Effect of Virtual Learning Strategy on Urban and Rural Students' Interest and Achievement in Difficult Concepts in Basic Science and Technology in Benue State, Nigeria.

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DOI: https://doi.org/10.51584/IJRIAS.2025.100800125

Received: 10 August 2025; Accepted: 15 August 2025; Published: 22 September 2025

ABSTRACT

The study investigated the Effect of virtual learning strategy on urban and rural students' interest and achievement in difficult concepts in Basic Science and Technology in Benue State, Nigeria. The study was guided by two specific objectives. Two research questions were asked and answered by the study. Two hypotheses were formulated and tested at 0.05 level of significance. The researcher adopted a quasi-experimental research design. The population of the study was 23,994 students and the sample size was 116 students. The study used two instruments, Basic Science and Technology Interest Rating Scale (BSTIRS) and Basic Science and Technology Achievement Test (BSTAT). The instruments were validated by five experts. Reliability coefficient of 0.67 and 0.78 was obtained for the interest rating using Cronbach Alpha formula and using Kuder-Richardson 20 formula respectively. The data obtained from the study were analyzed using mean and standard deviation to answer the research questions while ANCOVA; was used to test the hypotheses at $P<0.05$ alpha levels of significance. The findings revealed no significance difference in the mean interest ratings and achievement of students in urban and rural schools taught difficult concepts in Basic Science and Technology using virtual learning strategy. Based on the findings, the study concluded that virtual learning strategy is an effective strategy for teaching Basic Science and Technology as it helps to increase urban and rural students' interest and achievement in Basic Science and Technology. The study recommended that virtual learning strategy is an effective strategy in teaching Basic Science and Technology and therefore should be employed by the teachers of Basic Science and Technology at all levels of Basic education in both urban and rural schools.

Keywords: Virtual Learning Strategy, Urban and Rural Students, Basic Science and Technology**.**

INTRODUCTION

Every economy in the world depends heavily on the education sector for its growth. It is the cornerstone of significant international advancement. With the advent and utilization of computer software packages for instructional purposes in the classroom, scientific and technological advancements in recent years have altered educational systems across countries. Bharathy (2015) asserts that a significant paradigm change in education has been brought about by the use of computers into the classroom. In contrast to traditional lecture-based techniques, computer-assisted learning increases student autonomy by allowing them to set their own pace, go over material again, and gain a deeper comprehension of the subject. In addition to saving time throughout the learning process, this technology helps pupils focus better and comprehend particular ideas more readily.

Students can easily grasp complex ideas by using technological tools to simplify them. According to Raja and Nagasubramani (2018), virtual learning techniques can foster a more engaging learning environment and increase classroom participation. Additionally, according to Musa et al. (2021), technology can aid students in comprehending ideas, concepts, and difficult subjects by making it easier for them to absorb and retain information. As a result, ICT has emerged as a key force behind the globalization of education, impacting both the teaching and learning processes.

Scientific knowledge is important in understanding some of the day-to-day activities of human beings and is

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue VIII August 2025

strongly related to the active notion of teaching science in schools (Kavsut, 2010). Science and its applications are part of the daily activities that make life better and understandable as well as fostering critical thinking. Science education combines both theoretical and practical subjects, and as such, this subject must be presented in a creative and engaging way in order to be studied more efficiently. According to Nwagbo in Usman (2010), science is an intellectual endeavor undertaken by humans with the goal of learning more about the natural world in which we live and figuring out how to organize information for the good of humanity. Man's ability to apply scientific knowledge for progress has enhanced his capability to solve and manage challenging problems in industry, education, and health.

Building national unity, instilling national consciousness, preparing the mind to comprehend the world around us, acquiring the necessary skills, and enhancing citizens' mental, physical, and social capacities to support national development are all objectives of science education, according to the National Policy on Education (FRN, 2014). But according to Musa *et al*. (2021), science basic science and technology is a challenging subject to comprehend. According to Awal (2015), this challenge can result from a deficiency of interactive and visual learning resources. Therefore, in order to solve this issue, Basic Science and Technology were introduced in Primary and Junior Secondary Basic Education Schools.

Basic Science and Technology is a mixture of the former Integrated Science and Introductory Technology which a kid experiences at the Upper Basic level of education. It is a composite kind of science at Upper Basic level of education integrating concepts from Chemistry, Physics, Biology, Technology, Physical and Health Education, and Geography. It prepares Upper Basic students for further study in specialised core scientific courses, claim Enemarie et al. (2019). According to the Nigerian Educational Research and Development Council (NERDC) (2012), the objectives of basic science and technology are to: foster students' interest in science and technology; help them acquire fundamental knowledge and skills in the field; and help them apply these skills to meet the needs of modern society. Furthermore, the Federal Republic of Nigeria (FRN, 2014) highlights the importance of preparing pupils to thrive in the current scientific and technological period in her secondary school curriculum. As a distinct approach to scientific education, Basic scientific and Technology contains certain ideas that are challenging for pupils to comprehend on their own (Achor and Agbidye, 2014). Ivowi (1999) asked if the curriculum's content matched the pupils' cognitive capacities. According to Ncharam in Achor and Agbidye (2014), students who struggle to understand complex ideas in Basic Science and Technology perform poorly on the Junior Secondary School Certificate Examination (JSSCE) and generally lag behind in terms of scientific and technological advancement. According to Akpan (2007), a thorough comprehension of concepts in any science subject, including basic science and technology, significantly improves students' academic performance. Students may approach any topic with confidence when they have a thorough understanding of a particular concept since they have mastered the concepts that are being asked. Conversely, students who struggle to grasp specific concepts may find it difficult to learn, which may result in exam malpractice in their pursuit of academic success (Akpan, 2007). The results of the Basic Education Certificate Examinations (BECE) over the previous five years clearly demonstrate low achievement among students studying basic science and technology (BSEB, 2017). Insufficient exposure to practical activities, poor preparation, difficulty understanding questions, ineffective teaching strategies, gender insensitivity, a shortage of qualified Basic Science and Technology teachers, and the school's location have all been blamed for these failures (Balarabe, 2016). According to Mat and Yusoff (2019), the teaching strategy should take into account the inclinations, aptitudes, and capabilities of the pupils according to their age and cognitive capacity. Appropriate teaching strategies will support students in understanding the lesson, gaining information and skills, developing a strong sense of interest in the material, and achieving high levels of retention and success.

It has been discovered that interest is a very potent motivating factor that promotes learning and is necessary for academic achievement. According to Ezike in Yusuf (2011), interest is the emotion of worry or curiosity about a topic. A student's interest in any subject is essential for effective learning to occur, claims Abakpa (2011). Interest is regarded as the trait that sparks curiosity and, as a result, keeps a student's interest during a learning exercise. When a student becomes interested in a subject, and they study that subject, they will undoubtedly be satisfied with their acquired knowledge.

Many pupils have lost interest in traditional teaching and learning methods as a result of the 21st century's rising technological complexity. Innovative approaches that demand creativity and instructional programs are

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue VIII August 2025

necessary to maintain student engagement (Zaidi et al., 2018). This includes new ways of delivering lessons to make learning more interesting, boost interest, and enhance comprehension (Gulley & Jackson, 2016). Researchers' interest in using YouTube videos and other virtual platforms for teaching and learning has grown recently. Many teachers continue to use traditional, teacher-centered teaching and learning approaches despite all of these resources, which may discourage students from learning.

Teaching students the definition of science and the methods used by scientists can help them grasp scientific concepts as outlined in the Basic Science and Technology core curriculum for Upper Basic schools (FRN, 2014). This has the potential to improve pupils' comprehension and performance.

Academic achievement measures how well a student meets learning objectives and goals while being guided by the teacher (Emaikwu, 2013). It is the manifestation of the students' capacity to achieve specific goals and results from their education and experiences in the classroom. According to Atadoga and Lakpini (2013), the teacher's foundation and method of instruction are the main reasons why students consistently perform poorly academically in science courses like biology, physics, and chemistry. The author pointed out that students' interest and academic performance may not be significantly impacted by their geographic location.

The demographic region in which the school is located is another name for its location. According to the classification of the society in which the student resides, a school may be situated in an urban or rural setting, as explained by Peni in Upu (2015). High population density, tertiary institutions, and quality secondary health care facilities are characteristics of urban environments, while low population density, occasionally primary schools, and primary health care facilities are characteristics of rural environments (Daudu & Udofia, 2010). Students' academic performance in rural and urban schools differs significantly. Compared to urban schools, rural schools confront distinct challenges with regard to staffing and infrastructure, which are necessary for enhancing STEM (science, technology, engineering, and mathematics) education (Ossola, 2014). Bichi (2012) asserted that when the right teaching techniques, such as virtual learning, are used, students are more likely to become interested and perform better.

Virtual learning is the learning experience via the use of digital platforms or computers and the internet to facilitate learning beyond the traditional classroom. This could be through video conferencing, internet platform, PCs and interactive learning settings. Virtual learning has attracted substantial attention in recent years as technology continues to improve and influence the landscape of education. Basic science and technology education has historically been primarily delivered through classroom instruction. But as technology advances and internet access grows, virtual learning provides answers to the problems of teaching and comprehending difficult/complex concepts.

In contrast to traditional classroom settings, virtual learning encourages a student-centered approach and creates new opportunities for interaction. For instance, synchronous virtual learning makes it possible for students to participate in real-time lessons through platforms like Zoom or Google Meet, which supports active learning by facilitating direct communication with peers and instructors. Virtual learning also supports flexibility, student-paced learning, and improves digital literacy among students, allowing them to engage with complex topics at their own pace.

According to Zaidi *et al.* (2018), innovative instructional methods are necessary to capture students' attention. Gulley and Jackson (2016) also argued for modern teaching practices that increase students' interest and enhance their comprehension as well as their achievement. Given the variety of ways that students learn, it is imperative that teachers adopt these teaching strategies, especially in the twenty-first century. In light of this, the researchers aim to investigate the effect of virtual learning strategy on urban and rural students' interest and achievement in difficult concepts in Basic Science and Technology in Benue State, Nigeria.

Objectives of the Study

The primary aim of this research is to examine how the use of virtual learning strategies influences the interest and academic performance of students from both urban and rural settings in difficult topics within Basic Science and Technology in Benue State, Nigeria.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue VIII August 2025

Specifically, the study seeks to Investigate:

1. the difference in the mean interest scores of urban and rural students who are taught difficult concepts in Basic Science and Technology through virtual learning methods.
2. the difference in the mean achievement scores of urban and rural students who are taught difficult concepts in Basic Science and Technology through virtual learning methods.

Research Questions

This study was guided by the following research questions:

1. What is the difference in the mean interest scores of urban and rural students who are taught difficult concepts in Basic Science and Technology through virtual learning methods?
2. What is the difference in the mean achievement scores of urban and rural students who are taught difficult concepts in Basic Science and Technology through virtual learning methods?

Hypotheses

The study tested the following null hypotheses at a 0.05 level of significance:

1. There is no statistically significant difference in the mean interest scores of urban and rural students who are taught difficult concepts in Basic Science and Technology through virtual learning methods.

2. There is no statistically significant difference in the mean achievement scores of urban and rural students who are taught difficult concepts in Basic Science and Technology through virtual learning methods.

Results and Discussion

This section presents the results and discussion of findings of the study.

Research Question 1

What is the difference in the mean interest scores of urban and rural students who are taught difficult concepts in Basic Science and Technology through virtual learning methods?

Table 1: Mean and Standard Deviation of Interest Ratings of Students in Rural and Urban Schools Taught Difficult Concepts in Basic Science and Technology Using Virtual Learning Strategy.

Groups	Pre-Interest				Post-Interest		
	N	**Mean**	**Standard Deviation**	**Mean**	**N**	**Standard Deviation**	**Mean Gain**
Urban	**76**	3.03	0.31	3.53	**76**	0.12	**0.50**
Rural	**40**	3.01	0.30	3.52	**40**	0.12	**0.51**
Mean Difference		**0.02**		**0.01**			**0.01**

The data reported in Table 1, shows that the mean interest ratings of students in urban schools taught Basic Science and Technology utilizing virtual learning technique was 3.03 for pre-interest and 3.53 for the post-interest with corresponding standard deviation of 0.31 and 0.12 respectively. However, the mean interest scores of students in rural schools taught Basic Science and Technology utilizing virtual learning technique was 3.01 for the pre-interest and 3.52 for the post-interest, with standard deviation of 0.30 and 0.12 correspondingly. The mean gain for the students in the urban schools was 0.50 while the students in rural schools have a mean gain of 0.51. The group mean difference was 0.02 for pre-interest and 0.01 for post-interest whereas the interest mean gain was 0.01 in favor of the pupils in rural schools.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue VIII August 2025

Research Question 2

What is the difference in the mean achievement scores of urban and rural students who are taught difficult concepts in Basic Science and Technology through virtual learning methods?

Table 2: Mean and Standard Deviation of the Achievement Scores of Students in Urban and Rural Schools Taught Difficult Concepts in Basic Science and Technology Using Virtual Learning Strategy.

Groups	Pretest				Posttest		
	N	**Mean**	**Standard Deviation**	**Mean**	**N**	**Standard Deviation**	**Mean Gain**
Urban	**76**	21.01	2.13	27.64	**76**	3.66	**6.63**
Rural	**40**	21.45	2.26	26.23	**40**	5.91	**4.78**
Mean Difference		**0.44**		**1.41**			**1.85**

According to the result in Table 2, students in urban schools that used virtual learning to teach basic science and technology had mean accomplishment scores of 21.01 on the pre-test and 27.64 on the post-test, with corresponding standard deviations of 2.13 and 3.66, respectively. However, the pre-test and post-test mean accomplishment scores of students in rural schools that used virtual learning to teach basic science and technology were 21.45 and 26.23, respectively, with standard deviations of 2.26 and 5.91. Students in rural schools saw a mean gain of 4.78, whereas those in urban schools saw a mean gain of 6.63. The achievement mean gain was 1.85 in favour of the students in urban schools, while the group mean difference was 0.44 for the pre-test and 1.41 for the post-test.

Hypothesis 1

There is no statistically significant difference in the mean interest scores of urban and rural students who are taught difficult concepts in Basic Science and Technology through virtual learning methods.

Table 3: Summary of ANCOVA Results of the Difference in Mean Interest Ratings Students in Urban and Rural Schools Taught Difficult Concepts in Basic Science and Technology Using Virtual Learning Strategy.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	.037[a]	2	.019	.192	.825	.003
Intercept	.875	1	.875	9.042	.003	.074
PostInterest	.024	1	.024	.249	.619	.002
Group	**.012**	**1**	**.012**	**.121**	**.728**	.001
Error	10.940	113	.097			
Total	1073.962	116				
Corrected Total	10.977	115				

a. R Squared = .003 (Adjusted R Squared = -.014)

Table 3 displays the results of the Analysis of Covariance, which indicate that the P-value of 0.728 is higher than the significance level of.05 (P>0.05). This indicates that there was no significance in the test. As a result, the null hypothesis was accepted. The findings suggest that the mean interest rating of students in urban and rural schools

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue VIII August 2025

that use virtual learning to teach basic science and technology does not differ statistically significantly. This indicates that the degree of interest displayed by students exposed to the virtual learning strategy was the same in both urban and rural schools.

Hypothesis 2.

There is no statistically significant difference in the mean achievement scores of urban and rural students who are taught difficult concepts in Basic Science and Technology through virtual learning methods.

Table 4: Summary of ANCOVA Results of the Difference in Mean Achievement Scores of Students in Urban and Rural Schools taught Difficult Concepts in Basic Science and Technology Using Virtual Learning Strategy.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	142.005[a]	3	47.335	13.126	.000	.260
Intercept	243.454	1	243.454	67.512	.000	.376
Posttest	136.017	1	136.017	37.719	.000	.252
Group	**.124**	**2**	**.062**	**.017**	**.983**	.000
Error	403.883	112	3.606			
Total	52503.000	116				
Corrected Total	545.888	115				

a. R Squared = .260 (Adjusted R Squared = .240)

Table 4 displays the results of the Analysis of Covariance, which indicate that the P-value of 0.983 is higher than the significance level of.05 ($p>0.05$). This indicates that there was no significance in the test. As a result, the null hypothesis was accepted. The findings suggest that the mean accomplishment scores of students in urban and rural schools that use virtual learning strategies to teach basic science and technology do not differ statistically significantly. This indicates that after being exposed to the virtual learning technique, kids in urban schools did not outperform those in rural schools.

Summary of Major Findings

Based on the analysis of data from the study, the following findings were made:

1. There is no statistically significance difference in the mean interest ratings of students in rural and urban schools taught difficult concepts in Basic Science and Technology using virtual learning strategy.
2. There is no statistically significance difference in the mean achievement scores of students in rural and urban schools taught difficult concepts in Basic Science and Technology using virtual learning strategy.

DISCUSSION OF FINDINGS

There is no statistically significant difference between the mean interest ratings of students in rural and urban schools who are taught challenging ideas in basic science and technology using virtual learning strategies, according to the data in hypothesis one table 3. The results of this study are consistent with those of Bello (2020), who discovered no statistically significant difference between the interest ratings of upper basic science students taught using e-learning facilities in rural and urban areas. However, this study's results run counter to those of Ahmed and Odewumi (2020), who discovered a statistically significant difference between rural and urban students' attention levels in relation to the influence of visual learning technologies. Notably, the experiment focused on difficult concepts in Basic Science and Technology and Basic 8 students (Upper Basic 2), which is why the current findings conflict with others.

There is no statistically significant difference between the mean achievement scores of students in rural and urban schools who are taught challenging topics in basic science and technology using virtual learning strategies, according to the findings in hypothesis two table 4. The results of this study are consistent with those of Bello (2020), who discovered that, on average, the academic performance of students taught Basic Science in rural and urban areas using e-learning resources was equal. The results of this study go counter to those of Ahmed and Odewumi (2020), who discovered a statistically significant difference between rural and urban students' achievement scores regarding the influence of visual learning aids on academic performance. Because the effort focused on challenging ideas in Basic Science and Technology, the current findings were notably different.

CONCLUSION

According to the study's findings, students' interest in and academic achievement in basic science and technology are greatly increased when virtual learning strategy is used. Students in both urban and rural environments benefit from this teaching strategy.

RECOMMENDATION

The study's conclusions lead to the following recommendation: Basic science and technology teachers at all basic education levels, regardless of where their schools are located, should embrace virtual learning strategies as a practical and effective way to deliver instruction and raise student achievement and engagement.

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ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue VIII August 2025

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