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Influence of Instructional Materials on the Teaching and Learning of Sciences in Senior Secondary Schools in Aba Education Zone, Abia State, Nigeria

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Abstract: *The purpose of the study was to examine the influence of instructional materials on the teaching and learning sciences in senior secondary schools in Aba education zone. To achieve this, the study was guided by two objectives, research questions, and null hypotheses which were formulated to find out the influence of instructional materials on the academic performance of students in the senior secondary schools in Aba education zone. The theoretical framework was based on Piaget's cognitive development theory of (1983). A total of 140 male and female teachers were randomly selected from population of 280 teachers in the study area. A structured four point scale questionnaire titled "influence of instructional materials on the teaching and learning sciences in senior secondary schools" was constructed by the researchers and used to collect data for the study. Data obtained were analyzed using inferential statistics. The research questions were answered using descriptive design by calculating mean and standard deviation for scales based on the sub-variables from male and female science teachers and the hypotheses were tested with paired t-test at 0.05 alpha level of significance. The findings of the study revealed that influence of instructional materials in teaching and learning resulted to poor academic performance of students in the senior secondary schools in Aba educational zone. The researchers recommended that all the school stake holders and non-governmental agencies should help to ensure that enough instructional materials such as charts, pictures, lens, mode and maps, graphs and so on are provided for the teaching and learning sciences in Aba educational zone.*

Keywords: *Science education, teaching, learning, teaching strategies, instructional materials.*

Introduction

Over the years science education has faced various challenges. The school curriculum offers a child-centered teaching-learning approach as students are encouraged to take up the science related subjects which occupies a unique position in the school curriculum and is central to many science related courses (Yusuf and Folabi, 2010). In Nigeria, the curriculum of science subjects in the school curriculum is to promote national development as the nation adopts more science oriented policies and programs in education (Oriahi, Umumuavbi and Aguele, 2010). Science is the study of nature and behaviour of living and non-living things (Okolo, 2010). It is a body of knowledge gotten through a step-by-step study of all forms of matter. According to Mbajorgu (2003)

science is concerned with regards to developing, acquiring and controlling knowledge, skills, capacity and attitude about natural factors of the environment. Science education has been recognized worldwide as a pre-requisite in science and technological development. It is that education intended to make every individual scientifically literate enough to live in this age of science technology and to have men and women with high intellectual ability, productive and functional members of the society through training in science based progressions or vocation (Hyacinth, 2004). Science is a great enterprise which technically, is receiving much emphasis in education because of its significant and relevance to life and society.

Effective teaching and learning of sciences is a process by which a science teacher adopts all the possible methods used in teaching in the classroom to make sure that students understand the concept and be able to respond positively during assessment or to produce a good result (Ugwuoke, 2018). Teacher effectiveness is exhibited in the teaching method, classroom management, material used in teaching, as well as the way students are been handled. Effective teaching and learning is crucial in order for students to reach educational success in and outside classroom setting. However, there are many factors militating against effective use of instructional materials in teaching and learning sciences in secondary schools. These factors are grouped into three- learner's characteristics, teacher's characteristics and the learning environment. The learner is the most important of these factors because without him, there will be no learning at all. The teacher is important since he is the person who provides the learning experiences which the learner needs. The learning environments count because it represents all the elements which act to affect the learner and the teacher in one way or the other. These factors should be taken into account for the achievement of effective teaching and learning of sciences in Aba education zone.

It is necessary to use appropriate teaching strategies in learning and teaching science so as to attain its objectives in the school. Onyejemezie cited in Ojike (2018) makes reference to a Chinese saying "a look is worth a thousand words". This explains that what a teacher may spend much time and words trying to describe can easily be understood by the learner if effective instructional materials are used to present the situation or object. Teaching is an attempt to help someone to acquire or change attitude, knowledge, skill, behavior or appreciation. It consists of setting the stage so that someone can learn. To achieve this objectives there are a lot of inputs in terms of human and material resources such as teachers and instructional materials: charts, pictures or images, modes, graphs, lens and so on.

Chart is a geographical representation of data in which the data is represented by symbols such as bar, in a bar chart, line chart or slices in a pie chart. A chart can represent tabular numeric data, functions or some kind of quantitative structures and provides different information to the learners. They are often used to ease understanding of large quantitative of data and relationships between the parts of data. They are usually read more quickly than the raw data.

Picture also called image is a group of colored points on flat surface that looks the same as something else, is an instructional material for teaching and learning sciences. For example, a picture can look the same as an object or a person. A picture can also be drawing paintings or photographs. They are very helpful in teaching and learning sciences. Pictures and diagrams can be used to explain how to do things and

thus a picture is a kind of tool, while an image is something that can be seen but it is not physically there. It can be photograph, a painting or a picture on a television or computer screen. A lens can make an image of an object to appear somewhere else. For instance, when there were no cameras, people made pictures by using paint, brush, pencils, crayons, pens and other things people can write or draw with. Pictures made with paints and brushes are called paintings. They can be put on walls and other things even in class for teaching and learning sciences (Ihedioha, 2019).

Chart is a means of representing data, also called graphs. It can be a set of verticals or edges (discrete mathematics). Graphs are used in teaching and learning sciences in the classroom and other teaching areas other than classrooms.

Mode is another useful instructional material for teaching and learning sciences. Modes are a type of musical scale constructed with a set of characteristic melodic behaviours, musical thoughts used since the middle ages, and were inspired by the theory of the ancient Greek music. The name is derived from a Latin word “modus”, meaning measure, standard, manner, way, size, limit or quantity, or method (Wikipedia, 2019).

Map is another instructional material of relevance in teaching and learning sciences. Map represents physical features on the ground (roads, or buildings), using tags, attached to its basic data structure (its nodes, ways and relations). Each tag describes a geographical attribute of the feature been shown by that specific node, way or relation. The way science is been thought in senior secondary schools and colleges leaves more to be desired. The secondary schools in Aba education zone are not in exception. It is against this background that the researcher attempts to examine the influence of instructional materials on the teaching and learning sciences in secondary schools in Aba educational zone.

Statement of the Problem

Every year when results of the public or officials exams (WAEC/JAMB) on science subjects are released, there are mass failures on the sciences (mathematics, physics, biology, chemistry) and even geography precisely. The reason for these mass failures could be that some topics in science subjects are yet to be understood by the students but could effectively be well taken with the use of instructional material like charts, maps, modes, pictures, lens and diagrams.

Purpose of the Study

1. The general purpose of this study is to find out the influence of instructional materials on the teaching and learning sciences in Aba educational zone. Specifically, the study sought to find out influence of inadequate use of instructional materials such graphs, maps, images and so on, on teaching and learning sciences in Aba education zone.
2. The effect of inadequate instructional materials on the teaching and learning sciences in the secondary schools in Aba education zone.

Research Questions

The following research questions were posed to guide the study:

1. What are the influences of instructional materials on the teaching and learning sciences in Aba educational zone?.
2. What are the influences of inadequate materials like charts, images and so on, on teaching and learning sciences in Aba educational zone?.

Hypotheses

The following null hypotheses testable at 0.05 levels of significance are formulated to guide this study.

1. There is no significant difference between the mean scores of male and female teachers' responses on the influence of instructional materials on teaching and learning sciences in Aba education zone.
2. Inadequate use of instructional materials does not influence significantly on the mean rating scores of teacher's responses on the teaching and learning sciences in senior secondary schools in Aba educational zone.

Significance of the Study

The study is significant because of its possible benefits to the teachers, students, administrators, curriculum planners, government and the society in general. It may be beneficial because students who do well in sciences could have prospects of becoming doctors, nurses, pharmacists, microbiologists, biochemists, teachers and other related disciplines in future.

Theoretical Framework

The study is anchored on the theory of cognitive approach of Piaget and associates (1983). Piaget and Bruner were frequently cited as foundational influences on development of this perspective. Cognitive theorists recognized that much learning involves association established through cognitivity and repetition of reinforcement, although they stressed that its role in providing feedbacks about the correctness of responses as a motivator. Cognitive theorists view learning as involving the acquisition or reorganization of the cognitive structures through which human process store information. Cognitive theorists believed that materials are analyzed and sequenced, often to a simple to complex or hierarchical order (Piaget, 1983).

According to Bruner (1978)'s theory of development, learning is effectively engaged in, if the learner is given the opportunity to discover facts by him or herself. He argues that many presentation of information will not enhance effective solution of a problem. The theory stress cognitive effectiveness. He further stated that the learning by discovery begins when a science teacher purposefully create a problem and present it to the students by introducing some inconsistence among the information which are given in the process of teaching. The intellectual discomfort created by the inconsistency make the learner to attempt to bring order out of this confusion by engaging in mental processes: discovery activities which involves observation, hypothesizing, measuring, stating problem, data collection, classifying and inferring (Ihedioha, 2019; Mberekpe, 2013).

The application of Jerome Bruner is a theory of teaching and learning created or presented problems to students either by apparent contribution or inconsistency among learning sources of information which are given in the process of instruction. Encouraging discovering learning in science class by the science teachers will result out

helping problem solving. Discovering learning encourages creativity, so students' should be taught concepts in such a way that they have applicability beyond the situation in which they are instructed to learn. Cognitivism advocated the fundamental structure of curriculum to begin with simple contents and later graduated to complex contexts. This means that teaching of science should be inductive. Cognitivism supported the spiral nature of curriculum as we have in our present science curriculum at all levels of education (Mkperekpe, 2013).

Methodology

The study adopted the descriptive survey design. The design entails the collection and use of data systematically, from a given population to describe certain characteristic features which aims at investigating the influence of structural materials on the teaching and learning of sciences in secondary schools in Aba educational zone. Survey research is viewed as one in which a group of people or items are studied by collecting and analyzing data from only a few people or items considered to be the sample of the entire group (Nwogu, 2006). The target population for the study consists of 140 male and female science teachers, from the 280 targeted science teachers in Aba education zone. The main instrument adopted for the collection of data was a 9 item structured questionnaire captioned "influences of instructional material on the teaching and learning sciences". The instruments was validated by experts in education technology and measurement and evaluation in the school of education, National Institute for Nigerian Languages, Aba. The questionnaire was trial tested using 50 male and female science teachers from umuahia education zone and it yielded a reliability coefficient value of 0.87 using Cronbach alpha statistics. The co-efficient signifies high internal consistency and reliability which is good enough for the study. The data collected were analyzed using inferential statistics. The research questions were answered using correlation design by calculating mean and standard deviation for scales based on the sub-variables of science teachers, while the hypotheses were tested with paired t-test at 0.05 alpha level of significant.

Discussion of Findings

Research question one: what are the influence of instructional materials in teaching and learning sciences in Aba educational zone?

Table 1: mean scores and standard deviation of male and female science teachers on the teaching and learning sciences with instructional materials.

S/N	Statements	n	Means	SD	Dec.
1.	Most teachers do not use their instructional materials during Their science classes.	140	3.33	.82	SA
2.	Some schools do not have instructional materials for science classes.	140	2.99	1.07	A
3.	Most teachers use textbooks in their teaching of sciences in classroom.	140	2.99	1.07	A
4.	Most teachers do not remember to write on the chalk board While teaching some topics of sciences in the classroom	140	3.41	.86	SA
	Over all mean average		3.28	.89	SA

Table one revealed that the mean scores and the standard deviation for the influence of instructional materials in teaching and learning ranged from 2.99-3.41 and .08-1.07 respectively. The overall mean average was 3.28. Close observation of the result showed the respondents strongly agree that teaching and learning sciences in the senior secondary schools in Aba educational zone is influenced by instructional materials.

Research question two: what are the influence of inadequate materials like charts, pictures and images, maps and so on, on teaching and learning sciences in Aba education zone?

Table 2: mean scores and standard deviation of male and female teachers responses on the influence of inadequate instructional materials like charts, pictures, images, maps and so on, on the teaching and learning sciences.

S/N	**Statements**	n	Mean	SD	Dec.
5.	Most teachers do not use pictures or images when Teaching biology, physics, chemistry and mathematics	140	2.46	1.22	A
6.	Science teachers do not use charts or maps when teaching mathematics, physics, biology and chemistry.	140	2.96	1.18	A
7.	Someone science teachers do not enter the class with Lens, modes and graphs.	140	3.26	1.15	SA
8.	Some students loose interest in sciences as a result of motivation from inadequate instructional materials.	140	3.26	1.15	SA
9.	Students fail science subjects due to inadequate use of instructional materials in teaching and learning sciences	140	3.31	1.03	SA
	Overall average		3.03	1.10	A

Table 2 showed that the mean and standard deviation for the influence of inadequate materials on the teaching and learning of sciences ranged from 2.46-3.31 and .92-1.22 respectively. The overall mean average was 3.03. Therefore, the result implied that male and female respondents agreed that inadequate use of instructional materials has in influence on teaching and learning in senior secondary in Aba educational zone.

Test of Hypotheses

The null hypotheses were tested using paired t-test at 0.05 alpha level.

Hypotheses one: there is no significant difference between the mean scores of male and female teachers' responses on the influence of instructional materials on teaching and learning in Aba educational zone.

Table 3: paired t-test analyses on the influence of instructional materials on teaching and learning sciences in senior secondary schools. (n=140)

Variables	X	SD	T- Value	Df	Sig.
Instructional materials	13.13	2.25			
			31.50	139	.000
Teaching and learning	30.26	6.75			

Table 3 indicated that paired t-test (139)= 31.50, P=.000. The p-value was less than the alpha level 0.05, therefore, the null hypotheses that there is no significant influence of instructional materials on teaching and learning sciences in senior secondary schools in Aba education zone is rejected.

Hypotheses 2: inadequate use of instructional materials does not have significant influence on the mean rating scores of male and female teachers responses on teaching and learning sciences in senior secondary schools in the Aba education zone.
Table 4: paired t-test analysis on the influence of inadequate instructional material on teaching and learning in senior secondary schools (n=140).

Variables	X	SD	T-value	Df	Sig.
Inadequate instructional materials	15.17	3.19			
			27.79	139	.000
Teaching and learning	30.25	6.75			

Table four indicated that paired t-text (139)= 27.79, p-value was less than the alpha level, 0.005. The null hypotheses that inadequate use of instructional materials on teaching and learning sciences does not influence teaching and learning significantly was rejected. Therefore, it deduced that there is statistically significant influence of inadequate materials on teaching and learning sciences in the senior secondary schools in Aba education zone.

Discussion of Findings

The first and second findings showed that influences of instructional materials influenced teaching and learning sciences in senior secondary schools in Aba education zone. The teachers who participated in this study indicated that inadequate instructional materials influence the students' lessons in the classroom. The result indicated that inadequate instructional materials not only influenced the teachers' instructions, but lowers the students' interest, intelligence and development of self confidence in the science subjects. The findings of this study agrees with Ojike (2018) that instructional materials can help make the message of the teacher more vivid, interesting and intelligible. The result also agreed with Uzuegbu, Mbadiwe and Anulobi (2014) that instructional materials are devices used to assist the instructors in preparing their lessons and learning by the students.

The result also revealed that teachers have positive response to all the listed influences of instructional materials on teaching and learning sciences and that inadequate instructional materials does not facilitate better understanding of intelligence and self development among students. This assertion is in confirmation with the news of Onyejemezi cited in Ojike (2018). The result is also in support of Owuamanam (2011) and Ihedioha (2019) that instructional materials on teaching and learning gives room for acquisition of skills, knowledge and self-confidence, and self-actualization.

Conclusion

Evidence from this study has led the researchers to conclude that there is influence of instructional materials on teaching and learning sciences in the senior secondary schools in Aba Education Zone. That inadequate use of instructional materials does not

give teachers room to explain, create reality and supply events and active participation in the class. Conclusively, it is clear that inadequate use of instructional materials influenced teaching and learning sciences in the senior secondary schools in Aba Education Zone.

Recommendation

The researchers based on the findings and conclusion, recommended that schools should provide enough instructional materials to enable science teachers discharge their duties effectively for proper understanding by the students and that:

1. Education resource centres be established at local government levels to enable both the primary and secondary schools within the area benefit from their services.
2. The three tier governments, education management boards and the non-governmental agencies should do well to help in funding the provision of instructional materials in the schools.

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