

Un-Immersive Virtual Reality As A Veritable Approach To Reducing The Disparity Between Rural And Urban College Students In The Covid-19 And Post-Covid-19 Era

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Abstract

This experimental study sampled 347 students from nine urban (212 students) and nine rural (135 students) secondary schools, grouped into three and taught in; conventional classrooms, virtual reality or blended learning methods respectively. A modified Interest Scale with an alpha coefficient of 0.79 was used for data collection. It took three months to complete the study, with strict observation of COVID-19 protocols. A total of 341 students completed this study. Six subjects were discarded for missing some treatments either during or post COVID 19 period. The data were analyzed using Analyses of Covariance (ANCOVA). The pre-experimental test confirmed that urban school students showed higher educational interests than rural school students did. This was the same in all groups. The post-test found that students in all groups indicated an increased mean educational interest after teaching. The mean educational interest of the students in the blended learning group increased the most, while the interest of students in the conventional group increased the least. There was no within-group gender significant difference in the mean educational interest of students taught in virtual reality and blended learning, but there was a significant gender difference in the mean educational interest of students taught in the conventional classroom. Therefore, Blended Learning could bridge the gap between the interests of rural and urban students.

Keywords: urban, rural, conventional classroom, virtual reality, blended learning, educational interest.

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I. Introduction

Education is a reliable tool for the viable growth of any nation. Education engenders skills improvement, modifies behaviour, enables upward socioeconomic mobility and serves as a pathway to escaping poverty. Education improves life, stimulates social tranquillity, increases self-worth, encourages confidence and impels both individual and national viable social and economic progress. No nation can achieve economic, social, political and cultural prosperity without a sound and functional educational system. Investing in an evenhanded education is, therefore, essential to developing a skilled workforce for the future and improving economic growth (United Nations Global Impact, 2018). The ultimate aim of any relevant educational system should be to equip its recipients with the numeracy, literacy and wider skills required to realize their potential and develop abilities which their countries need to generate jobs, innovation and fiscal growth.

For education to positively transform life and society, it has to be efficient. Education is considered efficient when it is satisfactory in terms of access, quality and relevance. UNESCO (2019) emphasised that education is a lifetime fundamental human right, and that access must be matched by quality. UNICEF (2020) asserted that all children, irrespective of their location, circumstances and background, have the right to quality education. Every nation is expected to ensure inclusive and equitable quality education and promote life-long learning opportunities for all (United Nations, 2019). Therefore, governments, organisations and educational authorities are expected to deliberately and meticulously contribute to the development of methodologies needed to produce data for monitoring the targets of the Education 2030 agenda as specified in SDG 4 (Osborn, et al, 2015; United Nations, 2019). Consequently, educators should be equipped and supported to manipulate educational settings to bring about optimal conditions for an effective, relevant and all-inclusive learning experience.

Despite efforts by different organisations to increase access to quality education and improve school enrollment at all levels, it seems equal education for all was not achieved. United Nations (2018) stated the increase in the number of children globally did not translate to a proportionately higher school enrollment and the majority of those who were privileged to attend any form of school did not learn effectively. Without urgent attention to addressing inequalities in enrolment and quality of learning, more than 1.5 billion adults might not acquire any form of education beyond the basic level in 2030 (United Nations, 2019). UNESCO (2020) warned that about 260 million children of school age were not enrolled in any form of education in the 2018 school year. The breakdown showed that 59 million children of primary school age, 62 million junior high school age and 138 million of senior high school age were not in any form of school. This indicates that the rate of dropout increased along the school levels. In 2016, about 250 million children and young people were not in school, and another 330 million among those in school did not learn due to poor learning environments (United Nations, 2019). UNESCO, (2019) found that more than half of all children and adolescents worldwide did not meet basic skills in reading, mathematics and technology, with schools in urban areas differing significantly from schools located in rural areas (Husain, 2017).

While urban and rural schools face similar challenges in education globally, the University of West Alabama (2019) observed that rural schools often are hit harder, requiring more imaginative solutions than their urban counterparts. Studies found that students of urban schools were more interested in education than students of rural schools in America (Duarte, et al, 2011), Asia (Zhang, et al, 2015), Africa (Chakanika, et al, 2012; International Labour Organization 2016; Lindsjö, 2018; Litheko, 2012; Zhang, 2006), Oceania (Sullivan, et al, 2018), and Europe (Echazarra & Radinger, 2019), although at different levels. This problem was found among higher institutions (Faisal, Shinwari & Mateen, 2016), secondary schools (Ajai, & Imoko, 2013, McCracken & Barcinas, 1991) and primary schools (Lindsjö, 2018). As a result, the rate of school dropout is higher in rural schools than in urban schools (UNESCO, 2019). Yet, rural schools are often overlooked by researchers and policy analysts (Public Schools First, 2021 January, 12).

Africa has the greatest number of students who did not meet the minimum proficiency standard in education and greater effects of disparity between urban and rural schools on growth (Chakanika, et al, 2012). Watkins, (2013, January 16) lamented that one in three African children were still out of school in rural African communities. Inoue, et al (2015) reported that about 89 million school-age children in Africa were out of school. For every two children who attend school in the African rural setting, one will drop out before graduating (UNESCO Institute for Statistics, 2019). Africa has the world's lowest secondary school rates of enrollment, as only 28% of children get enrolled in secondary school (Inoue, et al, 2015). Researchers estimated that about 61 million African children may attend teenage years deficient in most rudimentary knowledge and numeracy abilities and although learning levels among children who are in school are abysmal, Africa's education ineptitude rarely appeared in the media headings or summit agenda and analysis (Mohamud, 2022; Watkins, 2013, January 16).

Most out-of-school children in Africa were found to live in rural areas. However, it was lamented that only 7 out of 10 children who live in rural areas may never set foot in a school (Hazzard, 2017 July, 21). It was not certain that rural African children who were in school had access to quality education, and the gulf in educational opportunities separating Africa from the rest of the world seems to be consistently widening. It is not just about enrollment, it is also about interest and learning. The United Nations (2018) reported that about 54 % of the entire African population lives in rural areas. Therefore, failure to tackle this learning deficit in Africa may deprive a generation of an opportunity to develop their potential and escape unemployment and poverty and undermine the prospect for dynamic growth with shared prosperity (Fleet, et al, 2012 September 17; Lawson, et al (eds) 2020; World Bank 2022).

Of all African regions, Sub-Saharan Africa has the highest rate of educational exclusion in the world, with over one-fifth of children between the ages of about 6 and 11, one-third of youth between the ages of about 12 and 14, and almost 60% of young Africans between the ages of about 15 and 17 who were out of school (UNESCO, 2019). Nigeria remains the most populated country in Africa, therefore, a large percentage of this figure lives in Nigeria (Ajai, & Imoko, 2013; Alokun & Arijesuyo, 2013; Oyeromi, et al, 2018; Uzobo, et al, 2014). United Nations, (2019) cautioned that if out-of-school trends continue, by 2030 over three-quarters of a billion young people in low- and middle-income countries, such as Nigeria will not be on track to acquire basic secondary-level skills. The World Bank (2023) predicted that Sub-Saharan Africa may suffer a deceleration of economic growth – from 3.6% in 2022 to 2.5% before the end of 2023.

In 2009, about 5 million children dropped out of school in Nigeria within the year 2008. Nigeria since 2009, maintained the largest number of children in the world who were not been educated, with approximately 20% of the total out-of-school children population in the world (Global Partnership for Education, 2020). Adedigba, (2019) reported that only 61% of 6 to 17-year-olds regularly attended any form of school in Nigeria. Aliogo (2018) regretted that about 60 million Nigerian children of school age neither could read nor write. Consequently, about 50.8 % of Nigerian children, between the ages of five and seventeen years, were involved

in child labour (National Bureau of Statistics, 2018). National Bureau of Statistics, (2019) lamented that these educationally deprived children aimlessly roamed about and increased incidences of crime and restiveness, as regularly witnessed in Nigeria. Metz and Burdina (2016) found that most insecurity and crime originated from educationally disadvantaged communities. Chamberlain and Boggess (2016) confirmed that crime is much more prevalent in poor inner-city, uneducated neighbourhoods than in better-off suburbs. Most of the conflicts and collective violent behaviours may be shreds of evidence of dissatisfaction from the poor, uneducated and unemployed. Aliogo (2016) was alarmed that the over 13.2 million children roaming around the streets across Nigeria were potential recruits for terrorism, kidnapping and other social menaces. It is easier for the Boko Haram terrorists, bandits, armed robbers, cultists, criminal-minded politicians and kidnapers to recruit the uneducated, unskilled and jobless youths than those who are educated and gainfully employed. The security and stability of any nation seem to hinge, to a large extent, on its ability to provide functional education to its citizens. Nigeria has about 47 % of its population residing in rural areas (theglobaleconomy.com, 2022; FGN, 2022). This portends that actions towards improving gender-fair education and educational interest among students in rural areas will be effective in reducing school drop-out, illiteracy and its attendant unemployment, poverty, low self-esteem, rural-urban migration and attendant crime as well as national insecurity rates.

One form of improving education is to create a situation which arouses the interest of the young people. Weir, et al, (2015) reiterated that students' interest was lower in rural communities, especially among females. This may have resulted from the poor condition of school facilities and teaching approaches in rural communities (University of West Sydney, 2013). The rate of illiteracy in Nigeria is higher in rural areas than the urban areas. Promoting rural schooling and gender-fair education must go beyond deficit approaches to finding causes and effects (ILO, 2016). It must involve the determination of tools and approaches for arousing and maintaining students' educational interests. Researchers found that interest powerfully influences academic and professional choices and success (Harackiewicz & Hulleman, 2012). Dimovski, (2021 January, 5) argued that educational interest is a major determinant of students' school enrollment and academic progress. Chen, Toh, and Ismail, (2005) and Duruji, et al, (2014) in separate studies, opined that settings espoused for instruction could affect the disposition of learners, either to remain in school or discontinue.

Although governments and non-governmental bodies made efforts to reduce out-of-school children in Nigeria, the emergence of the novel coronavirus (COVID-19) has disrupted learning and challenged lives, especially the most vulnerable and marginalized cultures, such as the rural dwellers (UNESCO, 2020). Schools were closed down in many countries of the world and educational interest waned due to the pandemic. It was feared that school closure would lead to increasing school drop-out rates in rural communities, which would disproportionately affect adolescent girls, further entrench location and gender gaps in education, and lead to increased risk of sexual exploitation, forced marriages and crime (Giannini & Anne-Birgitte, 2020 March, 31). It was feared that getting children back to school following long-term school closures which resulted from the COVID-19 pandemic would be difficult (Selbervik, 2020). The COVID-19 pandemic has widened the academic gender divide and diminished the interest of the less privileged, such as rural dwellers (Duncanson, et al, 2020). After COVID-19 school closures, so many school children in the rural areas were likely to lose interest and no longer return to school, because they would prefer to help their parents cultivate so they can eat. (Human Rights 2020, April, 29). Save the Children group reported that about 10 million children may lose interest and never go back to school after COVID-19 shutdowns, especially among females and rural dwellers (Bellis, 2020, July, 13). With Nigeria already behind in preparing young people for the workplace of the present and future (UNICEF, 2015; World Economic Forum, 2020), the effects of the pandemic would exacerbate unemployment, poverty, rural-urban migration and crime, if students' educational interest is not adequately aroused. This situation calls for a revolutionized teaching and learning approach capable of closing students' educational interest gap. Reforms in teaching and learning during the pandemic and post-pandemic would be an effective way to bridge the gap in educational inequality, increase youth employability, reduce poverty and trim down the rate of crime.

Studies have suggested many forms of increasing students' interest and achievement. Asiegbu, et al, (2015) suggested reforms in educational facilities, content and manpower, to increase educational interest in response geared towards meeting the growing needs of Nigeria. Other researchers suggested that reforms in the study environment: academic staff, learning facilities and management will increase the educational interest of students in rural communities (Adelabu, 2008; Amorighoye, 2020 June, 2; Aramide, Leif & Shannon, 2010; Nworgu, Christian & Nworgu, 2013; Serumu, 2015). The joint report of IIEP, the Association for the Development of Education in Africa (ADEA) and FAO indicated that training more teachers will not solve the educational problem in rural areas (FAO/IIEP/ADEA, 2006). Improving classroom conditions was recommended as an effective way of encouraging school enrollment and retention (Jaiyesimi, 2016; Onele, 2014; UNESCO Institute for Statistics, 2019). All these point to the need for a change in the teaching and learning process. Sheridan, et al (2017) recommended technology as a way of motivating educational interest in rural dwellers. Technology has been used to arouse students' educational interest in many areas. Technology is

a fundamental driver of educational innovations and helps to create unbiased, self-motivated, quality and sustainable learner-centred educational systems that are appropriate for the 21st century. Rapid advances in technology are revolutionising how effective teaching and learning are conceptualised, designed, and implemented in education. One form of technology that has been used for teaching and learning is information and communication technology.

In line with this, Nigeria considered uploading context-appropriate strategies and content for continuous learning that would allow pupils, teachers, and schools to utilize flexible and remote/home-based learning, which may include homework assignments, reading material, Radio, television, online content, and internet-based learning, as an approach to increasing students' educational interest and bridging gender and location gaps. UNESCO (2020) warned that such a transition to distance learning tends to be messy and frustrating, breeding confusion, corruption and a rise in the school dropout rate of students. Amorighoye, (2020 June, 2) observed that children in rural and underserved communities in Nigeria were left behind as they were not equipped to adapt or transition to new methods of learning, thereby further widening the gap of educational inequality. Lack of access to radios, television, computers, the internet, and data left many students unable to engage in remote learning (Human Rights Watch, 2020) This means many children could not follow the curriculum online during and after the coronavirus crisis. Amorighoye (2020) lamented that those students who could not keep up with their peers because of inaccessibility to digital tools lost educational interest and dropped out of school thereby broadening the educational gap long after the pandemic is over.

Some experts have used conventional face-to-face classroom teaching methods to improve student's educational interest (Chatfield, 2014). Jeffrey, et al, (2014) found that teachers put much more pedagogical effort into developing and using classroom engagement strategies than online platforms. On the other hand, digital educational technologies such as virtual reality have been used effectively in engaging students and reducing gender gaps (Ogbuanya & Onele, 2018). Virtual reality is defined as a computer-simulated (sometimes game-based) educational setting which looks like the actual object and permits students to interface with the learning resources and network with both their instructors and other students. In virtual reality, individuals are enabled to manipulate computer-generated elements in the setting and play with imaginary or simulated mechanisms and apparatuses. Virtual reality has been found to present equal learning potential to all, irrespective of one's location and gender (Ogbuanya & Onele, 2018; Onele, 2023). This may be because so many young people are inclined to computers and mobile phones. Hu-Au and Lee, (2017) accentuated that the school-age population has a renewed interest in computer-based educational platforms, irrespective of their backgrounds and gender. Research reported about 92% of young people are actively involved in online and virtual activities daily, playing games, live streaming and sharing memorable experiences, and fleeting moments on Snapchat, or posting pictures of thrilling day-to-day incidents on Instagram (Wadhwa, 2016). Learners may be inclined more to simulated environments owing to their increased level of engagement, participation, and sense of immersion as against the regular conventional paper and pencil-based workshop guide scenery (Ren, et al, 2015).

Yet, others have used a combination of methods called blended learning to improve teaching and learning, for improved educational interest (UNESCO, 2017). Blended learning refers to some combination of on-campus class meetings and online activities (McGee & Reis, 2012). It is the hybrid model which includes online learning and the traditional method. Blended learning involves a strategic and systematic approach to combining times and modes of learning, integrating the best aspects of face-to-face and digital interactions for each discipline, using appropriate ICTs (University of West Sydney, 2013). Although many studies have been carried out on the effectiveness of blended learning, literature appears not to be readily available in a blend of the conventional face-to-face classroom and virtual reality. Therefore, the educational strategies covered in this study do not seem to have been compared in any other available study to ascertain the level of effectiveness in reducing the disparity in educational interest between male and female students or rural and urban dwellers.

II. Objectives of the Study

Urban and rural communities face similar challenges in education, but rural areas often highly affected, neglected and require more imaginative solutions. Therefore, the objectives of this study were to find a suitable study environment to improve the educational interest of college students by determining the positive impact of;

1. conventional classroom environment on the educational interest of rural and urban college students
2. virtual reality environment on the educational interest of rural and urban college students
3. blended learning on the educational interest of rural and urban college students
4. interaction between gender and study environment on the interest of college students

Research Hypotheses

1. A conventional classroom environment will have no significant positive effect on the interest of college students.

2. The virtual reality study environment will have no significant positive effect on the interest of college students.
3. A blended learning environment will have no significant positive effect on the interest of college students.
4. Interaction between gender and study environment will have no significant positive effect on the interest of college students.

III. Methodology

This study adopted a pre-test post-test quasi-experimental design. A sample size of 347 students from 18 schools was used for this study. The sample comprised nine urban and nine rural schools, consisting of 135 and 212 students respectively. Only the public secondary schools were sampled. The sample was categorized into three groups made up of 3 rural and urban secondary schools respectively. Group one had 121 students (rural=34 and urban=81); group two had 109 students (rural=37 and urban=72); and group three comprised 117 students (rural=41 and urban=76). The sample was made up of 149 female students and 198 male students. The updated Interest Scale adopted from Fredrick, Blumenfeld, et al, (2005) was used for data collection. The Interest Scale is a 28-item instrument, which was arranged in a five-point Likert scale for measuring educational interest and has an alpha coefficient of 0.90. This study was carried out in three months (from September to November 2021). The first day was used to administer the interest scale (pre-test), nine days were used to train the 16 paid assistants on how to use the Electric VLab software program and COVID-19 protocol, one week was used to train the respondents (students), two months were used for teaching, and the remaining one week was used for data collection (post-test). The same procedure was carried out after the COVID-19 period (5th April to 4th July, 2022). All the students were taught basic components and symbols as contained in basic technology, which is a compulsory subject for students in all Nigerian secondary schools (UBEC 2004; Gabriel, 2012). Each class met from 9 am to 10 am on Thursdays and the lesson covered 115 components, their symbols and uses. The conventional group (1) was taught by the conventional classroom method with the teacher explaining the lesson using illustrations on the chalkboard. The virtual environment group (2) studied on their own with minimum guidance using desktop virtual reality with a teacher moving about the class without interfering with their studies. The blended learning group (3) was taught by the combination of desktop virtual reality and the conventional classroom method. The students were guided in their study with desktop virtual reality and further illustrations were made on the chalkboard to buttress each point. Intact classes were used; therefore, there was no randomization. All of the groups comprised students from three urban and three rural secondary schools. A lesson plan was developed to guide each lesson for all three groups. The classroom condition was made to be the same in all the schools studied. The researchers ensured that all participants were subjected to the same physical experimental conditions. At the end of six weeks of teaching, the same interest scale was re-administered to the students. A total of 341 students completed this study. Six students missed some treatments and were not used for data analysis. The data were analyzed with the use of Analyses of Covariance (ANCOVA). ANCOVA can reduce the initial differences between groups, due to the lack of randomization, and makes compensating adjustments to the data (Ganyaupfu, 2013).

IV. Results

The preliminary analysis between the COVID-19 and post COVID-19 periods showed no significance difference. Therefore, the two results were combined and presented below

Estimates				
Dependent Variable: Students' Pre Interest				
Different Groups	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Rural conventional group	1.500	.152	1.200	1.800
Urban conventional group	2.155	.096	1.966	2.344
Rural VR Group	1.621	.143	1.339	1.904
Urban VR group	2.125	.127	1.876	2.374
Rural blended learning group	1.563	.191	1.187	1.938
Urban blended learning group	2.045	.105	1.839	2.252

Table 1: Descriptive Statistics of Students' Interest Pretest Result

The descriptive statistics of the pre-test presented in Table 1 show that the mean educational interest of students in the rural conventional group, before the intervention, was 1.50, the mean educational interest of students in the urban conventional group was 2.16 and the mean educational interest of students in rural VR

group was 1.62. Moreover, the mean educational interest of students in the urban VR group was 2.16, the mean educational interest of students in the rural blended learning group was 1.56 and the mean interest of the urban blended learning group was 2.05. The result connoted that students in secondary schools located in urban areas have a higher educational interest than those in schools located in rural areas.

Table 2: Descriptive Statistics Post-Test Result of Students' Interest

Descriptive Statistics				
Dependent Variable: Students' Post Interest				
Different Groups	Gender	Mean	Std. Deviation	N
Rural conventional group	Rural Female Students	1.8000	.44721	11
	Rural Male Students	2.6400	.56862	23
	Total	2.5000	.62972	34
Urban conventional group	Urban Female Students	2.7143	.61125	37
	Urban Male Students	3.4048	.58683	44
	Total	3.2321	.66033	81
Rural VR Group	Rural Female Students	4.3333	.51640	15
	Rural Male Students	3.5909	.50324	22
	Total	3.7500	.58531	37
Urban VR Group	Urban Female Students	3.8571	.69007	35
	Urban Male Students	3.7273	.62370	37
	Total	3.7451	.62748	72
Rural blended learning group	Rural Female Students	4.3333	.57735	16
	Rural Male Students	4.4167	.50361	25
	Total	4.4074	.50071	41
Urban blended learning group	Urban Female Students	4.3636	.50452	32
	Urban Male Students	4.4091	.54210	44
	Total	4.4000	.53055	76
Total	Rural Female Students	3.4286	1.34246	42
	Rural Male Students	3.5352	.90760	69
	Urban Female Students	3.5313	.94985	106
	Urban Male Students	3.8538	.71649	124
	Total	3.6964	.86067	341

The descriptive statistics of the post-test presented in Table 2 show that the mean educational interest of students in the rural conventional group increased from 1.50 to 2.50, the mean educational interest of students in the urban conventional group increased from 2.16 to 3.23 and the mean educational interest of students in rural VR group increased from 1.62 to 3.75. Moreover, the mean educational interest of students in the urban VR group increased from 2.16 to 3.75, that of students in the rural blended learning group increased from 1.56 to 4.41 and the urban blended learning group increased from 2.05 to 4.40. This showed that the mean educational interest of the students in the blended learning group increased the most while that of students in the conventional group increased the least.

Table 3:

Analysis of Covariance Table for the Test of Significant Difference in the Mean Effect of Un-immersive Virtual Reality for Reducing the Disparity between Rural and Urban College Students.

Tests of Between-Subjects Effects								
Dependent Variable: Students' Post Interest								
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^b
Corrected Model	106.973 ^a	12	8.914	27.719	.000	.587	332.629	1.000
Intercept	277.438	1	277.438	862.687	.000	.787	862.687	1.000
Interest1	.200	1	.200	.622	.431	.003	.622	.123
Grp	73.355	4	18.339	57.024	.000	.494	228.097	1.000
Gen	.908	2	.454	1.412	.246	.012	2.824	.301
Grp * Gen	8.818	4	2.204	6.855	.000	.105	27.418	.993
Error	75.254	328	.322					

Total	3557.000	341					
Corrected Total	182.227	240					

Table 3 points out that the calculated F-value for different groups is 57.024. This is much greater than the statistical table value at 0.05 level of significance and degree of freedom 4 and 328. Furthermore, the calculated p-value of 0.000 is less than 0.05. All these indicated that there was a significant difference in the interest of secondary school students who were taught in the conventional classroom setting, those who were taught with desktop virtual reality and those taught with the blended learning method. Therefore, the null hypothesis of no significant difference in the educational interest of students who were taught with the conventional method, virtual reality and those taught with blended learning was rejected. The result also indicated a partial eta squared of 0.494. This showed the high effects of the intervention on the learning interest of electrical installation students in secondary schools.

Gender gave a calculated F-value of 1.412. This is lower than the table value at a 0.05 level of significance and a degree of freedom 2 and 328. Also, the calculated p-value for gender was 246, which is greater than the table p-value of 0.05. All these show that there was no gender-significant difference in the overall mean post-educational interest of secondary school students. Therefore, the null hypothesis of no significant effect of gender on the interest of students of secondary schools was upheld. Also, the partial eta squared of 0.012 indicates no effect. Furthermore, the interaction of gender and educational setting yielded a calculated F-value of 6.855, which is higher than the table value at 4 and 328 degrees of freedom and a p-value of 0.000, which is lower than the level of significance. Therefore, the null hypothesis of no significant interaction effect between study environment and gender in the educational interest of students who were taught with the conventional method, virtual reality and those taught with blended learning was rejected. There was a Partial Eta Squared of 0.105. This indicated a moderate effect.

Students' Post Interest					
Duncan ^{b,c}					
Different Groups	N	Subset			
		1	2	3	4
Rural conventional group	34	2.5000			
Urban conventional group	81		3.2321		
Rural VR Group	37			3.7500	
Urban VR Group	72			3.7451	
Rural blended learning group	41				4.4074
Urban blended learning group	76				4.4000
Sig.		1.000	1.000	.970	.955

Table: 4

The post-hoc result in Table 4 shows that there was a significant difference in the mean educational interest of college students in the blended learning group, virtual reality group and conventional learning group. However, there was no significant difference in the mean educational interest between rural and urban students in the blended learning group. There was also no significant difference between the mean educational interest of rural and urban college students of the virtual reality study group. However, there was a significant difference between the mean educational interest of rural and urban college students in the conventional study group.

Findings from the Study

The following findings emerged from the study:

The first is that there was no significant mean difference between the methods of reducing the disparity between rural and urban college students in the covid-19 and post-covid-19 era. The pre-experimental test showed that students in secondary schools located in urban areas have a higher educational interest than those in schools located in rural areas. This was the same in all groups.

The post-test found that students in all groups indicated an increased mean educational interest due to teaching. The mean educational interest of the students in the blended learning group increased the most while that of students in the conventional group increased the least.

There was a significant difference in the mean academic interest in conventional, virtual reality and blended learning groups.

After experiments, there was no within-group gender significant difference in the mean educational interest of students who were taught in virtual reality and blended learning, but there was a significant gender difference in the mean educational interest of students taught in a conventional classroom.

There was a significant difference in the interest of students of schools who were taught in the conventional classroom setting, those who were taught with desktop virtual reality and those taught with the

blended learning method.

There was no significant difference between the mean academic interest of rural and urban students in virtual reality and blended learning groups. However, there was a significant difference between the academic interest of rural and urban students who were taught with the conventional method

V. Discussion of Findings

The pre-test established that students of urban secondary schools indicated higher educational interest than those in schools located in rural areas. This was in agreement with Hussain (2017) who stated that interests and achievements in urban schools differed significantly from schools located in rural areas.

The post-test findings indicated that the educational interest of students was increased by each of the three approaches to teaching. The study further revealed significant effects of different educational environments as shown by the values of partial eta squared in each situation. The values of partial eta squared ranged between 0.6-0.19. Anglim (2011), asserted that 0.01=small effect, 0.06=medium effect, and 0.1=large effect. Lenhard and Lenhard (2016) concluded that <0=adverse effect, 0.003=no effect, 0.039=small effect, 0.110=intermediate effect, and 0.140 and above=large effect. This could mean that every form of teaching affects educational interest. However, the direction and extent of effect an approach to teaching and learning has on educational interest is a measure of its effectiveness. This agrees with Chen, Toh, and Ismail, (2005) and Duruji, et al, (2014) that methods adopted for teaching could affect the educational interest and achievement of learners. Jiang and Potter, (1994) emphasised that students' interest depends on the adopted method of teaching. Some may lead to low levels of student engagement and result in low academic interest (Hall, et al, 2012). The purpose of this study was to identify an efficient approach that can equally increase the educational interest of students, irrespective of gender and location of schools.

Students taught in traditional classrooms recorded the lowest educational interest, with a significant difference between students of rural and urban schools. There was also a significant difference between the educational interests of male students and their female counterparts. The students taught in a desktop virtual environment indicated a higher educational interest and there was no significant difference between the mean interest of students in rural and urban schools. This higher interest implies that virtual reality is an educational tool that could enhance learning more than the conventional classroom method. This finding agrees with the work of Gannon, (2014), who advocated that virtual reality can increase students' interest and participation in educational activities. The result was also consistent with the findings of Berger, et al, (1994), Chang, and Barufaldi, (1999), Yang and Heh (2007), Lee, et al, (2009) and Moazami, et al, (2014), that those experiments which involve hands-on and minds-on activities and in which students could actively be involved in the learning process can be enhanced by computer-assisted learning, such as virtual reality. Although some research findings, such as Crosier, Cobb, and Wilson, (2000); Snyder, et al, (2011) and Chatfield (2014), showed no significant advantage of using virtual reality-based learning on students' achievement and academic interest, this variance could result from the level of equipment in the areas where these studies were carried out. Some physical laboratories in developed countries where some of those studies were carried out were equipped with all the needed facilities. In such cases, virtual reality may not be more effective than the traditional setting. Rural schools in Nigeria lacked educational facilities that could engender optimum laboratory practice (Hussain, 2017; Amorighoye, 2020 June, 2).

Students who were taught using the blended learning method indicated the highest academic interest. There was no significant difference in the mean academic interest of rural and urban school students who were taught using the blended learning method. This is in agreement with UNESCO, (2017), that blended learning is effective in improving educational interest, irrespective of one's gender or location. This suggests that virtual reality can be more effective when it is carefully combined with the conventional classroom method of teaching. Peter and William (1999) stated that whether to build accurate representations of reality or create consensual meanings in social activities, or personally coherent models of realities, the experience is still paramount. However, the experience would be effective if the facilities available for teaching and learning were enough to bring about the desired educational goal. Therefore, an unconventional way of providing effective instruction within the school system, such as virtual reality technology will become more effective when combined with an effective conventional classroom.

The study also revealed that there was a significant difference between the mean educational interests of female and male students in the conventional classroom method. However, there was no significant difference between the mean educational interests of female and male students in the virtual reality group and blended learning group. Barnea & Dori, (1999) and Onele, (2023) also found no gender differences in teaching and learning in the virtual environment, the researchers did not compare two or more teaching environments, they compared teaching methods in virtual reality. Bryan and Volchenkova (2016) observed that blended learning had the potential to bridge space, and time, and individualise learning. Although Choi and Gennaro, (1987) established that male students indicated higher interest than their female counterparts in virtual reality,

the teaching method was found to be responsible for the difference (Onele, 2023). Also, time lapse may have affected their findings as teens are more interested in computer-based programmes now than when their research was conducted. Therefore, the teaching approach in virtual reality may encourage or discourage gender equality in the academic interest of students.

VI. Summary of Discussions of Findings

This study has found that blended learning (a combination of virtual reality and conventional classroom methods) boosted the academic interest of both rural and urban students in secondary schools. This finding suggests that virtual reality could be gender unbiased when rightly applied to teaching and learning. This suggests that the blended learning method appeals equally to both male and female students in secondary schools. Although virtual reality alone showed gender-unbiased achievement and produced high academic interest in students, (Onele, 2023), the method is not as effective as the blended learning approach. This result conjectures that male and female students in both rural and urban schools will achieve equally high when the blended learning method is used for teaching and learning. Therefore, blended learning can increase academic interest, thereby reducing incidences of dropout among students and the educational imbalance between urban and rural school students.

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