

INFLUENCE OF TEACHERS' TRAINING ON UTILIZATION OF BASIC SCIENCE VIRTUAL LABORATORIES FOR ENTREPRENEURSHIP EDUCATION IN JUNIOR SECONDARY SCHOOLS OF KOGI-CENTRAL, NIGERIA

By

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Abstract

This study investigated the influence of teachers' training on utilization of basic science virtual laboratories for entrepreneurship education in junior secondary schools in Kogi-central. The study adopted descriptive research methods. Three research objectives and questions were raised as a guide to the study. The population of the study consists of 132 basic science teachers and 8,704 basic science students in Kogi-central. The sample of the study consisted of 100 basic science teachers and 800 basic science students which were purposively selected. Four (4) research instruments were used for data collection. The instruments were validated by relevant experts and reliabilities indexes of 0.82, 0.76, 0.71 and 0.83 were obtained. Frequency count, mean, and standard deviation were used to analyze the collected data. The findings of this study revealed that virtual laboratory training for basic science teachers helped the teachers to acquire some entrepreneurship skills and consequently helped their students to also acquire entrepreneurship skills in basic science. Based on the findings of this study, it was recommended that more teachers should be trained on virtual laboratory skills for entrepreneurship in basic science so that students in junior secondary schools can acquire entrepreneurship skills for job creation.

Keywords: Basic Science, Virtual laboratory, Entrepreneurship, Education, Training.

Introduction

The primary aim of any educational venture is to make individuals a better person, useful to him/herself and add value to the society where such an individual belongs. Education seeks to develop the minds and characters of future citizens, their skills and potentials in order to equip them for the society in which they will be useful for themselves. One of the objectives of education is to prepare young ones to face future challenges and develop them to meet up with science and technological attainment and to be self-dependent (Oyelade & Abolade, 2017). Science is simply the study of our environment. This body of knowledge has two components- the process skills (Practicals) and the content. The process skills involve the ways by which knowledge is made more real and applicable in solving real-life situations (Bajah, 2012).

Basic science is the way in which children in Basic schools try to learn and understand their environment, observe and explore the world around them. Among other things, the following are rationales for basic science education in Nigeria: Basic science education provides opportunity for acquisition of skills among teeming population of youths in Nigeria.

It reduces emphasis on science concepts and form one perspective rather emphasize science from a unified approach or interrelatedness among science discipline. It serves as a bedrock for citizens in Nigeria to pursues science related discipline or career which account for rapid development among nations in the 21st century. Basic science education stresses the fundamental unity of among science discipline. It opens frontiers to knowledge through research and collaboration among educators and fosters cross- cultural interaction among nations. It contributes greatly to improving living and working conditions of individual citizens through the application of acquired concepts and skills. Management of natural human and natural resources, reduction in environmental hazard, increase in energy supply and high productivity in the economy is achievable through basic science education.

Entrepreneurship Education

Entrepreneurship education is the act of training and retraining of students and individuals on the basic skills required for job creation and self-reliance in order to make a profitable living wherever such an individual finds him/herself (Sunday, Akanmu & Fajemidagba, 2016). Dawal(2020) discovered that laboratory approach is very effective in enhancing students' acquisition of skills necessary for entrepreneurship education. It spams from the above that Basic science have a lots of intrinsic and extrinsic value that could be harnesses for job creation and self-reliance which is what entrepreneurship education is all about. Basic science education is aimed at producing large, qualitative manpower that have good base in science and technology and generally a scientific literate society that have all its takes to handle and solve its own unique problems in a unique way(Jirga, Ajangem & Atoo, 2022).

Some of the entrepreneurship skills in basic science curriculum that could be developed include: making models of Human and other vertebrate, kidney, skull; extraction of colour and making paints, constructing different shapes of objects, mat weaving, basketry, calabash craving, making of pesticides, paints from oil, sewage disposal, refuse disposal, flowerings, fabrication of all sorts of electrical components among others. Lately, usage and switching from physical to virtual laboratory is gaining more popularity as a result of advancement and improvement in Information and Communication Technology (ICT) in this 21st century otherwise known as digital age which is also necessitated by the spread of Covid-19. Hand-on and Mind-on, practical and experiments are essential organs of science and technology targeted to equipped the students with valuable skills for their tasks in and outside academics environment(Bello, 2020).

Vasiliadou (2020) opined that students perform experiments at home amidst corona virus disease conveniently with the introduction of virtual laboratories. The scholar further asserted that not all physical laboratories skills can be replaced by virtual laboratories. However, virtual laboratories work encourages online experiments without time limitations, receive instant result, and familiarize with laboratory safety and health rules, repetition of activities without wasting laboratory wares and generation of data for assessment.

Chiu, Dejaegher and Chao (2015) defines virtual science laboratories as software based tools created to mimic scientific and experiments processes as possible in a traditional science lab. This is can be developed informs of multimedia and simulation, that are frequently used in many aspects of science and applied science like physics, chemistry, biology, astronomy and earth sciences. Virtual experiments delivered with either of the virtual labs using Information and Communication Technology (ICT) tools add value to physical hand-on experiments by allowing the students to explore unobservable phenomenon (Jong, Linn, & Zacharia, 2013).

Chaturvedi and Dharwadkar (2011) described the criteria in designing experiments in virtual labs. They are: The salient features of each physical experiment must be preserved in the physical to virtual domain mapping; the objectives, experimental procedure, data acquisition and expected outcomes of the experiments are replicated with the reasonable care so that the virtual experiment can serve as a proxy for the physical experiment during the pre-lab practice session. The virtual labs experiment must be interactive and allow for online and offline practice session; the operation of virtual labs experiment including manipulation of a key components, must be based either on empirical data collected from physical experiment.

Erdan, Anagun, and Kumtepe, (2020) carried out a study on effects of virtual laboratory on learners' academic achievement and perceived learning. The study was a sequential explanatory mixed methods design involving both qualitative and quantitative. The study sampled 65 students which 33 were tagged group A and 32 tagged group B. Group A was exposed to hand-on physical laboratory and group B were exposed to virtual laboratory activities. At the end of the laboratory activities, selected students were interviewed on the experience gained so far. The quantitative data collected was analyzed using the analysis of covariance (ANCOVA) and qualitative data was analyzed using thematic descriptive analysis which includes creating codes and then developing the themes of set of codes. The result of the study revealed that virtual lab students (group B) expressed that the virtual laboratory practical experience contributed to their knowledge except two students who find it difficult to cope and learned how to conduct experiments setting by practicing with virtual laboratory.

Diwakar, Radhamani, Sasidharakurup., Kumar, Nizar, Achutan and Nair (2016) worked on assessing students and teachers experience on simulation and remote biotechnology virtual labs: a case study with a light microscopy experiment. The study sampled 250 students and 100 teachers who are exposed to hands-on workshops. The findings of the study revealed that 48% of students supported interactive simulations with the reasons that it helped them to apply their theoretical knowledge into practice. 44% of students suggested that continuous use of simulations in their workshop motivated the use of ICT enabled tools in their education. 56% of students suggested that they got a real feel of experiments and equipment as in a physical hands-on laboratory, with the claim that there was a high degree of interactivity between users and computers while performing simulations.

Utilization of the laboratory is the way by which the available laboratories are being put into use. Making use of a well-equipped laboratory that contains all relevant equipment and apparatuses for the purpose of teaching and learning improves the efficiency of the teachers as well as that of the students, as it enables the students to have a deeper and practical understanding of what he has been taught (Makolo, 2014). Laboratories are places or work places where scientific experiments are systematically carried out. Activities in the laboratory are of two types: structured and unstructured activities. In a structured activity, the students are given instructions that lead them through a procedure designed to produce certain results, but in an unstructured activity, a problem is posed and students are allowed complete freedom to devise their own procedure, organize their own data and arrive at their own generalizations (Seweje & Jegede, 2005).

A Laboratory is a place which provides controlled conditions in which scientific research, experiments and measurement may be performed. Learning by inquiry is a challenge for teachers and learners (Bransford, Brown and Cocking, 2000). Inquiries are diverse ways in which scientist study the natural world, propose ideas, explain and justify the assertions based upon evidence derived from scientific work. It could also be described as learning science in

classrooms and laboratories, through which the students and their teachers explore and discuss science in a narrative of enquiry context (Seweje and Jegede, 2005).

Teaching basic science is challenging, but the practical activities in the laboratory have peculiar challenges that make it a demanding task, as it calls for advanced skills. Felder and Brent (2004) opined that the method of teaching Physics should change from the lecture to a more active and investigative practical approach. When students are presented with such approach through laboratory activities, they tend to develop traits such as curiosity, problem solving, creativity and perseverance, which are essential in science.

According to Duyilemi (2000), laboratory practical and field work have all been stressed as the basis for teaching and learning of Physics. The author stressed further that a good science course must be laboratory-based. In his opinion, laboratory activities help Physics students to stimulate the desire to learn Physics, make those things they learn theoretically clearer to them and enable them to reason more critically and to be able to apply the information acquired throughout their lives. Laboratory activities enable students to carry out experiment by themselves and this helps in facilitating proper and efficient teaching and learning. Physics laboratories, if available in the secondary schools and are well utilized, will improve the teaching and learning of Physics, and more specially, will improve the level of imagination, creativity skills and cognitive aspect of the learners.

Virtual laboratories otherwise known as simulation laboratory is mainly used for two purposes in science education. It is being used to avail the students at all categories with visual representations of science concepts and to prepare them for physical laboratory and virtual labs. The impact of utilization of this virtual laboratory on entrepreneurship education in junior secondary school was what this study investigated in Kogi central, Nigeria.

Statement of the Problem

The universal problem of unemployment has posed great challenges to the Nigeria economy. To curb the problem, the federal government of Nigeria has double its efforts to promote and standardize educational structure that will help to create job opportunities and solve the problem of dwindling economy. With this global trend of equipping youths with requisites skills for self-reliance, the government has emphasized the need for promoting entrepreneurship education in schools. One of such avenue is the utilization of Basic science virtual laboratories for enhancing entrepreneurship education in junior secondary schools during covid-19. Hence this study investigated the influence of teachers' training on Basic Science Virtual Laboratories on entrepreneurship education in Kogi-Central Nigeria.

Objectives of the Study

The main objective of this study is to investigate the impact of teachers' training on the utilization of basic science virtual laboratories on entrepreneurship education in junior secondary schools in Kogi-central, specifically;

1. To ascertain influence of teachers' training on the utilization of virtual laboratories in teaching basic science in junior schools
2. To find out the skills developed by basic science teachers during training for entrepreneurship education in Kogi-central.
3. To find out the influence of teachers' training on virtual laboratory on students' entrepreneurship skills in Kogi Central.

Research Questions

The following research questions were raised to guide the study:

1. What is the influence of teachers' training on the utilization of virtual laboratories in teaching basic science in junior schools?
2. What are the skills developed by basic science teachers during training for entrepreneurship education in Kogi-central?
3. What is the influence of teachers' training on virtual laboratory on students' entrepreneurship skills in Kogi central?

Methodology

The research is both qualitative and quantitative research where both qualitative and quantitative data were collected in Kogi central area which has six local government and predominantly dominated by the Ebirá people. The population for this study were all the 132 Basic science teachers and 8721 Basic science students in Kogi-central of Kogi state Nigeria. The sample consisted of 100 basic science teachers and 800 Basic science students (JSS3) which were purposively selected based on availability to participate in the study. The teachers were trained on the utilization virtual laboratories for entrepreneurship education for five (5) days. The trained teachers used their acquired skills in the training in developing the entrepreneurship skills of their students.

Four (4) instruments were used for data collection: Basic Science Virtual Laboratories Training Manual for Teachers; Basic Science Teachers Virtual Laboratory and Entrepreneurship Skills Questionnaire; Basic Science Students Entrepreneurship Skills Questionnaire and Basic Science Entrepreneurship Skills Checklist. All the instruments were validated by three experts in Basic science and Entrepreneurship from Federal University Lokoja, Prince Abubakar Audu University and two experienced Basic science teachers in secondary schools in Kogi State. The reliability indexes were: Basic Science Virtual Laboratories Training Manual for Teachers 0.82, Basic Science Teachers Virtual Laboratory and Entrepreneurship Skills Questionnaire 0.76, Basic Science Students Entrepreneurship Skills Questionnaire 0.71 and Basic Science Entrepreneurship Skills Checklist 0.83. The collected data were analyzed using frequency count, mean and standard deviation.

Results

Research Question One: What is the influence of teachers' training on the utilization of virtual laboratories in teaching basic science in junior schools?

Table 1

Responses of basic Science teachers who were trained on the use of virtual laboratories in junior secondary schools.

SN	Statement	Mean	Standard Deviation	Remark
1	I enjoyed the training on the utilization of virtual laboratory as it exposed to better practical techniques	3.8	1.2	Accepted
2	I can now use virtual laboratory effectively in teaching basic science practical	3.9	1.1	Accepted
3	Virtual laboratory training helped me to know basic preparations in teaching basic science practical effectively	3.1	0.9	Accepted
4	The training on virtual laboratory has helped me to be more confident in teaching basic science laboratory	3.8	1.3	Accepted

5	I have acquired very useful entrepreneurship skills which has benefitted my students' entrepreneurship education.	3.4	0.7	Accepted
Grand mean		3.5		Accepted

Source: Tetfund sponsored research field work

Table 1 shows the responses of Basic science teachers on the influence of the training they received on virtual laboratories in basic science. The table shows that the teachers enjoyed the training as it exposes them to better practical technique (mean score 3.8 and standard deviation 1.2), the teachers can use the virtual laboratory in teaching basic science practical (mean score 3.9 and standard deviation 1.1), Virtual laboratory training helped the teachers to know the basic preparations in teaching basic science practical (mean score 3.1 and standard deviation 0.9), the virtual laboratory has improved the teachers confident in teaching basic science practical (mean score 3.8 and standard deviation 1.3) and virtual laboratory training helped the basic science teachers acquire some entrepreneurship skills in basic science (mean score 3.4 and standard deviation 0.7). With a grand mean of 3.5, Table 1 shows that the training on virtual laboratory have influenced the basic science teachers positively.

Research Question Two: What are the skills developed by basic science teachers during training for entrepreneurship education in Kogi-central?

Table 2

Responses of Basic Science Teachers on the Entrepreneurship skills developed during the utilization of virtual laboratory training for entrepreneurship

S/N	Statements	Mean	Standard Deviation	Remarks
1	Virtual laboratory training has helped me to develop the skills of soap making	2.9	1.4	Accepted
2	Virtual laboratory training has helped me to develop the skills of mat making	3.3	1.2	Accepted
3	Virtual laboratory training has helped me to develop the skills of fishing and preservation	2.9	1.3	Accepted
4	Virtual laboratory training has helped me to develop the skills of leather shoe making	2.3	0.8	Rejected
5	Virtual laboratory training has helped me to develop the skills of pure water making	3.5	1.2	Accepted
Grand mean		2.7		Accepted

Source: Tetfund sponsored research field work

Table 2 indicated that virtual laboratory training helped the basic science teachers in knowing how to make soap (mean score 2.9 and standard deviation 1.4), it helped the teachers on the skills of mat making (mean score 3.3 and standard deviation 1.2), It helped the teachers on the development of fishing and preservation of fish (mean score 2.9 and standard deviation 1.3), it didn't helped the teachers in developing the skills of leather shoe making (mean score 2.3 and standard deviation 0.8), but it helped the teachers in the development of skills for pure water production (mean score 3.5 and standard deviation 1.2). Since the grand mean is 2.7, it implies that virtual laboratory training for basic science teachers improved their entrepreneurship skills greatly.

Research Question Three: What is the influence of teachers' training on virtual laboratory on students' entrepreneurship skills in Kogi central?

Table 3

Responses of students on their acquired entrepreneurship skills in Basic Science after their Basic science teachers attended virtual laboratory training on entrepreneurship education

S/N	Statement	Mean	Standard Deviation	Remarks
1	My Basic science teachers teaches basic science practical better now than before	3.2	1.3	Accepted
2	I now enjoy basic science practical than I use to before my teacher went for training	3.6	0.9	Accepted
3	My basic science teacher has helped me to develop the skills of mat making	3.1	0.7	Accepted
4	My basic science teacher has helped me to develop the skills of fishing and preservation	3.9	1.1	Accepted
5	My basic teacher has helped me to develop the skills of soap making	2.9	0.7	Accepted
6	My basic science teacher has helped me to develop the skills of pure water making	3.1	0.9	Accepted
	Grand mean	2.9		

Source: Tetfund sponsored research field work

Table 3 shows the responses of students to the entrepreneurship skills they have acquired after their basic science teachers attended training on virtual laboratory on entrepreneurship education. The students believed that their basic science teachers teaches basic science practical better than before he went for the training (mean score 3.2 and standard deviation 1.3), they enjoy the basic science practical now than before their teacher went for training (mean score 3.6 and standard deviation 0.9), the students have acquired the skills of mat making (mean score 3.1 and standard deviation 0.7), the students have acquired the skills of fishing and fish preservation (mean score 3.9 and standard deviation 1.1), the students have acquired the skills of soap making (mean score 2.9 and standard deviation 0.7), and the students have acquired the skills of pure water making (mean score 3.1 and standard deviation 0.9). The grand mean of 2.9 indicated that the students have acquired some entrepreneurship skills after their basic science teacher came back from training on virtual laboratory for entrepreneurship.

Discussion

The findings from this study revealed that teachers who participated in the three days training on virtual laboratory for entrepreneurship were influenced positively as the training exposed them to better ways of teaching basic science practical and make their teaching more effective. This is in line with the findings of Makolo (2014) whose study discovered that teachers' participation in conference enhances their students understanding of Biology practical. This findings is also in line with that of Falode(2014) whose findings revealed that virtual laboratory package enhances Physics students' interest and achievement in Physics.

From research question two, this study revealed that basic science teachers acquired some entrepreneurship skills such as soap making, pure water production, fishing and preservation, and mat making. This could be as the results of the effectiveness of virtual laboratory training which enhances basic science teachers' skills in entrepreneurship. This findings agrees with the findings of Jirgba, Ajangem and Atoo (2022) whose findings revealed that Basic science teachers developed entrepreneur skills such as mat making, basketry among

others when properly trained. The findings also corroborated by Alebiosu (2017), whose findings revealed that basic science has several entrepreneurship skills when harnessed.

The findings of this study revealed that teachers training on virtual laboratory for entrepreneurship enhances students' skills in entrepreneurship such as mat making, soap making, pure water production among others. This is could be as a result of the training received by the basic science teachers in entrepreneurship education which they in turn impacted same to their students in the junior secondary schools. This findings is in line with the recommendations of Mathew, Olorundare and Olaniyan (2017) whose study recommended that science teachers should train their students on entrepreneurship development in secondary schools.

Conclusion

Based on the findings of this study it was concluded that training of basic science teachers on virtual laboratory and entrepreneurship education greatly impacted their entrepreneurship skills, teaching practical skills, effectiveness in teaching basic science and consequently enhances the development of their students' entrepreneurship skills in junior secondary schools in Kogi central, Nigeria.

Recommendations

Based on the findings of this study, the following recommendations were made:

- i. The government should invest more in the training of Basic science teachers for the development of entrepreneurship skills in junior secondary schools.
- ii. The basic science teachers should adopt the utilization of virtual laboratory for teaching of basic science practical to develop their students' entrepreneurship skills.
- iii. Curriculum should be structured to encourage students to participate fully during their basic science practical to be able to develop hands-on and entrepreneurship skills.

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