering all the research questions, while analysis of covariance (ANCOVA) was used in testing all the research hypotheses at the .05 level of significance. The research questions were answered using mean and mean gain scores. A higher mean gain score for a treatment group indicated better students' academic performance compared with the other group. The null hypotheses were tested at the 0.05 level of significance. Therefore, a null hypothesis was rejected when the probability value was less than 0.05, while it was retained when the probability value was greater than 0.05.

Data Analysis and Results:

Research Question 1:

What is the difference in the academic performance of SS II Biology students taught with Wakelet technology and those taught with expository method in Uyo LGA?

Table 1: Mean and Standard Deviation of SS II Students taught Biology with Wakelet technology and those taught with expository method.

Treatment Groups	n	Pre-test $\bar{X}$	Pre-test SD	Post-test $\bar{X}$	Post-test SD	Mean Gain
Taught with Wakelet technology	102	16.71	4.19	63.62	6.22	46.91
Taught with Expository method	100	16.25	4.28	55.35	7.04	39.1
Total	**202**					

The data presented in Table 1 indicate that the experimental group of students taught biology using Wakelet technology had pre-test and post-test mean scores of 16.71 and 63.62, with corresponding standard deviations of 4.19 and 6.22, respectively. In comparison, students taught using the expository method recorded pre-test and post-test mean scores of 16.25 and 55.35, with standard deviations of 4.28 and 7.04, respectively. Analysis of these results reveals that while both instructional groups exhibited an improvement in post-test performance, the experimental group demonstrated a greater mean gain score of 46.91, compared to 39.10 for the expository group. This finding suggests that the integration of Wakelet technology into biology instruction significantly enhanced students' academic performance relative to conventional expository teaching methods.

Research Question 2: What is the difference in academic performance of male and female SS II Biology students taught with Wakelet technology in Uyo LGA?

Table 2: Mean and Standard Deviation of male and female SS II Students taught Biology with Wakelet technology.

Taught with Wakelet (Gender)	n	Pre-test $\bar{X}$	Pre-test SD	Post-test $\bar{X}$	Post-test SD	Mean Gain
Male	50	17.10	4.17	64.60	6.61	47.5
Female	52	17.30	4.36	64.90	4.37	47.6
Total	**102**					

The data presented in Table 2 show that male students taught biology using Wakelet technology obtained pre-test and post-test mean scores of 17.10 and 64.60, with standard deviations of 4.17 and 6.61, respectively. Similarly, female students recorded pre-test and post-test mean scores of 17.30 and 64.90, with corresponding standard deviations of 4.36 and 4.37. The results indicate that both male and female students exhibited substantial improvement in post-test performance. Furthermore, the mean gain scores for male and female students were 47.5 and 47.6, respectively, demonstrating that the two genders performed comparably when taught biology with Wakelet technology. These findings suggest that the integration of Wakelet technology into biology instruction effectively enhanced the academic performance of both male and female students equally.

Research Question 3: What is the difference in academic performance of urban and rural SS II Biology students taught with Wakelet technology in Uyo LGA?

Table 3 Mean and Standard Deviation of SS II urban and rural Students taught Biology with Wakelet technology

Wakelet group (School Location)	n	Pre-test $\bar{X}$	Pre-test SD	Post-test $\bar{X}$	Post-test SD	Mean Gain
Urban	50	16.90	4.15	56.30	8.13	39.4
Rural	52	16.53	4.80	56.25	6.01	39.72
Total	**102**					

The data presented in Table 3 indicate that urban students taught biology using Wakelet technology obtained pre-test and post-test mean scores of 16.90 and 56.30, with standard deviations of 4.15 and 8.13, respectively. In comparison, rural students recorded pre-test and post-test mean scores of 16.53 and 56.25, with corresponding standard deviations of 4.80 and 6.01. The results demonstrate that both groups exhibited improved performance in the post-test. Additionally, the mean gain scores for urban and rural students were 39.4 and 39.72, respectively, indicating comparable performance between the two groups when taught biology with Wakelet technology. These findings suggest that the use of Wakelet technology effectively enhanced academic performance for students across both urban and rural settings.

Research Hypothesis 1: There is no significant difference in the academic performance of SS II Biology students taught with Wakelet technology and those taught with expository method in Uyo LGA.

ANCOVA was used in testing the hypothesis and the summary is presented in Table 4.

Table 4: Summary of ANCOVA analysis of SS II Students taught Biology with Wakelet technology and those taught with expository method (n=202).

Source	Type III Sum of Squares	df	Mean Square	F	P-value
Decision					
Corrected Model	3466.290[a]	2	1733.145	39.130	.000
Intercept	44977.902	1	44977.902	1015.495	.000
Pre-test	6.562	1	6.562	.148	.701
Instructional_methods* Sig.	3465.822	1	3465.822	78.250	.000
Error	8414.032	199	44.292		
Total	728125.000	202			
Corrected Total	12280.322	201			

The ANCOVA results presented in Table 4 indicate an F-ratio (2, 202) = 78.250, p = .000 < 0.05. This indicates that the observed p-value (.000) is less than the alpha level (0.05), which served as the decision criterion for hypothesis testing. Based on this outcome, the null hypothesis, which stated that there is no significant difference in the academic performance of SS II students taught biology with Wakelet technology and those taught using the expository method, was rejected. The findings therefore demonstrate a significant difference in the performance of students, with those in the experimental group taught using Wakelet technology achieving higher academic performance compared to the control group taught via the expository method. This result underscores the effectiveness of Wakelet technology in enhancing student achievement in biology.

Research Hypothesis 2: There is no significant difference in the academic performance of male and female SS II Biology students taught with Wakelet technology in Uyo LGA.

ANCOVA was used in testing the hypothesis and the summary is presented in Table 5.

Table 4.5: Summary of ANCOVA analysis of SS II male and female Students taught Biology with Wakelet technology (n=102).

Source	Type III Sum of Squares	df	Mean Square	F	P-value
Decision					
Corrected Model	2.360	2	1.180	.037	.963
Intercept	24386.385	1	24386.385	774.665	.000
Pre-test	.007	1	.007	.000	.988
Gender* N/Sig.*	2.346	1	2.346	.075	.785
Error	3116.512	99	31.480		
Total	430825.000	102			
Corrected Total	3118.873	101			

Source: Field data (2026)

The ANCOVA results presented in Table 4.5 show an F-ratio (2, 102) = 0.075 and p = 0.785 > 0.05. This indicates that the observed p-value (0.785) is greater than the alpha level (0.05) used as the decision criterion. Consequently, the null hypothesis, which stated that there is no significant difference in the academic performance of SS II male and female students taught biology using Wakelet technology, was retained. The findings suggest that there is no significant difference in the performance of male and female students, indicating that both genders achieved comparable academic outcomes when taught with Wakelet technology.

Research Hypothesis 3: There is no significant difference in academic performance of urban and rural SS II Biology students taught with Wakelet technology in Uyo LGA. ANCOVA was used in testing the hypothesis and the summary is presented in Table 6.

Table 6: Summary of ANCOVA analysis of SS II urban and rural Students taught Biology with Wakelet technology (n=102).

Source	Type III Sum of Squares	df	Mean Square	F	P-value
Decision					
Corrected Model	78.623[a]	2	39.312	.777	.462
Intercept	23962.708	1	23962.708	473.922	.000
Pre-test	78.560	1	78.560	1.554	.216
School_location* N/Sig.*	.374	1	.374	.007	.932
Error	5005.690	99	50.563		
Total	328100.000	102			
Corrected Total	5084.314	101			

The ANCOVA results presented in Table 4.6 show an F-ratio (2, 102) = 0.075, p = 0.932 > 0.05, indicating that the observed p-value (0.932) is greater than the alpha level (0.05) used for decision-making. Therefore, the null hypothesis, which stated that there is no significant difference in the academic performance of SS II urban and rural students taught biology

using Wakelet technology, was retained. These findings suggest that there is no significant difference in performance between urban and rural students, indicating that both groups achieved comparable academic outcomes when instructed using Wakelet technology.

Results and Discussion

The analysis showed a statistically significant difference in the academic performance of Senior Secondary Two Biology students taught with Wakelet technology and those taught using the expository method. Students exposed to Wakelet-based instruction performed better, suggesting that the platform improved learning by providing interactive and multimedia materials that helped students understand biology concepts more clearly. This finding agrees with Hussin and Karim (2022), whose study showed that students in the Wakelet group achieved higher post-test scores than those in the control group. It also supports the findings of Pebsrikova and Akhiriyah (2024) and Syafaah (2021), who reported significant improvement among students taught with Wakelet-supported instruction. The improvement may be linked to Wakelet's ability to promote active participation, collaboration, quizzes, and digital content creation, which can strengthen retention and application of knowledge better than the expository method.

The analysis showed no statistically significant difference in the academic performance of male and female Senior Secondary Two students taught biology with Wakelet technology. This suggests that Wakelet-based instruction improved students' biology performance without gender bias, as both groups had equal access to the same interactive, multimedia-rich materials. The finding agrees with Ibrahim and Umar (2022), who reported no statistically significant difference between male and female students' biology scores. This result may be linked to Wakelet's support for collaborative learning, digital content creation, and interactive quizzes, which encourage active participation among all students. However, the finding contradicts Okeke and Eze (2021) and Adewale and Nwosu (2023), who reported a statistically significant difference in favor of female students in biology achievement.

The analysis showed no statistically significant difference in the academic performance of urban and rural Senior Secondary Two students taught biology with Wakelet technology. This indicates that Wakelet-based instruction produced similar learning outcomes across school locations, suggesting that the platform can support biology learning irrespective of whether students attend urban or rural schools. This result may be because Wakelet provides students with access to the same interactive and multimedia learning materials, thereby promoting more equal learning opportunities. It may also be linked to the platform's support for active participation, collaboration, and self-paced learning, which helps students engage with biology content effectively. However, this finding contradicts Bello and Yusuf (2022), Akinola and Adebayo (2020), and Onyema and Eze (2021), who reported significant differences in biology performance in favor of urban students due to environmental and locational factors.

CONCLUSION

The study concluded that Wakelet-based instruction significantly improved secondary school students' academic performance in Biology and was effective across gender and school location.

RECOMMENDATIONS

On the basis of these research findings the researcher made the following recommendations:

i. Biology teachers should adopt Wakelet-based instruction as a supportive teaching strategy to improve students' academic performance through interactive, multimedia, and collaborative learning activities.

ii. School administrators and education stakeholders should provide adequate digital facilities, internet access, and teacher training to ensure effective use of Wakelet in both urban and rural secondary schools.

REFERENCES

Adamu, T. A., Alafiatayo, B. M., and Adamu, T. I. (2022). Impact of internet use on Biology students' academic performance in Nigeria. *African Journal of Humanities and Contemporary Education Research, 3(2)*, 120–128.

Adewale, O., and Nwosu, G. (2023). The Influence of Gender on Students' Academic Achievement in Biology in Oyo State Secondary Schools. *Journal of Science Education Research*, 12(1), 45–59.

Akinola, O., and Adebayo, F. (2020). Effect of School Location on Academic Performance of Senior Secondary School Students in Biology in Oyo State. *Journal of Science Teacher Education*, 11(1), 37–52.

Akpan, U., and Nwosu, I. (2019). Influence of Teaching Methods on Students' Interest and Achievement in Biology in Nigeria Secondary Schools. *International Journal of Educational Studies*, 8(3), 101-112.

Bello, M. A., and Yusuf, H. A. (2022). Impact of School Environment and Location on Students' Performance in Biology in Kaduna State. *Journal of Science Education Studies*, 8(2), 102–119.

Ema, Iniobong Bassey, Ukpong, Anglica Fidelis and Usen, Mercy Godwin (2025). ATutor Learning Management System, Academic Performance and Retention of Secondary School Students in Biology in Uyo Local Government Area, Akwa Ibom State. *Gaspro International of Eminent Scholars*, 12 (3): 1 – 13.

Eno, N. S., Uko, P. J., and Utibe, U. J. (2023). Digital devices and secondary school students' achievement in Biology in Eket Local Government Area, Akwa Ibom State, Nigeria. *Journal of Research in Education and Society, 14*(1), 23–33.

Federal Republic of Nigeria. (2013). *National Policy on Education*. 6th Edition. Lagos: NERDC Press.

Hewson, P. W., and Jenson, M. L. (2020). The Role of Biology Education in Scientific Literacy. *Journal of Biological Education*, 45(3), 23-31.

Hussin, A., and Karim, A. (2022). Digital learning integrations for curated web content: Effects on student engagement and outcomes. *International Journal of Academic Research in Progressive Education and Development, 11*, 60–71.

Kumi-Yeboah, A. (2021). The Role of Educational Technology in Enhancing Student Engagement in Secondary Schools. *Journal of Educational Technology*, 22(3), 45-59.

Liu, J., Zhang, W., and Wei, J. (2021). The Impact of Technology on Teaching and Learning in Secondary Schools: An Empirical Study. *Educational Researcher*, 56(7), 66-79.

McKinney, M. L., Schoch, R. M., and Allen, L. (2021). Biology for the Global Citizen: The Role of Biology in Addressing Environmental and Public Health Issues. *Environmental Biology*, 18(4), 51-63.

McQuaid, A. (2021). Digital Curation Tools in Education: A Wakelet-Based Model for Collaborative Learning. *Journal of Educational Technology and Society*, 24(2), 45-58

Nguyen, T., and Trinh, H. (2022). Technological Innovations in Secondary Education: A Study of Online Learning Platforms and Their Impact on Student Performance. *Educational Review,* 34(2), 112-124.

Obi, P., and Eze, C. (2020). Effects of Teaching Methods on Secondary School Students' Performance in Biology in Nigeria. *Journal of Educational Research and Development*, 15(1), 45-56.

Okeke, A. U., and Eze, P. C. (2021). Gender Differences in Academic Achievement of Senior Secondary School Students in Biology in Enugu State, Nigeria. *International Journal of Science Education Studies*, 7(4), 112–129.

Onyema, J. C., and Eze, P. N. (2021). School Location and Secondary School Students' Academic Achievement in Biology in Anambra State. *African Journal of Educational Research*, 9(3), 68–82.

Pebsrikova, B., and Akhiriyah, S. (2024). *The effectiveness of using Wakelet in improving senior high students' descriptive text writing.* Journal of Research in English Language Teaching, 8(2), 125–132.

Smith, P. M., Johnson, T. R., and Baker, J. (2019). Critical Thinking and Problem-Solving in Biology Education: A Review of Best Practices. *Journal of Science Education and Technology*, 28(5), 1097-1110.

Syafaah, R. (2021). *Application of Wakelet-based interactive learning model to improve student performance and engagement.* Master's thesis, Universitas Brawijaya Repository. https://repository.ub.ac.id/185061/ (Retrieved on January 12th, 2026).

Umar, M. (2020). *Motivation and learning outcomes in secondary school science education*. Nigerian *Journal of Educational Psychology*, 6(1), 34–49.

UNESCO. (2019). *Gender and Education: Analytical Report on Global Trends and Challenges*. Paris: United Nations Educational, Scientific and Cultural Organization.

Wakelet Education. (2024). *Wakelet for education: Guide and examples.* https://wakelet.com/site/education (Retrieved on February 10th, 2026).