

Improving Basic Science and Technology Instruction in Owo, Ondo State: Implication for Teacher perception of Learning Experiences and Classroom Interactions

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Abstract

This study investigated students' learning experiences and classroom interaction as predictors of a achievement in Basic Science and Technology in Owo, Ondo State. The survey design was adopted. The instruments were: Student Learning Experience Questionnaire ($r=0.76$) and Classroom Interaction Questionnaire ($r=0.74$). Ten Junior Secondary School were randomly selected and 20 students were selected from each school making a total of 200 students who participated in the study. Also, two Basic Science and Technology teachers were randomly selected from the ten schools and a total of 20 teachers participated in the study. Data were analysed using Pearson product moment correlation and multiple regression at 0.05 level of significance. Results showed that the joint significant contribution of the learning experience and classroom interaction to Achievement was significant ($R = .299$ and a multiple R^2 of $.089$) accounting for 8.9% of the variance in achievement. The relative contribution were $\beta=.350$, and classroom interaction ($\beta= .010$) $t=$ respectively. There were positive relationships between learning experience ($r=4.210$), classroom interaction ($r=0.151$) and achievement. Teachers of Basic Science and Technology should improve on their teaching techniques and strategies and improve their relationship with the students for better learning outcome.

Introduction

Basic science and technology curriculum for junior secondary schools has been designed to serve two purposes first, to form an integral part of the general education for all the children of school age for the nine years compulsory basic education programme and secondly, to produce future scientist and technical and constructionist. Thus, the effective teaching and learning of basic science and technology in the school system should be accorded to priority of any educational system. Science and Technology has proved significantly useful in the daily struggles of human to control their environment and the build a virile world. Besides, the rapid pace of globalization in most parts of the world has fueled the use of science and technology as a means to solve human problems and attain the Sustainable Development (SDGs) and Vision 20.20 (UNESCO 2016).

To this end, Science Education has become essential for any nation to compete favorably with her contemporaries all over the world. Science Education is expected to produce scientifically and technologically literate individuals and equip potential scientists with skills, knowledge and attitudes that would enhance the global, economic, social and industrial growth that are increasingly driven by the advancement of Science and Technology.

Basic science and technology in education system in Nigeria, was as a result of the re-alignment

and restructuring made in the curricula of primary and junior secondary school integrated science Basic science and technology is a broad field subject that investigates into nature, analyses societal problems and also provides some technological needs of the society. The importance of science and technology cannot be over emphasis. Human capital developments in science and technology education are the gate way to a scientific, technological and progressive society. They are also the bedrock upon which modern scientific, technological and advanced nations are building. According to national policy on education, Basic science and technology is a broad field subject which comprises of basic science, basic technology, information communication technology, and physical and health education.

Basic technology is a synonymous with technical education, industrial technical education and industrial art is defined by the nation policy on education as an aspect of the educational process involving acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life. Technology education is the teaching of technology subjects in order to acquire practical skills. According to the National Policies of Education, Basic technology should be directed at making student to acquire the following skills: Provides trained manpower in the applied sciences, technology and business particularly at craft, advanced craft and technical levels; Provides the technical knowledge and vocational skills necessary for agriculture,

commercial and economic development; Give training and impart the necessary skills to individual who shall be self-reliant economically.

Despite the fact that basic science curriculum at junior secondary school is derived from the experience in teaching earlier curriculum content, evidences were given by inspectors and practicing teachers to confirm that as far as teaching of basic science and technology was concerned, the lecture method still predominates in contradiction to the agreed guided discovery methods of teaching because of lack of experts to the subject, teaching is still essential done by specialist in Biology, Chemistry or Physics. The resulting poor teaching of the subject and the non-completion of the prescribed content has introduced a weak background and prevented the introductory purpose of the course to senior secondary school science subjects from been achieved. Consequently, student readiness for biology, chemistry and physics at the SSS level has become defective.

Lamb and Amola (1980) are the view that children learn best when they are interested and when the activities reflect their own experiences. There has been a growing public anxiety about the teaching and learning of Science in Nigerian schools. Studies such as Ogunmade (2005) has showed that large numbers of students learn very little science at schools, learning tends to be by rote and most students find learning of Science to be difficult. The quality of Science teaching and learning has also been questioned over time by parents, Science educators and the general public and even the government. Science teaching in Nigeria has been criticized because of poor performance of Nigerian students in Science subjects relative to their counterpart in other countries. This is evident from the second international science competition in which Nigerian students came last in primary and secondary science among the participatory countries in the world (Ogunmade, 2005).

Learning activities, as the name suggests, are activities designed or deployed by the teacher to bring about, or create the conditions for learning. The difference between a learning by Design approach to employing various learning activities and other approaches to teaching relates to the pedagogical character or focal intent of the activities selected. *What do I want to achieve with this activity? How will I achieve my aims? Which Knowledge Process is best suited to achieving my aim?* With Learning by

Design the teacher mindfully designs or chooses particular learning activities based on which Knowledge Process is activated by that activity. Some learning activities stimulate experiential learning; others mobilize conceptual thinking, while still others prompt students to engage in analytical discussion. The pedagogical effectiveness of a **Learning Element** – a teacher's overall design – can be traced to the mindful selection of learning activities based on the Knowledge Processes which those activities set in motion; the establishment of direct links between those activities and the intended **Knowledge Objectives**; and the careful sequencing of those activities such that they build on, or contribute to, the learning of earlier or later activities.

Learning activities is a form of activity that leads learners to gain experience. Dada 1999 describe learning activities what the learner do to bring about the acquisition of knowledge in the course of implementing the curriculum and in selecting learning activities that essentially leads to the achievement of curriculum objectives, consideration must be given to the nature of the learners because the learning activities must be at the range of the learners age, mental, emotional, and psychological state of the learner and also the available materials must be considered too because these brings the learner and the curriculum content together under the guidance of the teacher. Content must be well organized both in scope (coverage) and sequence so that learning activities can leads to learning experiences. While learning experiences as part of the elements of curriculum, refers to any interaction, course, program, or other experience in which learning takes place, whether it occurs in traditional academic settings (schools, classrooms) or nontraditional settings (outside-of-school locations, outdoor environments), or whether it includes traditional educational interactions (students learning from teachers and professors) or nontraditional interactions (students learning through games and interactive software applications). Because students may learn in a wide variety of settings and ways, the term is often used as a more accurate, preferred, or inclusive alternative to terms such as *course* for example, that have more limited or conventional connotations. *Learning experience* may also be used to underscore or reinforce the goal of an educational interaction – learning - rather than its location (school, classroom) or format (course, program), as explained

by Tyler refer to the interaction between the learner and the external condition in the environment to which he can react. This is the learner's knowledge or prior knowledge which they bring into the new situation where they are expected to learn new things and skills, values and concept. Dada 1999 also observed that what learners do when they are brought in contact with the contents and the materials of education, under the guidance of the teacher, in a conducive environment, that they have the experience of doing or performing a given task.

The learning activities and learning experience leads to classroom interaction, during the activities, interaction occurs between the various elements of the instructional system and their reciprocal inter-play or relationships. Classroom interaction is studied from a social interaction perspective to unearth the mechanisms teachers and students use to conduct their classroom business. This business varies from teacher-fronted activities to student group work, or teacher-student dyadic interaction. Language and social interaction research of classroom interaction is concerned with the classroom work participants do together in mutual interactional engagement and therefore focuses empirically on what participants make observable for each other in their interaction behaviour, both in terms of how participants want to be understood and in terms of how participants understand each other. For this observable character of the interaction process of meaning making, it is referred to as "social" interaction. The interaction and the mutual understanding involved are the concern and the achievement of more than one actor and these activities therefore are studied as a social process rather than as a set of individual cognitive processes. Therefore, learning cannot take place as expected, as both teacher and students need to interact meaningfully before they can achieve the set objectives.

Teacher-student interaction is important for many reasons. Teacher student interaction is highly influence a student's skill, to do well at different levels of education, and to relate to peers (Pianta, 1999). Teachers who had positive and secure relationships with students reported that their students were less likely to stay away from school, appeared more independent, more supportive, and busy in learning (Birch & Ladd, 1997; Klem & Connell, 2004).

Teacher-student Interaction has an impact on classroom management and affects learning and growth. According to developmental perspective, the establishment of a positive teacher-student relationship aids a student's cognitive, social and emotional growth and enhances their mental well-being (Brazelton & Greenspan, 2000). The teacher-student relationships impact productively on a student's self-esteem and enhance their skills. Student-Teacher interactions are very important for the development of the students' academic self-concept and enhancing their enthusiasm and success.

Teachers who have positive interaction with their students create classroom environments more helpful to learning and meet students' developmental, emotional and educational needs. Curriculum therefore, cut across different subjects, as each subject has its own peculiarities and work plan. One of the major subjects for the junior secondary schools across the country is basic science. Science is an aspiring process of discovering, that helps satisfy the natural curiosity on nature and the environment both physical and biological. Science can be defined as the pursuit and application of knowledge and understanding of the natural and the social world following the systematic methodology based on evidence, it is the process of thinking, observing and investigating an event. Ogunleye 2000 defined science as that dynamics human activities concerned with the understanding of the world. This understanding helps human to know about the universe and the awareness of other part of the planets. Science and technology as develop and fulfill the needs of any country to the barest minimum, promote efficiency, self-reliance and the wellbeing of humanity through inventions and innovations in telecommunications, transportations, agricultures, health, education and so many others. Science occupies a very important and enviable position in Nigeria education system. This important has been realized by the government, parents, the society at large, the teacher and the secondary school students themselves. Science courses are linked together and many professions emanate from their linkage including medicine, pharmacy, nursing and engineering etc.

However, proper stimulation of students learning experiences and class interaction with both human and material resources could go a long way to improve the current trend of poor academic performance in Basic Science and Technology. Therefore, this study investigated students learning

experiences, and classroom interaction as correlates of student's achievement in Basic Science and Technology in Owo Local Government area , Ondo State.

Statement of the Problem

Efforts have been made by government, schools and other agencies towards ensuring that scientific attitude, skills and knowledge of science concepts are inculcated in learners right from schools by exposing them to qualitative science teaching. These efforts include curricular reviews, exposing teachers to new teaching strategies and skills development through regular workshops, providing funds to purchase of instructional materials or encourage the use of science kits. Despite these efforts, students still exhibit poor attitude and under achievement in sciences in junior secondary schools in Nigeria, indicating that the objectives of the Basic Sciences as stated in the curriculum are not being achieved. Majority of previous studies on effort to address the problem focused on the use of different strategies to teach student directly. However, most of the studies did not emphasize learning experiences and classroom interaction as correlates of students' achievement as a focus. This study therefore investigated learning experiences and classroom interaction as correlates of achievement in Basic Science and Technology in Owo, Ondo State

Research Questions

1. What relationship exists between the independent variables and achievement in Basic Science?
2. What are the composite contributions of independent variables (students learning experiences and classroom interaction) to achievement in Basic Sciences and Technology?

3. What is the relative contribution of learning experiences and classroom interaction to achievement in Basic Science and Technology?

Scope of the study

This study focused on student learning experiences, and classroom interactions as correlates of student's achievement in junior secondary schools in Basic Science and Technology.

Significance of the study

This study will be of theoretical importance as it will contribute to the body of literature on the role of learning experiences and classroom interaction on students' achievement in Basic Science and Technology. Also, curriculum planners will be more informed on some factors that could help in setting benchmark for the Basic Science and Technology curriculum.

Methodology

This study adopted the correlational research design. Twenty junior secondary schools were enumerated in Owo Local Government Area. Random sampling was used to select 10 junior secondary schools from Owo Local government Area. Two teachers of Basic Science were also randomly selected from each school making a total of 20 Basic Science and Technology teachers who participated in the study. The instruments used were: Students' learning experiences questionnaire ($r=0.76$) and students' classroom interaction questionnaire ($r=0.78$) and Achievement Test in Basic Science and Technology ($r=0.74$). Data were analysed using Pearson product moment correlation and multiple regression at 0.05 level of significance.

Research Question one: What is the composite contribution of Student learning experience and Classroom Interaction to Students' Achievement in Basic Science and Technology?

Table 1: Regression Analysis showing the joint contribution of Student learning experience and Classroom Interaction to Students Achievement in Basic Science and Technology

R	R Square	Adjusted R Square	Std. Error of the Estimate			
.299	.089	.075	3.1700			
A N O V A						
Model	Sum of Squares	DF	Mean Square	F	Sig.	Remark
Regression	193.556	3	64.519	6.415	.000	Sig.
Residual	1971.319	196	10.058			
Total	2164.875	199				

Table 1 shows the joint contribution of the three independent variables to the prediction of the dependent variable i.e. Students Achievement in Basic Science and Technology. The table also shows a coefficient of multiple correlation ($R = .299$ and a multiple R^2 of $.089$). This means that 8.9% of the variance in student achievement in basic science and technology was accounted for by three predictor variables when taken together. The significance of the composite contribution was tested at $P < .05$. The table also shows that the analysis of variance for the regression yielded F-ratio of 6.415 (significant at 0.05

level). This implies that the joint contribution of the independent variables to the dependent variable was significant and that other variables not included in this model may have accounted for the remaining variance.

Research Question two: What is the relative contribution of the independent variables (Teachers' perception of curriculum objective, Student learning experience and Classroom Interaction) to the dependent variable (Students Achievement in Basic

Table 2: Regression Analysis showing the relative contribution of Student learning experience and Classroom Interaction to Students Achievement in Basic Science and Technology

Model	Unstandardized Coefficient		Standardized Coefficient	t	Sig.
	B	Std. Error	Beta Contribution		
(Constant)	11.971	3.881		3.084	.002
Teachers' perception of curriculum objective	.137	.041	.275	3.313	.001
Student learning experience	-.148	.035	-.350	-4.207	.000
Classroom Interaction	7.273E-03	.048	.010	.151	.880

Table 2. reveals the relative contribution of the three independent variables to the dependent variable, expressed as beta weights, viz: Teachers' perception of curriculum objective ($\beta = .275$), Student learning experience ($\beta = -.350$) and Classroom Interaction ($\beta = .010$) respectively. In conclusion, it can be inferred that the three independent variables (Teachers perception of curriculum objectives, students' learning

experiences, and classroom interactions) contributed individually to students' achievement in basic science and technology.

Research Question Three: What is the relationship between learning experiences and classroom interaction and Achievement in Basic Science and Technology?

Table 3: Correlation matrix of independent variables and Students Achievement in Basic Science and Technology

Construct	Achievement in Basic Science and Technology	Learning Experiences	Classroom Interaction
Achievement in Basic Science and Technology	1		
Learning Experiences	.719* .000	1	
Classroom Interaction	.595* .000	.039* .019	1
Mean	25.50	26.55	21.05
Std. Deviation	5.925	3.759	3.316

*Denotes correlation at 0.05 level of significance.

Table 3 indicates that there is a significant relationship between learning experiences ($r = .719$) and Classroom Interaction ($r = 0.595$).

Discussion .

Learning Experiences and Classroom Interaction as Correlates of Achievement in Basic Science and Technology

There was a positive correlation between the independent and dependent variables. The findings of this study revealed that learning experiences and classroom interaction has a positive significant relationship on teachers' professional identity. It means that any slight improvement in the two variables would improve students' achievement. This would be attributed to the fact that the nature of learning experiences and classroom interaction would influence learning outcomes.

Student Learning Experiences, Classroom Interaction and Student Academic Achievement in Basic Science and Technology.

Findings from this research revealed that there is joint contribution of the three independent variables (curriculum objectives, learning experiences, and classroom interaction) to the prediction of dependent variables i.e. Student Achievement in Basic Science and Technology. There are some researchers who used a broader combination of classroom relations, interactions and teacher characteristics as classroom characteristics to predict student academic performance. There is high contribution of the variables to academic achievement. Classroom has great impact on academic achievement. Teacher's attitude and behaviour are vitally important, genuine involvement of student in class activities, flexibility of rules by teachers, communication, competition, staff morale also plays crucial role, use of new techniques, planning various activities - assignments- encouraging creative thinking in student, affiliation between classmates and teacher etc. are various factors which influence academic achievement of students.

Relative Contribution of Students Learning Experiences, and Classroom Interaction to Student Academic Achievement).

Findings reveals the relative contribution of learning experiences and classroom interaction

to academic achievement. Learning Experiences is what the learner interacts with, the materials and the content under the guidance of the teacher, in a conducive learning environment, that they can have experience of doing or performing a given task. It is the activities the teacher engaged the student with that leads the learner to gain experience. Kolawole (2015). Content must be well organized so that learning activities can lead to learning experience which have a very huge impact on student achievement. Classroom interaction plays an important role in development for school-aged children. Student experiences within the classroom help to develop their behavioral, social, and academic skills. Close teacher-student relations and teacher self-reported use of good instructional practices predicts positive student academic achievement. The quality of the interactions that students have with their teachers predicts later academic success (Pianta, Steinberg, & Rollins, 1995). Classroom characteristics, such as class composition, student and teacher characteristics, student interactions with peers and teachers, classroom values, and classroom beliefs all influence student academic development.

Conclusion

Learning experiences and Classroom interaction influenced academic achievement of students in Basic Science and Technology.

Recommendation

Teachers should be well trained and in-service training should be organized by the government to improve their teaching techniques and strategies. Teachers should be partaker of the curriculum development, they are closer to the learners and interact with them on a daily basis, they know the learners needs, ability and their learning styles. Students should be well sensitized on the importance of classroom interaction both teacher-student interaction and student-student interaction. Curriculum planners should lay emphasis on enriching learning experiences of students.

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