



Science E-Library Resources and Science Students' Academic Achievement on Forest Conservation in Ibiono Ibom Local Government Area, Nigeria

Ekemini A. Edet, Rebecca U. Etiubon and Uduak P. Edem
Department of Science Education, Faculty of Education University of Uyo, Uyo

Abstract

The study is an empirical examination of science e-library resources and Science students' academic achievement on forest conservation in Ibiono Ibom Local Government Area, Nigeria. Three research questions and three null hypotheses guided the study. The design of the study was quasi-experimental with non-randomised pretest, posttest group. The population consisted all the 2,335 Senior Secondary School Two (SS 2) Science students. The sample size of 183 (88 males and 95 females) Senior Secondary Two (SS 2) students in three intact classes of three co-educational secondary schools in Ibiono Ibom Local Government Area, Nigeria were selected using purposive sampling technique. Science Achievement Test (SAT) was used for data collection. Science Achievement Test (SAT) had forty (40) items multiple choice questions. The test measured students' pretest and posttest achievement in the concept. The reliability of SAT was determined using Kuder-Richardson 20 (KR-20) with reliability indices of 0.82. Mean and Standard Deviation were used to answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the null hypotheses at 0.05 level of significance. The result showed that there is significant difference in mean achievement scores of Science students taught forest conservation using science e-books, e-journals and e-magazines resources, with e-books and e-journals resources achieved better than e-magazines. Also, there is no significant difference in the mean achievement scores of male and female Science students taught forest conservation using science e-books, e-journals and e-magazines resources respectively. It was also found that there is no significant interaction effects of teaching resources and gender on Science students' achievement on forest conservation. It was concluded that science e-books and e-journals were more effective than e-magazines in facilitating students' achievement in forest conservation in Science. Based on the findings, it was recommended among others, that Science teachers should make effective use of science e-books and e-journals in teaching the concept of forest conservation in Science.

Keywords: Academic Achievement, Forest Conservation and Science E-Library Resources

Introduction

The sustainability of a nation's scientific and economic growth is on scientific knowledge, skills and attitude that must be inculcated in the learners, especially those interested in Science. Over the decades, science has undergone rapid changes and has made significant impact on human lives, and this has led to production of antibiotics and vaccines, disease-resistance crops, organ-transplant and gene manipulation (Nnachi *et al.*, 2021). Science plays key roles in industrialization and development of many sectors of the economy, such as industrial, chemical

production, biotechnology using microorganisms and enzymes to produce goods for industry, including plastics, food, agricultural, pharmaceutical products and forest conservation (Udo, 2024).

Forest conservation is the protection and preservation of forests. It includes planting and maintaining forested areas for the benefit and sustainability of future generations, preserving the forest ecosystem, including plant and animal species (Esiere *et al.*, 2023). Forest products have to be conserved to prevent destruction of the natural



ecosystem, to make medicinal materials readily available, preserve aesthetic values, provide basis for researches and for economic and tourism purposes Michael (2022). Factors such as deforestation and bush burning, have posed serious threat to the biodiversity of life in the forest threatening the safety of ecosystems. The awareness of these have to be made known to students, since they are the link between the school and their respective environments. This is to bring to consciousness the students' environment, widen their horizon and prepare them for future career in life with necessary scientific knowledge, scientific literacy skills and attitude (Nivithra and Shoba, 2021). Innovative instructional teaching resources such as science electronic library - e-books, e-journals and e-magazines could be employed to reduce the failure rate of the students.

Science electronic library resources also known as science digital library resources are scientific resources available online which can be accessed over the internet for the purpose of teaching and learning (Khan, 2021). They are electronic resources in digital publications such as websites, academic publications and videos that provide knowledge through online platforms. Science e-library resources help to reduce the burden of sourcing for live objects, prolonged time of planning, burden of over talking and restrictions from usage (Chime and Ekwueme, 2023). Eahambaram and Jeeshma (2023) asserted that one of the reasons for using digital libraries in e-learning is that it can store and manage large amounts of digital content of full text, course materials, bibliographic databases, library catalogues, image and audio clips. For successful integration, teachers and students need digital literacy skills manipulation and navigation of science e-library resources such as e-books. They can be accessed anytime and anywhere, because of its global nature. Science e-library resources are abundant in different forms such as e-books, e-magazines and e-journals.

E-book is a non-printed e-library resource for teaching and learning, easily accessed over the internet in any format deemed fit by the students. Many online books exist and freely accessed over the internet. Sari *et al.* (2022) assert that e-books make possible the presentation of online information in text format, images, animations and videos accessed by users. Lim *et al.* (2020) posited that e-books are relatively cheaper when purchased online than in physical stationary shops. They give personalized experience accounts

created for each user. Its search feature allows quick location of materials and presentation of materials aid independent learning by students to construct their own knowledge (Choudhri, 2024). E-books encourage reading comprehension, less distractions and improves fundamental skills such as digital literacy skills. Science e-library resources encompass many materials including e-journals.

E-journal is a virtual publication of intellectual writings disseminated and accessed through the internet. It is a digital version of traditional academic and professional journal. Instead of printed paper, it is published, accessed and could be read on computers, tablets, phones through websites or apps. E-journal contain scholarly articles, research papers, reviews and case studies (Jbeen *et al.*, 2021). Though e-journals appear similar to the traditional print form, they are distinct in a number of ways due to its accessibility, frequency in publication, lower cost of publication, peer reviewing and integration of multimedia contents of videos not possible in traditional paper journals (Ashikuzzaman, 2023). There are numerous electronic journals, but the ones peculiar to forest conservation in Science include; International Journal of Forestry Research, International Journal of Forest and Ecosystem, Journal of Sustainable Forestry. Science e-library resources of e-journals help students improve on their reading skills particularly e-magazines.

E-magazine is a digital publication that offer learners the opportunity to read and interact with different information specific to their interest. E-magazines enhance students' learning because of their interactivity and integration of multimedia features such as audio, videos, animations and links. They are cheaper, eco-friendly and have wider distribution for easy access to help students improve on their literacy skills in Science. E-magazines are easily updated as they offer sharing of contents and searching features to filter out needed outcomes (Jones, 2023). Several e-magazines are available on forest conservations. Some examples are; the nature conservancy and Conservation Frontline. E-magazines however may influence students' gender by shaping their views on culture, trends, and social issues of forest conservation by engaging and easily accessing digital content.

Gender is a wide range of biological, behavioural, physical and mental characteristics that differentiates the female and male population (Okeke, 2020). It involves taking on responsibilities, roles, opportunities, constraints and needs of males and

females in all aspects of social context (Lyne, 2023). It is the identifiable features of male and females whose social, cultural and moral values conform to the standards of the community they belong. However, Bayerbach and Smith (2022) found that gender has no significant difference on students' achievement. Also, Mwihia (2020) as well as Onasanya and Omosewo (2021) posited that male and female students, when presented with equal opportunities, perform on the same. These conflicting results and the inconsistency existing in literature on gender, pose a need to check if gender affects academic achievement of students.

There is continuous decline in the academic achievement of Science students in internal and external examinations on the concept of forest conservation which have been directly or indirectly linked to lack of digital skills and appropriate teaching resources. Students face several challenges in understanding and appreciating the concept of forest conservation due to poor teaching resources. Digital teaching resources such as science e-library resources of e-books, e-journals and e-magazines are rarely considered to be integrated into classroom teaching of forest conservation. This make students' knowledge narrow on forest conservation. There is paucity of forest conservation knowledge among learners, even though they are surrounded by forest. Several studies have been carried out on innovative resources used in teaching Science for improved achievement but available literature shows little utilization of science e-library resources in teaching the concept of forest conservation, particularly in secondary schools in Ibiono Ibom, Akwa Ibom State. The question therefore is, can science e-library resources effectively enhance students' academic achievement on forest conservation? Can gender have significant effect on academic achievement of Science students on forest conservation?

Research Questions

1. What are the differences among the mean achievement scores of Science students taught forest conservation using science e-library resources (e-books, e-journals and e-magazines) respectively?
2. What is the difference between the mean achievement scores of male and female Science students taught forest conservation using science e-library

resources (e-books, e-journals and e-magazines) respectively?

3. What is the interaction effects of teaching resources (e-books, e-journals and e-magazines) and gender on Science students' academic achievement on forest conservation?

Research Hypotheses

- i. There is no significant difference in mean achievement scores of Science students taught forest conservation using science e-library resources (e-books, e-journals and e-magazines).
- ii. There is no significant difference between the mean achievement scores of male and female Science students taught forest conservation using science e-library resources (e-books, e-journals and e-magazines).
- iii. There is no significant interaction effects of teaching resources (e-books, e-journals and e-magazines) and gender on Science students' academic achievement on forest conservation.

Methodology

The study design is quasi-experimental research design. Specifically, the non-randomised pretest, posttest group. The population consisted all the 2,335 Senior Secondary School Two students offering Science in all the 13 public secondary schools in Ibiono Ibom Local Government Area, Akwa Ibom State. The sample size of the study was one hundred and eighty-three (183) Senior Secondary Two students. The sample was drawn from three co-educational secondary schools using purposive sampling technique. The selected schools met the criteria of having qualified Science teachers and schools that have registered candidates for West African Senior School Certificate Examination and National Examinations Council for the past 15 years. A researcher-made instrument termed Science Achievement Test (SAT) was used for data collection. SAT was designed to measure the students' achievement on the concept of forest conservation. It consisted forty (40) multiple choice items with four (4) options A - D with only one correct answer and three distracters drawn from the concept of forest conservation. The instrument was face validated by an

experienced Science teacher with 10 years teaching experience and a Science lecturer in Science Education, University of Uyo. Kuder-Richardson 20 (KR-20) was used in determining the reliability index of the Science Achievement Test. The choice of this reliability test is due to its ability to measure a single reliability coefficient that reflects the consistency of responses across different items in the test with a reliability index of 0.82, this indicate that the reliability is good.

Experimental Procedure

The science teachers in the sampled schools were used as research assistants with students in intact classes. Each of the classes was assigned to experimental group one, two and three respectively. To qualify as research assistants, the three science teachers were trained for one-week. Well prepared lesson packages were used by the research assistants in teaching forest conservation in their respective groups for four weeks. Experimental group one, two and three were taught forest conservation using e-books, e-journal and e-magazines teaching resource

respectively. Each group was assigned a sub-topic from the e-book, e- journal and e-magazines, and used the e-book, e- journal and e-magazines to display pictures showing forest degradation versus healthy forest ecosystems to explain forest conservation. The research assistants then showed students videos on how planting and growth process of a forest over time. Thereafter, the students, watched the video from the e-book, e- journal and e-magazines. Students identified points from the e-book, e- journal and e-magazines, and the research assistant elaborates. The students were given learning tasks to watch the videos again at home and note down their observations.

The data obtained from the achievement test were analyzed using Mean, Standard Deviation and Analysis of Covariance (ANCOVA). Mean and Standard Deviation were used to answer research questions while ANCOVA was used to test the null hypotheses at 0.05 level of significance, with the decision that when the calculated P value were greater than 0.05, the null hypotheses were retained but when it was less than 0.05, the null hypotheses were rejected.

Results and Discussions

Table 1: Mean and standard deviation of students’ pre-test and post-test scores classified by treatment groups

Treatment Groups	N	Pretest		Posttest		Mean Difference Score
		X	SD	X	SD	
e-books	69	4.94	1.47	29.41	4.07	24.47
e-journals	58	5.09	1.56	27.22	4.74	22.13
e-magazines	56	4.95	1.58	22.36	4.52	17.41

Data in Table 1 shows the pretest mean achievement scores and standard deviation of Science students taught forest conservation using science e-books (4.94, 1.47), e-journals (5.09, 1.56) and e-magazines (4.95, 1.58) resources respectively. The table also shows the posttest mean achievement scores and standard deviation of Science students taught forest conservation using science e-books (29.41, 4.07), e-journals (27.22, 4.74) and e-magazines (22.36, 4.52) resources respectively. The result shows that Science students taught using e-books, e-journals and e-

magazines resources gained mean achievement scores of 24.47, 22.13 and 17.41 respectively. From this result, it can be deduced that Science students taught using e-books and e-journals resources achieved better than those taught using e-magazine resource. Therefore, there are differences among the mean achievement scores of Science students taught forest conservation using science e-library resources (e-books, e-journals and e-magazines) respectively? in favour of those taught using e-books and e-journals resources.

Hypothesis 1: There is no significant difference in mean achievement scores of Science students taught forest conservation using science e-library resources (e-books, e-journals and e-magazines).

Table 2: Summary of Analysis of Covariance (ANCOVA) of the students' posttest scores classified by treatment groups

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision at p<.05 alpha
Corrected Model	1597.287 ^a	3	532.429	27.138	0.000	S
Intercept	11802.868	1	11802.88	601.594	0.000	S
Pretest	23.721	1	23.721	1.209	0.273	NS
E-library resources	1575.704	2	787.852	40.157	0.000	S
Error	3511.861	179	19.619			
Total	134178.000	183				
Corrected Total	5109.148	182				

a. R Squared = 0.313 (Adjusted R Squared = 0.301), S= Significant at 0.05 alpha level, NS= Not significant at 0.05 alpha level

Data in Table 2 shows the summary of Analysis of Covariance (ANCOVA) of posttest achievement of Science students when taught using e-books, e-journals and e-magazines resources respectively. The calculated F-value for the main effect of resources at 2, 182 is 40.157 while its corresponding calculated level of significance is 0.000 alpha. This level of significance is less than 0.05 in which the decision is based. The null hypothesis is

rejected, hence there exist a significant difference in the mean achievement scores of Science students taught forest conservation using science e-books, e-journals and e-magazines resources. For the fact that the hypothesis was significant, further analysis was done to determine the direction of the significant difference and achievement. The result of the Scheffe post hoc test is presented in Table 2b.

Table 2b: Scheffe Post Hoc tests for Post-test classified by treatment groups

(I) e-library	(J) e-library	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
e-book	e-journal	2.148*	.790	.007	.589	3.706
	e-magazine	7.048*	.797	.000	5.476	8.620
e-journal	e-book	-2.148*	.790	.007	-3.706	-.589
	e-magazine	4.900*	.830	.000	3.261	6.539
e-magazine	e-book	-7.048*	.797	.000	-8.620	-5.476
	e-journal	-4.900*	.830	.000	-6.539	-3.261

The results show that the mean difference between e-book and e-journal was (2.148; Sig=0.007), e-book and e-magazine was (7.048; Sig=0.000) and e-journal and e-magazine was (4.900; Sig=0.000) at 0.05

alpha level. This implies that those taught forest conservations using e-books had higher achievement, followed by those taught using e-journals and those taught e-magazine had the lowest achievement.

Table 3: Mean and standard deviation of students’ pre-test and post-test scores classified by treatment groups and gender

Treatment Groups	Gender	N	Pretest		Posttest		Mean Difference Score
			X	SD	X	SD	
e-books	Male	32	4.44	1.34	27.88	3.51	23.44
	Female	37	4.51	1.46	30.73	4.11	26.22
e-journals	Male	30	5.43	1.45	28.43	4.31	23.00
	Female	28	4.71	1.61	25.93	4.91	21.22
e-magazines	Male	26	4.54	1.27	23.19	3.84	18.65
	Female	30	5.30	1.76	21.63	4.99	16.33

Data in Table 3 shows the pretest mean achievement scores and standard deviation of male and female science students taught forest conservation using science e-books (male--4.44, 1.34, female—4.51, 1.46), e-journals (male---5.43, 1.45, female---4.71, 1.61) and e-magazines (male--4.54, 1.27, female—5.30, 1.76) resources respectively. The table also shows the posttest mean achievement scores and standard deviation of male and female Science students taught forest conservation using science e-books (male—27.88, 3.51, female—30.73, 4.11), e-journals (male—28.43, 4.31, female—25.93, 4.91) and e-magazines (male—23.19, 3.84, female—21.63, 4.99) resources respectively. The results show that

female Science students gained higher mean achievement scores in Science than the male counterpart when taught using e-books (26.22, 23.44) and e-journals male Science students gained higher mean achievement scores in Science than the female counterpart (23.00 versus 21.22) respectively. The results also show that male Science students had higher mean score in achievement than the female Science students using e-magazines (18.65 versus 16.33) respectively. These results indicate that e-books favour the female students while both e-journals and e-magazines resources favour male Science students.

Table 4: Summary of Analysis of Covariance (ANCOVA) of male and female students’ post-test scores classified by treatment groups and gender with pre-test scores as covariate

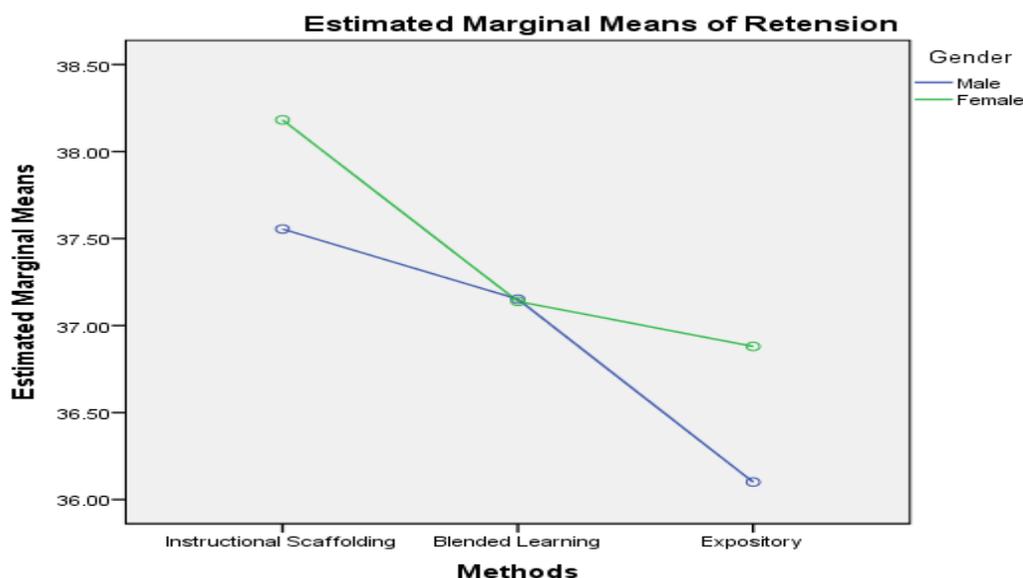
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision at p<.05 alpha
Corrected Model	1848.724 ^a	6	308.121	16.633	0.000	S
Intercept	10724.229	1	10724.229	578.902	0.000	S
Pretest	10.603	1	10.603	0.572	0.450	NS
e-library resources	1501.270	2	750.635	40.520	0.000	S
Gender	9.109	1	9.109	0.492	0.484	NS
e-library resources * Gender	247.850	2	123.925	6.690	0.002	S
Error	3260.424	176	18.525			
Total	134178.000	183				
Corrected Total	5109.148	182				

a. R Squared = 0.362 (Adjusted R Squared = 0.340), S= Significant at 0.05 alpha level, NS= Not significant at 0.05 alpha level

Data in Table 4 shows the summary of Analysis of Covariance (ANCOVA) for difference between the mean achievement scores of male and female Biology students taught forest conservation using science e-books, e-journals and e-magazines resources. The calculated F-value for the main effect of gender

($F=0.492$; $Sig=0.484$) is not statistically significant. Thus, the null hypothesis two is retained. Hence, there is no significant difference in the mean achievement scores of male and female Biology students taught forest conservation using science e-books, e-journals and e-magazines resources, respectively.

Research Question 3: What is the interaction effects of teaching resources (e-books, e-journals and e-magazines) and gender on science students’ academic achievement on forest conservation?



Covariates appearing in the model are evaluated at the following values: Potstest_Score = 40.6993

Fig 1: Plot for the interaction effects of interaction effects of teaching resources and gender on Science students’ achievement on forest conservation.

Fig 1 is the plot for the interaction effects of teaching resources and gender on Science students’ academic achievement on forest conservation. The plot shows that female Science students taught using e-book gained a higher achievement mean scores of 36.51 than their female counterparts taught using e-journal (32.05) and e-magazine (25.63). Result also shows that male Science students taught using e-book had achievement scores of 35.51 than their counterparts taught using e-journal (32.16) and e-magazine (24.00).

This indicates that both male and female Science students taught using e-journal achieved better than those taught using e-magazine. Result also shows that male and female Science students taught using e-book and e-journal achieved better than male and female counterparts taught using e-magazine. This implies no interaction effects of teaching resources (e-books, e-journals and e-magazines) respectively and gender on Science students’ achievement on forest conservation.

Table 5: Summary of ANCOVA testing the interaction effects of science e-library resources (e-books, e-journals and e-magazines) respectively and gender on Science students’ achievement on forest conservation

Source	Type III Sum of Squares	Df	Mean Square	F-value	P-value	Decision at $p < 0.05$
Corrected Model	6318.609	6	1053.101	134.290	0.000	*Not Sig
Intercept	23.397	1	23.397	2.984	0.086	
Posttest	1422.149	1	1422.149	181.350	0.000	
e-library resources	14.682	2	7.341	0.936	0.394	
Gender	8.054	1	8.054	1.027	0.313	
e-library resources * Gender	4.505	2	2.253	0.287	0.751	
Error	1144.933	176	7.842			
Total	218626.000	183				
Corrected Total	7463.542	182				

*Not Sig = Significant at $p > 0.05$

Data in Table 5 shows the summary of Analysis of Covariance (ANCOVA) for the interaction effect of teaching resources (e-books, e-journals and e-magazines) and gender on science students’ academic achievement on forest conservation. The calculated F-value for the main effect of e-library resources at 2, 182 is 0.287, while its corresponding calculated level of significance is 0.751 alpha. This level of significance is greater than 0.05 in which the decision is based. The null hypothesis is retained, hence there is no significant interaction effects of teaching resources (e-books, e-journals and e-magazines) and gender on Science students’ academic achievement on forest conservation.

Discussion of Findings

The findings on the difference in the mean academic achievement scores of Science students taught forest conservation using science e-books, e-journals and e-magazines resources indicated a significant difference. The result shows that Science students taught using e-books, e-journals and e-magazines resources gained higher mean achievement scores. This indicates that there is significant

difference in mean achievement scores of Science students taught forest conservation using science e-library resources (e-books, e-journals and e-magazines) in favour of e-books and e-journals resources. The significant difference might be due to the fact that e-books provide detailed explanations of concepts, theories, experiments and real-life applications, allowing students to fully grasp complex scientific ideas. However, e-journals present the latest peer-reviewed research, case studies and experimental results, keeping students up to date with scientific advancements, thus facilitating their understanding of the subject matter. The result is in line with the findings of Sami (2023) and Chinweuba *et al.* (2024) that there is significant difference of science students taught using e-book and those taught without e-book resource in favour of e-book resource. Carvalho and Mandrekar (2020) as well as Ugwuanyi (2022) also found that students taught with e-journals achieved significantly better than those taught without the use of e-magazines.

The findings on male and female Science students taught forest conservation using science e-books, e-journals and e-magazines resources indicated



a non-significant difference. Female Science students had higher mean achievement scores in Science than their male counterparts. Male Science students performed better than their female counterparts with regards to e-magazines. This might be due to the fact that the three teaching resources were students-friendly. The finding is in line with Bayerbach and Smith (2022) that gender has no significant difference on students' achievement. However, this study however, contrary to Onasanya and Omosewo (2021) that both male and female had no significant effect on students' achievement in sciences.

Findings on interaction effects of teaching resources (e-books, e-journals and e-magazines) showed no significant difference. From the results, female Science students taught using e-book gained a higher achievement mean scores than their female counterparts taught using e-journal and e-magazine. Result also shows that male Science students taught using e-book had achievement scores than their counterparts taught using e-journal and e-magazine. This indicates that both male and female Science students taught using e-journal achieved better than those taught using e-magazine. Result also shows that male and female Science students taught using e-book and e-journal achieved better than male and female counterparts taught using e-magazine. This implies that there was no interaction effects of teaching resources (e-books, e-journals and e-magazines) and gender on Science students' achievement on forest conservation. This implies that gender do not combine with the three teaching resources to affect the students' achievement on forest conservation. The finding of the study is in line with that of study of Bhutta *et al.* (2024) who found that there is no significant interaction effects of gender on students' achievement in Science. However, this study is contrary to the finding of Oguejiofor *et al.* (2021) that there are significant interaction effects of gender on students' achievement.

Conclusion

Based on the findings of the study, it was hereby concluded that out of the three science e-library resources investigated, science e-books and e-journals were more effective than e-magazines in facilitating students' achievement in forest conservation. Also, students' gender, had no significant influence on students' achievement. Again, the interaction effects investigated shows no significant interaction.

Recommendations

1. Students should make use of science e-books and e-journals resources in learning the concept of forest conservation to improve their academic achievement in Science.
2. Science teachers should be dynamic in imparting knowledge and skills to students so as to improve male and female students' academic achievement in Science.
3. Science teachers should deploy science e-books and e-journals resources in teaching forest conservation so as to improve students' academic achievement in Science.

References

- Ashikuzzaman, M. D. (2023). Necessity of e-Journals in Education. <https://www.lisedunetwork.com> (Retrieved on 18th March 2024).
- Bayerbach, S. K. & Smith, J. A. (2022). Computerization concept mapping in problem-solving in genetics in high school in Kansas USA. *American Journal of Educational Psychology*, 8 (4), 457–466.
- Bhutta, S. N., Ansari, A. N. & Ahmad, S. (2024). Gender disparity in students' performance of science and mathematics: Evidence from nationwide study in Pakistan. *Journal of Education and Educational, Development*, 11(1), 25-44.
- Carvalho, R. & Mandrekar, B. (2020). Impact of electronic magazines on Biology students' performance in selected secondary schools in Wamako Local Government Area of Sokoto State. *Library Philosophy and Practice E-Journal*, 2(3), 1-21.
- Chime, A. C. & Ekwueme, L. O. (2023). Postgraduate students' use of electronic resources for research output in federal university libraries in the South-East, Nigeria: Challenges and strategies for interventions. *Library Philosophy and Practice*, 2(2), 1-20.
- Chinweuba, H. N., Ugwuanyi, N. C. & Eseadi, C. (2024). The use of e-books to improve the academic performance of students in the subject of physics: Implications for counselling in Nsukka Education Zone, Nigeria. *Innoeducation International Journal*



- of Technology and Educational Innovation*, 10(1), 29-44.
- Choudhri, M. (2024). The role of electronic books in modern education. <https://kitaboo.com> (Retrieved on 10th January 2025).
- Eahambaram, C. M. & Jeeshma U. S. (2023). Impact of library electronic resources on students' retention and academic performance in physics in public universities, Lagos State, Nigeria. *International Journal of Environmental Economics, Commerce and Educational Management*, 10(8), 1-7.
- Esiere, N. E., Ndulue, N., Umeh, C. L. & Udofia, S. I. (2023). Multipurpose tree species of Akwa Ibom State and their Non-Timber Forest Products. *E-Proceedings of the Faculty of Agriculture International Conference, Akwa Ibom State, Nigeria, October 23 – 25*.
- Jbeen, A., Rehman, S. & Mahmood, K. (2021). Awareness, use and attitudes of students towards e-books: Differences based on gender, discipline and degree level. *Global Knowledge Memory Communication*, 2(4), 97-117.
- Jones, L. (2023). Collaborative learning and digital tools in higher education. *Learning and Teaching Journal*, 28(3), 78-95.
- Khan, R. (2021). Importance of digital library in Education. *International Journal of Research in Library Science*, 7(10), 102-117.
- Lim, B. C., Liu, W. L. & Choo, C. (2020). Effects of interactive science e-resources on chemistry students' academic achievement at Ajman University, Ajman. *Asian Journal of University Education*, 16(3), 1-11.
- Lyne, C. (2023). Definition, development of gender identity. <https://emedscape.com> (Retrieved on 26th June 2023).
- Michael, M. C. (2022). *Essential Biology for Senior Secondary School (5th Edition)*. Ogun, Nigeria: Tonad publishers limited, 434p.
- Mwihia, C. (2020). Gender difference in academic achievement of physics students in Kinangop Sub County, Nyandarua County, Kenya. *European Journal of Social Sciences Studies*, 5(4), 1-17.
- Nivithra, S. & Shoba, K. S. (2021). India: A study on social awareness about deforestation. *Journal Indexing and Metrics*, 50(5), 1576-1588.
- Nnachi, N. O., Ugama, J. O., Ikporo, F. B. & Ngwu, U. C. (2021). Effects of cooperative learning strategy on secondary school students' achievement and knowledge retention in Biology. *Journal of Education and Practice*, 12 (32), 59-66.
- Oguejiofor, V. Attah, E., Emeka, P., Nwadi, C., Joseph, T., Imakwu, V. & Eya, G. (2021). Influence of gender on academic achievement and retention of technical and vocational education and training students in Asaba in Delta State Nigeria. *Journal of Pharmaceutical Negative Results* 12(1), 1-20.
- Okeke, E. A. (2020). Gender difference in the understanding of some important science concepts. *Nigeria Journal of Education*, 2(1), 125-132.
- Onasanya, E. R. & Omosewo, S. O. (2021). Effects of using standard teaching resources in secondary school students' academic achievement and retention in Biology in Ilorin, Nigeria. *Journal of Education Technology*, 7(4), 18-23.
- Sami, A. (2023). Effectiveness of e-book in improving academic performance and attitudes toward mathematics from two middle schools in Abha, Saudi Arabia. *Reading and Knowledge Magazine, Egypt*, 13(3), 42-88.
- Sari, R. D., Agustini, R. & Widodo, W. (2022). The effectiveness of science e-magazine of socio-scientific issues-based inquiry model to improve critical thinking skill of junior high school students. *Studies in Learning and Teaching Journal*, 4(6), 1-22.
- Udo, A. E. (2024). Instructional scaffolding strategy and Biology students' academic performance on plastic waste management in Uyo Local Government Area, Akwa Ibom State, Nigeria. *International Journal of Education and Science Development*, 5(6), 49-69.
- Ugwuanyi, C. S. (2022). Evaluating the effectiveness of electronic journals resources on students' achievement in physics, Igbo-Eze North Local Government Area. *Library Philosophy and Practice E-Journal*, 2(3), 1-13.