**Faculty of Natural and Applied Sciences Journal of Mathematics and Science Education**
**Print ISSN: 2814-0885 e-ISSN: 2814-0931**
www.fnasjournals.com
**Volume 4; Issue 2; October 2023; Page No. 156-162.**

# EXPERIENTIAL LEARNING MODEL AND PUPIL INTEREST IN BASIC SCIENCE AND TECHNOLOGY

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## Abstract
The study was a quasi-experimental study that adopted a non-equivalent pre-test and post-test design to investigate the effect of the experiential learning model (ELM) on pupils' interest in Basic Science and Technology in public primary schools in Oyigbo Local Government Area of Rivers State. The population of the study consisted of all primary five pupils in public primary schools within the LGA. The sample of the study consisted of one hundred and twenty (120) pupils who were randomly selected from two public primary schools in the zone. It was guided by two research questions and hypotheses. The instrument for data collection was the Basic Science and Technology Interest Scale (BSTIS). The reliability of BSTIS was found to be 0.78. The research questions were analyzed using mean and standard deviation, while the hypotheses were tested at 0.05 level of significance using the Z test. The findings of the study revealed that the Experiential Learning Model (ELM) was very significant in enhancing pupils' interest in Basic Science and Technology. Moreover, it showed that gender did not significantly affect the pupils' interest in Basic Science and Technology. To this end, recommendations were made amongst which were: that ELM should be incorporated as a strategy for teaching Basic Science and Technology at the primary school level (primary 4-6).

**Keywords:** Experiential learning, Pupils Interest, Basic Science, Technology, Model

## Introduction
Science and technology play a very vital role in bringing about development in a nation. Nwogu and Ikiroma (2019) asserted that science education remains the magic wand which will recreate the nation by giving impetus to innovation and creativity that will enable the nation to catch up with the advancement of science and technology which characterizes the great nations of the world. They went further to declare that science education is an economic catalyst that significantly helps in boosting the economy of nations. To this end, there is a need to give adequate attention to the quality of science teaching and learning in schools, especially at the primary school level.
Guyana (2009) reported that the importance of science and technology in the contemporary world is inestimable; and that this reveals that the education system in the global world needs to square up to the demands of the time, to provide the required training in scientific skills to be in sync with the growing challenge; to close the gap in the dynamic economy. They went further to declare that there is no doubt that the application of science and technology has brought tremendous impact in almost all disciplines or fields of life such as medicine, engineering, electronics, and aeronautics, in a positive direction, as well as significant strides in recent times in computer technology, bringing about a transformation in the information and communication sector.

Science and technology, according to Guyana (2009), played a vital role in transforming many poor feudal countries into great nations of the world due to the increase in the application of science and technology knowledge. In this light, they noted that China and India remain examples of such nations that have grown from obscurity to become economic and industrial powerhouses that now compete favourably with highly developed nations. About the significant role science and technology play in the advancement of economies of nations, it behooves Nigeria as a nation to revitalize science education in her schools, by paying special attention to the primary school level which happens to be the foundation of the education system.

The goals of primary education as stipulated by the Federal Republic of Nigeria, FRN (2004) among others include: laying a sound basis for scientific and reflective thinking and also giving the child the opportunity to develop manipulative skills to have the capacity to function actively within his limits. A critical look at these objectives, reveals the important position basic science and technology occupies as a fundamental course at the middle basic level (Primary 4-6). The middle basic level prepares the child and sets the stage for his further educational advancement which is preparing the child for post-primary education. From the foregoing, the FRN (2004) noted that the success of the Nigerian educational system depends on the primary level of education because whether the whole system will be a success or a failure, can only be traced to the quality of the primary level of education. This implies that the quality of science teaching and learning at the primary level determines to a large extent, the interest the pupils will have towards science when they get to post-primary and tertiary levels of education.

Ejovwoke and Itie (2015) opined that one of the subjects which will help in the realization of the aim of education within the first six years is basic science and technology. According to them, basic science and technology appear to be the foundation on which the current leaps in technology are anchored. In line with this, the scholars went ahead to define basic science and technology as a way in which pupils attempt to understand their environment; by observation and exploration of the world around them.

Furthermore, Nwogu (2016) identified the following as the objectives of teaching and learning basic science and technology at the basic level of education;

i. To develop pupils' interest in science and technology.
ii. To help them acquire basic skills in science and technology.
iii. To apply their scientific and technological skills to meet societal needs.
iv. To make optimum use of the career opportunities offered by the study of science and technology.
v. To become prepared for further studies in science and technology.

These objectives reveal that basic science and technology as a fundamental course; helps in making the bulk of the citizens scientifically literate by inculcating in them the spirit of inquiry. It helps young persons to develop science process skills such as: observing, classifying, hypothesizing, recording, experimenting, and as well as scientific values such as objectivity, honesty, curiosity, patience, which is a code of conduct for the scientific community.
Ejovwoke and Itie (2015) emphasized the importance of basic science and technology at the primary school level by highlighting the reasons for teaching the subject:

a. It helps pupils to explain natural phenomena.
b. Assists them by making them think and reason logically.
c. Makes them have the ability to deal with everyday problems.
d. Helps pupils to develop the spirit of teamwork through working co-operatively.
e. Helps pupils to carry out scientific tests/investigations to satisfy their curiosity.
f. Make them apply scientific knowledge which they have acquired to improve the quality of life in their immediate environment.
g. It helps them to work with their brains and hands.
h. Inculcates positive attitude towards work in them, so that they will be productive.
i. Makes them creative and to think critically or outside the conventional sphere.

Concerning the reasons for teaching basic science and technology at the basic level as submitted by Ejovwoke and Itie (2015), the teacher must take into consideration the feelings of the learners, their attitudes and beliefs for effective learning of the pupils to take place. Undeniable, it is obvious that despite the significant position that basic science and technology occupies as a fundamental course that equips learners for further study in science and technology, by making them develop an interest to pursue a career in science and technology, some concepts in the subject appear very abstract and difficult that the conventional method does not seem effective on them (Nwogu, 2016).

Achor and Agbidye (2014), revealed that upper basic students in Makurdi metropolis in Benue state perceived some concepts in J. S. S 2. The basic science curriculum was difficult, and there was no significant difference in the mean performance of those who perceived the concepts difficult and those who did not. In the same vein, Babayemi, et al.

(2018) corroborated the fact that many concepts in basic science and technology appear difficult and abstract to students. The findings of the scholars reveal that the level of difficult concepts perceived by students was high in most of the concepts they investigated including energy and power concepts, and also that there was no significant difference between males and females regarding their level of the perceived difficulty of concepts in the subject. In light of the foregoing, the methods adopted by basic science and technology teachers have not been very effective in helping learners understand concepts in the subject. To this end, research has revealed that poor teaching methods and approaches adversely affect pupils' interest and performance in science (Akanbi, 2003, Obomanu & Ekeuobi 2011). Against this backdrop, science teachers must adopt innovative strategies for teaching basic science and technology. This in essence supports the need for the present study on the effects of experiential learning model (ELM) on the interest of pupils in basic science and technology.

The experiential learning model (ELM) is an instructional strategy which helps individual learners have a firsthand experience which forms the central point of the learning process (Bash et al., 2020). To this end, ELM emphasizes hands-on activities so that students can build up knowledge for themselves and have experience; instead of theoretical learning, where they read about science instead of doing science.

ELM is based on Kolb's model which stems from Dewey's theory of experience (Nweke et al., 2014). They further explained that (ELM) is a teaching-learning strategy which revolves around the idea that children are highly engaged in the learning process by the full interest they devote to doing anything by themselves; interacting with others, understanding tasks on their thinking critically, and attempting to clarify or prove their assumptions by carrying out test to arrive at conclusions based on available substantial evidence which they have collected.

Nweke et al. (2014) noted that ELM consists of four major stages involved in learning. These are made up of concrete experience and abstract conceptualization (two related modes of acquiring experiences), as well as reflective observation and active experimentation (i.e. two major pathways for transforming experiences). The scholars went further to submit that these stages may or may not have been in the same sequence. Everything according to them is a function of the nature or type of learning that is to take place. Some researchers have revealed the effectiveness of ELM in enhancing the teaching and learning of science. These studies show the efficacy of ELM in enhancing students' learning and performance (Weinberg et al., 2011, Nweke et al., 2014, Okoli & Abonyi 2014, Bash et al., 2020). It is imperative to note that research evidence is not sufficient about the effectiveness of ELM at the primary school level. Hence, there is a dire need for the present study.

**Statement of the problem**

Various factors have been identified as being responsible for the poor performance of students in basic science and technology in the Basic Education Certificate Examination (BECE) of which poor teaching methods loom high (Bash et al., 2020). To this end, teaching strategy has been identified as a significant factor affecting students' interest, performance and retention in Basic Science and Technology (Walele & Nwanekezi 2021). However, the traditional teacher-centred conventional lecture method (talk-chalk method) is still widely used in Nigeria and this adversely affects the teaching and learning of science. In this light, there is a need for teaching strategies that will encourage the active participation of learners for learning to be meaningful. Against this backdrop, the major thrust of this research is to investigate the effects of the Experiential Learning Model (ELM) on pupils' interest in basic science and technology at the middle basic level (primary 4-6). Also, the researcher wishes to embark on this research because many studies about this at the primary school level have not been done.

**Aim and Objectives**

In general terms, this study aims to investigate the effects of the experiential learning model (ELM) on pupils' interest in basic science and technology at the middle basic level (primary 4-6). Specifically, the objectives of the study include:

1. To determine the effect of the Experiential Learning Model on pupils' interest in basic science and technology.
2. To investigate the effect of gender on the mean interest scores of pupils taught basic science using the Experiential Learning Model.

**Research Questions**

1. What is the effect of the Experiential Learning Model on pupils' interest in basic science and technology?
2. Does gender affect the interest of pupils taught basic science and technology using the Experiential Learning Model?

**Hypotheses**

1. The Experiential Learning Model does not significantly affect pupils' interest in basic science and technology.
2. Gender has no significant effect on the interest of pupils taught basic science and technology using the Experiential Learning Model.

**Methodology**

The study was a quasi-experimental research. It adopted a pre-test, and post-test non-equivalent group design to investigate the effects of the Experiential Learning Model (ELM) on pupils' interest in basic science and technology at the middle basic level (primary 4-6). The population of the study consisted of all the pupils in primary six at a middle basic level in Oyigbo Local Government Area. The sample of the study is made up of one hundred and twenty pupils in primary six; which were constituted into intact classes from two public primary schools randomly selected out of the 21 public primary schools in the Education Zone. The experimental group (ELM) comprised sixty pupils, thirty-three males and twenty-seven females. While the control group (Expository Strategy, ES) comprised twenty-eight males and thirty-two females. The instrument used for data collection was the Basic Science and Technology Interest Scale (BSTIS). The (BSTIS) consisted of 20 items. It was a modified Likert type comprising Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) which were rated thus: 4,3,2,

BSTIS was validated by a specialist in measurement and Evaluation at the Ignatius Ajuru University of Education and another specialist in science education at the Federal College of Education, Technical, Omoku. This was done to ascertain the face and content validity of the instrument. Also, the validation of the lesson plans was done by an expert in basic science. The corrections made were reflected in the final draft of the instruments. The reliability of the BSTIS was determined by carrying out a trial testing on a sample of twenty-five pupils who were not part of the sample constituted for the study, but have similar characteristics. The instrument was administered to the pupil and retrieved as soon as they were through with responding to it. The reliability coefficient was found to be 0.78 using Cronbach's alpha. This showed that BSTIS was 78% reliable for carrying out the study.

The class teachers took part in the collection of data as research assistants. They were trained on the new strategy ELM. The questionnaire was first administered to the students in the experimental group before introducing ELM, their responses served as the pre-test scores. The students' responses after exposure to ELM served as post-test scores. After the pretest, the class teachers for the experimental group taught them using ELM, while the control group was taught by their respective class teachers using the expository strategy (ES). The content covered were energy concepts, simple machines and forces which were selected from the primary six curriculum. The experimental group were taught for three weeks. After the three weeks of teaching, BSTIS was administered to both groups (experimental and control groups) to ascertain their interest levels.

The research questions were answered using mean and standard deviation, while the hypotheses were tested at 0.05 level of significance using the Z test.

**Results**

**Research question 1**: What is the effect of the experiential learning model on pupils' interest in basic science and technology?


*Cite this article as*:
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**Table 1: Pretest and Post-test mean interest and standard deviation scores of pupils taught basic science and technology**

| Group | No of Pupils | Pretest | | Post-test | | Mean gain | % gain |
|---|---|---|---|---|---|---|---|
| | | Mean | S. D | Mean | S. D | | |
| **ELM** | 60 | 1.80 | 1.03 | 3.56 | 0.82 | 1.76 | 49.4 |
| **ES** | 60 | 1.83 | 0.90 | 2.06 | 1.01 | 0.23 | 11.2 |

Table 1 revealed that the experimental group, ELM had a mean interest score of 1.80 and a standard deviation of 1.03 in the pretest and a mean of 3.56 and a standard deviation of 0.82 in the post-test making a pretest – post-test mean gain of 1.76 (49.4%). Moreover, the control group had a mean interest score of 1.83 and a standard deviation of 0.90 in the pretest as well as a mean interest score of 2.06 and a standard deviation of 1.01 in the post-test, making a pretest – post-test gain of 0.23 (11.2%). This indicates that the ELM (Experimental) group had a higher interest towards Basic Science and Technology Concepts compared to the control group; because the pretest – post-test difference in mean gain of 1.53 (38.20%) was in their favour.

**Research question 2:** Does gender affect the interest of pupils taught basic science and technology using the Experiential Learning Model?

**Table 2: Pretest and Post-test mean interest and standard deviation scores of males and females in basic science and technology**

| Gender | No of Pupils | Pretest | | Post-test | | Mean gain | % gain |
|---|---|---|---|---|---|---|---|
| | | Mean | S. D | Mean | S. D | | |
| **Male** | 33 | 1.80 | 0.91 | 3.35 | 0.99 | 1.55 | 46.3 |
| **Female** | 27 | 1.76 | 0.87 | 3.29 | 1.10 | 1.53 | 46.5 |

From Table 2 it is obvious that the boys in the ELM (Experimental) group have a mean interest score of 1.80 and standard deviation of 0.91 in the pretest, as well as a mean interest score of 3.50 and standard deviation of 0.99 in the post-test making pretest – post-test gain of 1.55 (46.3%). Also, the girls had a mean interest score of 1.76 and a standard deviation of 0.87 in the pretest and a mean interest score of 3.29 and a standard deviation of 1.10 in the post-test; making a pretest – post-test gain of 1.53 (46.5%). This indicates that the difference in mean gain of 0.02 (0.20%) is quite negligible. Gender did not affect the interest of the pupils taught Basic Science and Technology using ELM.

**$H_{01}$:** ELM does not significantly affect pupils' interest in Basic Science and Technology

**Table 3: Z Test Analysis of Mean Interest Scores of Pupils in Basic Science and Technology**

| Group | Mean | S. D | No of Pupils | DF | Z cal | Zcrit | Result |
|---|---|---|---|---|---|---|---|
| ELM | 3.56 | 0.82 | 60 | | | | |
| | | | | 118 | 5.51 | 1.96 | Significant |
| ES | 1.83 | 0.90 | 2.06 | | | | |


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The result of Table 3 revealed that the calculated Z value (8.51) is greater than the critical Z value (1.96) at 0.05 level of significance and 118 degrees of freedom. On this ground, we reject the null hypothesis ($HO_1$). This implies that ELM significantly affected the pupils' interest in Basic Science and Technology.

**$H_{02}$:** Gender does not significantly affect the interest of pupils taught basic science and technology using ELM.

**Table 4: Z Test Analysis of Mean Interest Scores of Boys and Girls Taught with ELM.**

| Gender | Mean | S. D | No of Pupils | DF | Z cal | Zcrit | Result |
|---|---|---|---|---|---|---|---|
| Boys | 3.55 | 0.99 | 33 | 58 | 0.22 | 1.96 | Not Significant |
| Girls | 3.29 | 1.10 | 27 | | | | |

From the above table, it is obvious that the calculated Z value (0.22) is less than the critical Z value (1.96). Therefore, we fail to reject the null hypothesis. This implies that gender does not have a significant effect on the interest of pupils taught Basic Science and Technology using ELM.

**Discussion**

Table 1 revealed that the experimental group - ELM group had a higher mean interest score than the control group (ES group) i.e. the ELM group had a higher interest towards Basic Science and Technology than the ES group. The Z test for null hypothesis one showed that ELM significantly affected pupils' interest in Basic Science and Technology at a 0.05 level of significance. This established that the pupils taught with ELM had a higher interest towards Basic Science and Technology instruction compared to their counterparts taught with conventional expository methods. This finding is in line with Nweke et al. (2014) and Bash et al. (2020) whose works revealed that ELM was significant in facilitating students learning and achievement in basic science and technology. It is also in agreement with Geh (2014) who asserted that students' learning becomes very meaningful when the students learn from their own experience. The findings also agree with Bibi et al. (2022) who were of the view that the method was more effective than the usual traditional methods of teaching. Making use of experiential learning improves and enhances students' interest and understanding thereby helping the learners to create their knowledge.

Analysis of data about gender effect on the interest of pupils taught Basic Science and Technology using ELM, revealed that gender did not affect the interest of pupils taught with ELM because the difference in mean gain is negligible. Also, Z-test of hypothesis two showed that gender did not have a significant effect on the interest of pupils taught Basic Science and Technology using ELM at 0.05 level of significance.

**Conclusion**

The findings of this study have revealed that ELM is significant in enhancing pupils' interest towards basic science and technology at the middle basic level (Primary 4 – 5). Because most concepts in Basic Science and Technology appear abstract to pupils at this level, as well the fact that basic materials and resources may not be adequately available and that most science teachers at this level lack the competence and skills to make concepts in the subject look meaningful to pupils. It has become very imperative for primary school teachers about this study, to adopt innovative strategies like ELM to enhance the teaching and learning of Basic Science and Technology at the middle basic level of education (Primary 4 – 6).

**Recommendations**

1. Curriculum developers and experts should make ELM an instructional model for teaching Basic Science and Technology at the middle basic level (Primary 4 – 6).
2. Primary school teachers should be effectively trained on the ELM approach to enhance the teaching and learning of Basic Science and Technology.
3. Government and other stakeholders as well as NGOs should help to provide facilities and resources that will encourage and promote the use of ELM at the middle basic level (Primary 4 – 6).


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