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**Perception of Biology Teachers and Students on the Use of Virtual Reality to Improve
Teaching and Learning in Senior Secondary Schools in Lagos State, Nigeria**

by

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Abstract

It has been observed that the use of virtual reality can develop learner's ability skills, also serve as a medium for education that contribute to the learning efficiency of student which impacts positively learners. The purpose of this research work is to examine the perception of Biology teachers and students on the use of virtual reality to improve teaching and learning in Senior Secondary School in Lagos –State. Three (3) research questions guided the study. The survey research design was used to study the perception of Biology teachers and students on the use of virtual reality to improve teaching and learning in senior secondary school in Lagos – state. This was done using five (5) Senior Secondary School in Somolu and Bariga Local Council Development Area in Education District II, Lagos – state. The population comprises of all Biology teachers and students in selected Senior Secondary schools while a sample of fifteen (15) Biology teachers and five Hundred (500) students was randomly selected. A modified structure twenty (20) items questionnaire was used to gather data. The data was analyzed using percentages and weighted means. Findings showed that the use of virtual reality will improve the progressive change in knowledge skill of a learners. Also has a positive impact on the students. It serves as a useful toolsfor teaching and learning that provide experimental, constructivist learning experiences. Several recommendations were made among which is that teachers and students should be provided with technology devices this can improve their digital skills, Fund should be given to teachers to attend workshop, seminars, conferences in order to increase their teaching methodology. Also, teachers and students should be provided with free internet connections, this will enable them to have access to any virtual teaching in Biology.

Keywords: Perception, biology teachers and students, virtual reality, improve teaching and learning

Perception of Biology Teachers and Students on the Use of Virtual Reality to Improve Teaching and Learning in Senior Secondary Schools in Lagos State

The outbreak of Corona Virus diseases has been declared as a public health emergency of international concern which has affected the whole sectors in the country. It emerged in a sea food and poultry market in the Chinese city of Wuhan in 2019, and many cases were detected in most countries worldwide. This global pandemic is transmitted through direct contact with respiratory droplet of an infected person, individuals can also be infected from touching surface contaminated with the virus and touching their face. The Covid19 pandemic was the greatest interruption of the educational sector in human history affecting over 1.6 billion learners in the world causing the closure of schools and majority of the learning institutes in the world. Within the short span of the pandemic, several schools, colleges and universities discontinued face to face teaching and learning. The need of the hour is to innovate and implement alternative educational system and assessment strategies (United Nation, 2020).

In Nigeria, the Federal Ministry of Education directed all educational institutions in Nigeria, to shut down and allow students to go home as cases of reported COVID 19 increased every day. But due to the global challenges the world is faced many teachers have to inculcate the introduction of digital technology devices such as virtual reality to facilitate effective teaching and learning in schools. More so, the industrial revolution era has brought about the use of various devices that have enhanced the teaching and learning process. Among these devices include the computer which has greatly and enormously affected all aspects of human activities (Cobb, 2000). Virtual reality is a digital technology using visual, auditory and other sensor stimuli provided through head- mounted display, to create the illusion that a learner is present in a different environment. The purpose of virtual reality is to allow a person to experience and manipulate the virtual environment as if it were the real world. Also, the benefits of virtual reality in education can be used to develop practical knowledge in the classroom (Domingo, 2017).

Over the years, the evolvement of virtual reality is seen in several manner becoming more and more similar to the real world. Teaching and learning is a process that includes many variables.

These variables interact as learners work toward their goals and incorporate new knowledge, behaviors and skills that add to their range of learning experience. Also, virtual reality is a growing field and its applications within tertiary, secondary and primary education are beginning to be understood. Virtual reality in education offers an immersive learning experience that allows students to interact with their environment in a way that was previously impossible. The technology can be used to create simulations of real –world scenarios, allowing students to stimulate a science experiment and experience it firsthand. This immersive learning experience can lead to increased engagement and retention of information, as students are more likely to remember what they have experienced rather than what they have simply read or heard about (Yoon, H., Moon, H., Sung, M., Park, S. and Heo, H., 2021). More so, the use of virtual reality serves as a medium for education that contribute to the learning efficiency of students while the effectiveness of virtual reality application in Biology teaching specifically in enhancing the comprehension and understanding of concepts with efficient teaching tools will enhance students' attention and contribute to the learning outcomes.

Statement of the Problem

Teaching is fundamentally concerned with imparting ideas, skills and attitudes from the teachers to the learners. In most developing countries of the world including Nigeria the popular method of conveying ideas to learners is through verbal communication, while the use of words alone to communicate ideas to learners is grossly ineffective in producing desired learning outcomes. Biology is a subject taught in senior secondary schools curriculum which serve as preparation toward courses in tertiary institutions like botany, zoology and so on, the teaching of the subject is faced with a lot of challenges towards ascertain the specific objective. For instance, the outbreak of COVID 19 has cause a huge problem to the educational system to the extent that physical teaching is not effective then, this lead to the adoption of many virtual learning forms that both teachers and learners needs to adopt in order to achieve effective teaching delivery on the subject matter. Also, the knowledge of digital technology has educated us about the improvement and innovation of ideas that can solved the challenges facing education in Nigeria, there is need for

the teachers and students to have computer skills, adapt on the use of modern teaching methods like Virtual Reality (VR), Artificial Intelligent (AI) and so on. The study therefore tends to examine the perception of Biology teachers and students on the use of virtual reality to improve teaching and learning of Biology in senior secondary schools.

The purpose of this study is to examine the Perception of Biology teachers and students on the use of virtual reality to improve teaching and learning of Biology in Senior Secondary Schools in Lagos State. Specifically, the study seeks to examine the following:

- i. to examine the perception of Biology teachers and students on the use of virtual reality to improve teaching and learning in Biology;
- ii. to examine the challenges encountered on the use of virtual reality in teaching Biology; and
- iii. to ascertain solutions to the challenges encountered on the use of virtual reality in teaching Biology.

Research Questions

The study seeks answers from the following questions:

- i. What is the perception of Biology teachers and students on the use of virtual reality to improve teaching and learning in Biology?
- ii. What are the challenges encountered on the use of virtual reality in teaching Biology?
- iii. What are the solutions to the challenges encountered on the use of virtual reality in teaching Biology?

Method

The research design for this study is survey involving descriptive statistical data was used on collection of the data. The population comprises of all Biology teachers and students in selected senior secondary School in Somolu and Bariga Local Council Development Area in Education District II, Lagos state. **The sample was made up of** Five (5) senior secondary schools was randomly selected as sample for the study which three (3) biology teachers and One hundred (100) students per schools was selected. On the whole a total of fifteen (15) Biology teachers and Five

hundred (500) students was selected in Somolu and Bariga local Development Area in Education District II, Lagos state through the simple random sampling technique constitute the sample. The instrument consists of demographic information of teachers and students while the second part will consist of (Questionnaire for the teachers and students) The questionnaire contains of twenty (20) structured items, designed to elicit information that related to the three (3) research question. The instrument was designed by the researcher and validated by an expert who ensured content validity and reliability of the instrument. The instrument was given face content validity and reliability co efficient was determined to be 0.85.

Results

Section B (Teacher Analysis)

Research Question 1: What is the perception of Biology teachers on the use of virtual reality to improve teaching and learning of Biology.

Table 4.2:*The Use of Virtual Reality to Improve Teaching and Learning of Biology.*

S/N	ITEMS	SA	A	D	SD	Total	Mean Score	Remark
1.	Do you have a vast knowledge that the use of virtual reality can improve the student learning of Biology?	10	3	2	0	15	3.66	Accepted
	Weighted Mean	40	9	6	0	55		
2.	Do you agree the use of virtual reality can develop your students' practical knowledge in classroom?	13	2	0	0	15	3.60	Accepted
	Weighted Mean	48	6	0	0	54		
3.	Do you agree that the use of virtual reality can increase the motivation and anticipation of students during?	9	6	0	0	15	3.60	Accepted
	Weighted Mean	36	18	0	0	54		
4.	Do you agree that the use of virtual reality can facilitates collaboration among students in different continents?	11	4	0	0	15	3.73	Accepted
	Weighted Mean	44	12	0	0	56		
5.	Do you agree that students can feels immersed with concepts and processes through virtual reality hard ware?	8	7	0	0	15	3.53	Accepted
	Weighted Mean	32	21	0	0	53		
6.	Do you agree that the use of virtual reality can make technology of Biology more interesting and interactive?	8	7	0	0	15	4.0	Accepted
	Weighted Mean	32	28	0	0	60		
7.	Do you agree that the use of virtual reality can improve your students learning experiences?	12	3		0	15	3.80	Accepted
	Weighted Mean	48	9	0	0	57		
8.	Will you agree that the use of virtual reality serves as a medium for education which can contribute to the learning efficiency of students?	10	5	0	0	15	3.66	Accepted
	Weighted Mean	40	15	0	0	55		
9.	Will you agree that the use of virtual reality can enable your students to have adequate feedback from the teachers during learning of Biology?	13	2	0	0	15	3.86	Accepted
	Weighted Mean	52	6	0	0	58		
10.	Do you agree that the use of virtual reality can create the illusion that a learner is present in a different environment?	11	4	0	0	15	3.73	Accepted
	Weighted Mean	44	12	0	0	56		

Research Question 2: What are the challenges encountered on the use of virtual reality in teaching Biology?

Table 4.3

The challenges encountered on the use of virtual reality in teaching biology.

S/N	ITEMS	SA	A	D	SD	Total	Mean Score	Remark
11	Inadequate digital usage causes a lot challenge in the use of virtual reality in Biology?	13	2	0	0	15	3.86	Accepted
	Weighted Mean	52	6	0	0	58		
12.	Lack of constant power cause a lot of challenges in the use of virtual teaching in Biology?	8	7	0	0	15	3.58	Accepted
	Weighted Mean	32	21	0	0	53		
13	Lack of free internet service connection cause a lot of challenges in the use of virtual reality in teaching Biology?	12	3	0	0	15	3.80	Accepted
	Weighted Mean	48	9	0	0	57		
14.	Lack of computer skills from the teachers cause a lot of challenges in the use of virtual reality in teaching Biology	9	6	0	0	15	3.60	Accepted
	Weighted Mean	36	18	0	0	54		
15.	Lack of insufficient computer hardware devices cause a lot of challenges in the use of virtual reality in teaching Biology	11	4	0	0	15	3.73	Accepted
	Weighted Mean	44	12	0	0	56		

Research Question 3: What are the solution to the challenges encountered on the use of virtual reality in teaching Biology?

Table 4.4

The solution to the challenges encountered on the use of virtual reality in teaching Biology.

S/N	ITEMS	SA	A	D	SD	Total	Mean Score	Remark
16.	Adequate digital devices usage should be given to teachers; this will improve their teaching methodology in Biology?	11	4	0	0	15	3.73	Accepted
	Weighted Mean	44	12	0	0	56		
17.	Free internet connection should be given to teachers; this will help to have access to any virtual teaching in Biology?	13	2	0	0	15	3.86	Accepted
	Weighted Mean	52	6	0	0	58		
18.	Teachers should be trained with technology devices that can improve their digital skills.	10	5	0	0	15	3.66	Accepted
	Weighted Mean	40	15	0	0	55		
19.	Teachers should be provided with sufficient computer hardware devices, this will improve their hard	13	2	0	0	15	3.86	Accepted
	Weighted Mean	52	6	0	0	58		
20.	Fund should be given to the teachers to attend workshop, seminars, conference in order to increase their teaching methodology	9	6	0	0	15	3.60	Accepted
	Weighted Mean	36	18	0	0	54		

Discussion

Table 4.2 had ten (10) items on the use of virtual reality to improve teaching and learning of Biology. Cooper, Park, Nast, Thong and Johnson (2019) emphasized that the perceived used of virtual reality will improve progressive changes in knowledge skill of a learners. They also stated that the virtual reality serves as a useful tool for teaching and learning and for the inclusion of diverse learners. While items 1 to 10 have mean score of 3.66, 3.60, 3.60, 3.73, 3.53, 4.0, 3.80,

3.66, 3.86 and 3.73 respectively, these are all accepted and indicated that the use of virtual reality have a positive impact on the students. More so, Domingo (2017) emphasized that the use of virtual reality provides virtual spaces ideal for providing experimented, constructivist learning experiences while capacity of students to navigate these space at their own pace and ability makes the virtual world a student centered environment which the instructor is more of a facilitator than a distributor of knowledge.

Table 4.3 stated the challenges encountered on the use of virtual reality in teaching Biology have five (5) items with mean score of 3.86, 3.53, 3.80, 3.60, 3.73. This shows acceptability that a lot of challenges is been encountered during the use of virtual reality in teaching Biology. Bahari and Gholami (2022) revealed that most teachers lack the following digital devices usage, constant power supply, free internet services connection, lack of insufficient hardware devices all these cause a huge problem on the use of virtual reality in teaching Biology. Virtual reality program presents a certain degree of difficulty for those who are not familiar with these technologies, in addition some schools cannot invest on the necessary equipment and fear the new, which involves learning aside other traditional materials. Buchner (2022) said this has cause a huge challenge on the use of virtual reality in teaching Biology.

Finally, Table 4.4 items 16, 17, 18, 19 and 20 showed mean score of 3.73, 3.86, 3.66 and 3.60 respectively. These are all accepted and indicated that there is need find solutions to the challenges encountered on the use of virtual reality in teaching Biology. Dunleavy and Dede (2014) emphasized that there is need for necessity of providing technical support to users against problems that might occur on the use of virtual reality in teaching Biology such free internet connection should be given to both teachers and learners that will help them to have access to any virtual teaching in Biology . Also, teachers should be trained with technology device that can improve their digital skills.

Section B

Research Question 1: Perception of Biology students on the use of virtual reality to improve teaching and learning of Biology.

Table 4.7*The Use of Virtual Reality to Improve Teaching and Learning of Biology*

S/N	ITEMS	SA	A	D	SD	Total	Mean	Remark
1.	Do you have a vast knowledge that the use of virtual reality can improve the student learning of Biology?	250	230	20	0	500	3.46	Accepted
	Weighted Mean	1000	690	40	0	1730		
2.	Do you agree that the use of virtual reality can develop student knowledge in the classroom?	200	250	30	20	500	3.26	Accepted
	Weighted Mean	800	750	60	20	1630		
3.	Do you agree that the use of virtual reality can increase the motivation and participation of students during teaching and learning of Biology?	300	200	0	0	500	3.60	Accepted
	Weighted Mean	1200	600	0	0	1800		
4.	Do you agree that the use of virtual reality can facilitates collaboration among students in different continents?	200	200	50	50	500	3.10	Accepted
	Weighted Mean	800	600	100	50	1500		
5.	Do you agree that students can feels immersed with concepts and processes through virtual reality hardware?	200	150	100	50	500	3.60	Accepted
	Weighted Mean	800	750	200	50	1800		
6	Do you agree that the use of virtual reality can make teaching of Biology more interesting and interactive?	300	150	50	0	500	3.50	Accepted
	Weighted Mean	1200	450	100	0	1750		
7.	Do you agree that the use of virtual reality can improve students learning experiences?	250	200	50	0	500	3.40	Accepted
	Weighted Mean	1000	600	100	0	1700		
8	Do you agree that the use of virtual reality serve as a medium for education which can contribute to the learning effectiveness of students?	300	200	0	0	500	3.60	Accepted
	Weighted Mean	1200	600	0	0	1800		
9.	Do you agree that the use of virtual reality enable the students to have adequate feedback from the teachers during learning of Biology?	350	150	0	0	500	3.70	Accepted
	Weighted Mean	1400	450	0	50	1850		
10.	Do you agree that can access these technological resources from mobile phone, tablet or video game, so their access does not require complex equipment?	300	200	0	0	500	3.60	Accepted
	Weighted Mean	1200	600	0	0	1800		

Research Question 2: What are the challenges encountered on the use of virtual reality in teaching Biology?

Table 4.8

The Challenge Encountered on the Use of Virtual Reality in Teaching Biology

S/N	ITEMS	SA	A	D	SD	Total	Mean Score	Remark
11.	Lack of constant power supply cause a lot of challenges encountered on the use of virtual reality in teaching Biology	350	150	0	0	500	3.70	Accepted
	Weighted Mean	1480	450	0	0	1850		
12.	Lack of free internet service cause a lot of challenges encountered on the use of virtual reality in teaching Biology?	250	250	0	0	500	4.0	Accepted
	Weighted Mean	1000	1000	0	0	2000		
13.	Lack of computer skills from the students cause a lot of challenges encountered on the use of virtual reality in teaching Biology?	300	200	0	0	500	3.60	Accepted
	Weighted Mean	1200	600	0	0	1800		
14.	Lack of insufficient computer hardware devices cause a lot of challenges encountered on the use of virtual reality in teaching Biology?	250	250	0	0	500	4.0	Accepted
	Weighted Mean	1000	1000	0	0	2000		
15.	Lack of motivation of students cause a lot of challenges encountered on the use of virtual reality in teaching Biology?	350	150	0	0	500	3.70	Accepted
	Weighted Mean	1400	450	0	0	1850		

Research Question 3: What are the solutions to the challenges encountered on the use of virtual reality in teaching Biology?

Table 4.9

The Solutions to the Challenges Encountered on the Use of Virtual Reality in Teaching Biology

S/N	Items	SA	A	D	SD	Total	Mean Score	Remark
16.	Students should be provided with sufficient computer hardware devices that can be used to enable them have access to any virtual teaching in Biology	380	120	0	0	500	3.76	Accepted
	Weighted Mean	1520	360	0	0	1880		
17.	Students should be engaged in virtual reality programme through seminar, workshop, this can improve their critical and scientific thinking.	200	300	0	0	500	2.80	Accepted
	Weighted Mean	800	600	0	0	1400		
18.	Students should be trained with technology devices that can improve their digital skills.	350	150	0	0	500	3.70	Accepted
	Weighted Mean	1400	450	0	0	1850		
19	Students should be trained with technology devices that can improved their digital skills.	250	250	0	0	500	4.0	Accepted
	Weighted Mean	1000	1000	0	0	2000		
20.	Adequate time should be given when adopting virtual reality teaching in Biology	280	220	0	0	500	3.56	Accepted
	Weighted Mean	1120	660	0	0	1780		

Discussion

Table 4.7 had ten (10) items on perception of Biology students on the use of virtual reality to improve teaching and learning of Biology. Items 1to 10 have mean scores of 3.40, 3.26, 3.60, 3.10, 3.60, 3.50 ,3.40, 3.60, 3.70 and 3.60 respectively these are all accepted and indicated that the use of virtual reality has a positive impact to improve teaching and learning of Biology. Ibaneze and Delgado-Kloos (2018) emphasized that the use of virtual reality tends to improve the critical

thinking of the learners and expose them to practical experience in the content of learning the subject matter effectively while Hu and Lee (2017) supported the use of virtual reality in education because it serves as a tools for learning. Also, the use of virtual reality will have enhanced student's engagement, motivation and knowledge retention as information accessibility this tends to improve the teaching and learning of Biology.

Table 4.8 which stated that challenges encountered on the use of virtual reality in teaching and learning of Biology had five (5) items with mean score of 3.86, 3.53, 3.80, 3.60 and 3.73. This shows acceptability that is a lot of challenges students encountered on the use of virtual reality in teaching Biology such as lack of constant power supply, lack of free internet service, lack of computer skills from the students, lack of insufficient computer hardware devices, lack of motivation of students all these causes a huge problem on the learner. Yoou (2021) suggested on providing digital learning devices to learners this will equipped them on the proper usage rather than students' experiences lack of understanding and guidelines of the devices because this has negative impact on the eyes which tends to cause a huge challenges encountered from the learners.

Moreso, Bahari and Gholami (2022) emphasized there are several documented challenges to using 3D virtual environment to teach, therefore there is need for students to have sufficient computer hardware and reliable internet service this will reduce the challenges encountered from the students. From table 4.9 items 16, 17, 18, 19 and 20 showed mean score 3.76, 2.80, 3.70, 4.0 and 3.56 respectively. These are all accepted and indicated that there is need to find proper solution to the challenges encountered on the use of virtual reality in teaching Biology.

Conclusion

On the basis of the findings of this study, some conclusions were made about the teachers and the students. Teaching expressed that the use of virtual reality can develop the students' practical knowledge in the classroom, it can also increase the motivation and participation of students during teaching and learning of Biology. It was also observed that the use of virtual reality enables the students to have adequate feedback from the teachers during learning of Biology. More so, the use of virtual reality will improve students learning experiences. While both teachers and

students showed a positive response towards the perception on the use of virtual reality to improve teaching and learning of Biology in Senior Secondary School.

Recommendations

The following recommendations have been proffered based on the findings of the study.

- The use of virtual reality should be carefully planned and prepared in order to achieve the target goal.
- Teachers and students should be trained with the technology in order to achieve a good learning outcome.
- Teachers and students should be provided with technology devices this can improve their digital skills.
- Teachers and students should be provided with free internet connection this will enable them to have access to any virtual teaching in Biology.
- Government should provide the schools with sufficient computer hard ware devises this will improve the teachers teaching methodology in Biology.
- Fund should be given to teachers to attend workshop, seminars, conference in order to increase their teaching methodology.
- Parents and educational administrator should avoid any form of negatives stereotype against the use of virtual reality.
- School management should adopt more use of virtual reality as an instructional method.
- There should be stimulated environments for biology practical for students with phobias. Also, encourage to learn science subjects especially biology through virtual reality.
- The school should encourage the use of virtual reality with the provision of virtual reality headsets, phones with screen resolution of 1080 pixels and above

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