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IMPLEMENTATION OF SCIENCE CURRICULUM FOR SECONDARY SCHOOLS IN NKANU EAST LOCAL GOVERNMENT AREA OF ENUGU STATE

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Abstract: *This paper reviews the Implementation of Science Curriculum for secondary schools in Nkanu East local government area of Enugu State. Two research questions and two hypotheses guided the study. Descriptive survey research design was adopted. There was no sampling because the population was manageable. The entire population four hundred and forty (440) science teachers in Government owned secondary schools in Nkanu East local government area of Enugu State was used; Science Curriculum Implementation Process Questionnaire (SCIPQ) was used for data collection. The reliability coefficient for the entire instrument was 0.78. The data collected were analyzed using mean (X) and standard deviation for answering the research questions while t-test was employed to test the hypotheses. The findings include that the methods adopted by the Science teachers are demonstration, experimental and discussion methods and significant difference exists in the mean ratings of male and female teachers that utilize the available instructional materials for teaching and learning science only to a less extent, teachers comply with the appropriate teaching methods recommended for use in the Science curriculum to a moderate extent, teachers use the recommended evaluation techniques in assessing their students to a moderate extent, students' poor background from basic science, under-funding of education, lack of laboratory facilities and inadequate number of trained science teachers were the problems militating against the implementation of the national curriculum to a moderate extent, it was recommended among others that the science content should be monitored periodically to assess the extent to which the objectives are being achieved.*

Keywords: *Science Curriculum, Implementation, Evaluation. Secondary School*

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Introduction

"Scientia" in Latin means "Knowledge" and it was from this Latin word, that the word Science was derived. As an area of knowledge, science is as old as man on earth but was not initially practiced under the name science. It is both a process and a product. As a process, it means efforts made by man to understand himself, his environment and how his environment influences him. It includes man's application of knowledge acquired from such efforts to

influence and manipulate his environment to achieve better living conditions for himself. These the early man did hence science is said to be as old as man on earth. Knowledge arrived at through series of such efforts accumulated as the product of science and is continually improved upon, modified and applied by man on himself and his environment, to enhance better living conditions. It means that science as both a process and a product is not static but dynamic. It is the continuous study of the ever-changing (dynamic) world, which enables man explain the nature, origin, operations, functions, causes and consequences of world events.

Science is therefore, not only a source of knowledge but also a source of power. Science is systematic search for objective explanations along verifiable principles – a way of explaining events and phenomena in nature. The process involves observation and experiments that are conducted systematically. As a product, science is an orderly arranged ascertained knowledge that includes the methods by which the knowledge is accumulated as well as the criteria by which its truth is tested.

Aniodoh (1991) viewed science as a body of knowledge arrived at through systematic and procedural processes based on tentative observations and experiments. Compton in Ango (1990) defined science as follows – Science is not a technique or a body of knowledge, though it uses both. It is rather an attitude of inquiry of observation and reasoning with respect to the world. It can be developed not by memorizing facts or juggling formula to get an answer, but only by actual practices, of scientific observation and reasoning.

Eze (2004) viewed "Science" as a way of thinking in the pursuit of understanding nature, away of investigating and a body of established knowledge.

Ali (1999) noted that science consists essentially of an attempt to understand the relatives of selected aspects of things and events in the real world, an attempt which should have both intuitive and logical and tested by further observation.

Ezeano (2004) viewed science as a field of study of matter, the structure and behavior of the natural and physical world based on observation and experience. Sexena (1994) viewed it as a reliable process of learning that relies on testing ideas with evidence or data gathered from natural world around us.

Curriculum from the Latin word "Currere" means running a course. There is not much grounds for a uniform definition of the word since it seems to reject, or fails to appreciate the all-embracing connotation of its original Latin usage, which tended to cover all life activities – political economic and professional (Onwuka (2005). The general view of what curriculum should mean had changed with time and according to social conditions that is changes in the society, conception or nature of knowledge, the nature of the learner and indeed the total experiences offered to the learner by the schools. Eya (1999), maintained that this view recognizes the inclusion of needs and interests of new learner in the curriculum.

Science curriculum is a comprehensive documented plan developed with the intention that its implementation would lead to the achievements of some predetermined goals and objectives that guided its development.

Idoko (2001) viewed science curriculum as a documented plan that stipulates science learning objectives (outcomes); topics, contents, means and methods of teaching/learning than, learning experiences as well as learning activities.

According to Okeke (1985), in Ivowi (2004) to renew a curriculum is to revise or modify an existing curriculum with the hope of providing a better programme.

Science is one of the senior secondary schools subject taught in Nigeria. Science is an integral subject which provides contents in the training of students who want to study medicine, nursing, pharmacy, forestry, fisheries and so on. Requirement for a credit pass and above in science is needed for science related vocational disciplines. Majority of senior secondary schools choose science subjects in West African Senior School Certificate Examinations (WASSCE) or National Examination Council's Senior School Certificate Examination (NECOSSCE).

Science is one of the subjects in the curriculum for senior secondary schools, first published by the Federal Ministry of Education in 1985. Science curriculum was first introduced in the new National Policy on Education of 1977 revised in 1981 which led to 6-3-3-4 system of Education following the National Curriculum Conference of 1969. This conference encouraged government agencies and other professional bodies to develop science curriculum for both primary and secondary levels of education in Nigeria. At that time the duration for secondary school education was five years and in class

five, then the students took the West African School Certificate Examination (WASCE). In keeping with the dynamics of social change and demands on education, there was the need to broaden the curriculum. The quest for improving the method of teaching and learning of secondary school science began in 1982 by the Nigerian Educational Research and Development Council (NERDC, 2005).

In the National Policy on Education (FRN, 2004), each senior secondary school student is expected to study at least a science subject. In Enugu State, Nigeria, at least a Science subject is mostly registered for in the senior secondary school certificate examination and students are expected to study all the topics in the science curriculum. There is poor performance of students in science as a result of inadequate use of the acclaimed methods of evaluating science subjects. Implementation in the study is the teaching of science curriculum content to secondary school students.

Science is a systematic study of the structure and behaviour of physical and natural world through observation and experiment. It can also be the study of nature. Science curriculum has a spiral arrangement of content. The content of science curriculum is concept of nature. The curriculum for teaching science in senior secondary school emphasized the relationship between structures and observation of natural substances. Science education curriculum, refers to a documented plan that stipulates science learning objectives (outcome), topic, content, means and method of determining the extent to which the aims and objectives have been achieved science education curriculum is expected to equip learners with skills that will make them self-reliant, prepare them to enter into jobs and progress in then (Udu, 2019, Idoko, 2010).

Curriculum is planned, considering the target audience in order to achieve effective learning through an appropriate means or method of implementation curriculum, itself is a deliberately taught to learners in schools (Ikehi, Ifeanyieze, & Ugwoke, 2014). The term curriculum implementation is often referred holistically as all aspects of education experience within the reach of the student in the school (Mkpa & Izuagba, 2012). It is a process through which stated policies by the curriculum planners and developers are transcribed into practice such as the discharge of instruction by the teacher in the classroom (Mkandawire, 2013).

Teachers' quality and qualifications have great impact on curriculum implementation. Teacher qualification is one of the elements that produce a positive result in instructional delivery. The training of teachers is then important before engaging in curriculum implementation, since another qualifier for the name – teacher is curriculum implemented (Mkpa in Obilo & Sangoliye, 2010). The training is expected to expose the teacher to necessary skills, knowledge of the curriculum content and proper utilization of instructional resources in order to become an effective.

Curriculum implementation is important in secondary school for self-reliance and be empowered without waiting for the government. Ivowi (2004) noted that curriculum implementation involves a number of activities culminating in translating curriculum documents into classroom practice. It involves translation of theory into practice or proposal into action. Curriculum implementation also can be seen as the translation of the objectives of the curriculum from paper to practice (Okoro, 2008 in Isife and Ogaukwu 2016). This is achieved when the teacher is handed the curriculum and ends when the learners have been exposed to the learning experiences prescribed in the documents. There are intermediate steps which include verbal and non-verbal exposition, practical work in the laboratories, interaction, workshops, field work, teacher – student interactions, student – materials interactions and the evaluation and feedback. It shows that curriculum implementation means the actual exposure of the learner to the contents of curriculum and the real teaching and learning activities that involve the teachers, leaners and materials. Curriculum implementation is experience when the inter-curriculum has been translated into operating curriculum. Okoro, (2010), averts that curriculum implementation makes teachers to prepare lesson notes, use reinforcement and motivational strategies, classroom control and creation of friendly relationship, application of theories and principles of learning effective use of evaluation techniques and adequate consideration of learner's cognitive styles; this facilities resolution of instructional challenges as well as achievement of overall goals of education, which is the vision of the 21st century.

Curriculum implementation is the translation of the planned curriculum into the operational curriculum according to Offorma, (2005) cited in (Usman, Uzoma and

Nagngere, 2013). It is the execution of the curriculum document. Curriculum implementation is putting into action of the planned curriculum. This is the combined effort of the teachers and the learners in the tertiary institutions in the case of higher learning to have productive members of the society. This shows that it is actual classroom teaching that the learners are expected to put in practice for the society to benefit from them. Planned curriculum should have objectives, content and learning experiences have been selected and organized, and the evaluation procedure determined, then its implementation comes in for proper curriculum implementation to yield good results, it must be effective and properly planned to be in tandem to the societal needs. It is pertinent to note that curriculum implementation should relate to the native of the society, the society's value system and the social structure must be taken into consideration for effective curriculum implementation.

According to Fariwontan (2008), curriculum implementation is the putting into operation the curriculum document by the combined efforts of the teachers, the learner and others concerned. It has long been recognized that teachers have a major role in implementing the curriculum specifications by translating curriculum intentions into classroom practices (Ekwoanyasi, 2012). Danladi (2006) stated that the teacher in the class-room is the force or engine room of curriculum implementation because the teacher ensures the implementation of the curriculum according to specifications. This implies that teachers decide on the kind of materials, resources and evaluation techniques that are suitable for a particular lesson.

According to Olation and Ali (1997), teachers are ethically and legally bound to routinely assess students and report their progress. However, studies have revealed that the gender of the teacher affect methods and evaluating techniques in science lesson. Umeh (2003) reported that the job of teaching in Enugu State has been dominated by females. The findings of Achebe (2004) revealed that science subject is mostly taught by females. Therefore, it is necessary to evaluate female dominated science teaching in order to identify any gender based discrepancy between the actual teaching/learning process and what is expected. Furthermore, location may affect the implementation of science curriculum. This is because schools that are located in the urban areas are better staffed than their rural counterpart (Okoro, 2006). According to Ejieh, Fadipe and Timothy (2001), the school site can facilitate or hinder the implementation of its instructional and non-instructional programmes. It is worrisome to note that the science curriculum being implemented since 1985 still produce students who achieve poorly in science. Also no empirical study to the best of the researcher's knowledge has been carried out on science curriculum implementation to find out the extent to which the stated objectives of science curriculum are being achieved.

There is need for research that pays particular attention to the curriculum implementation process if progress is to be made in curriculum implementation and if instructional practices are going to be improved because the way a curriculum is implemented determines how the desired educational objectives are attained.

Purpose of the Study

The major purpose of the study was to determine the implementation of science curriculum for secondary schools in Nkanu East local government area of Enugu State. This study sought to find out;

- The method of teaching science employed by teachers while implementing the science curriculum
- The methods/tools of evaluation adopted by science teachers.

Research Questions

The following research questions guided the study:

- What are the methods of teaching adopted by the science teachers in the implementation of science curriculum in Nkanu East local government area of Enugu State?
- What methods/tools of evaluation are employed by teachers in evaluating science lesson?

Hypotheses

The following null hypotheses were tested at the 0.05 level of significance.

Ho_1 There is no significant difference in the mean rating of male and female teachers on the methods of teaching science.

Ho_2 There is no significant difference in the mean ratings of male and female teachers on the methods/tools of evaluation.

Method

The study adopted descriptive design. It was carried out in Nkanu East local government area of Enugu, Nigeria.

There was no sampling because the population was manageable. The population for the study consisted of all the science teachers (440) in government owned secondary schools in Nkanu East local government area of Enugu State. Data were collected using Science Curriculum Implementation Process Questionnaire (SCIPQ): the instrument was face validity, by three (3) experts. Two from Science Education Department, University of Nigeria Nsukka, one form measurement and evaluation department University of Nigeria, Nsukka. Mean and standard deviation were used to answer the research questions while t-test statistic was employed in testing the hypotheses at 0.05 level of significance.

Results

The results are presented in table according to the research questions and hypotheses that guided the study.

Research Question 1

What are the methods of teaching adopted by the science teachers in the implementation of science curriculum in Nkanu East local government area of Enugu State?

Table 1: Mean Ratings Teachers on the methods adopted by them in teaching science

N = 436

S/N	Items	SA (4)	A (3)	D(2)	SD(1)	Mean	Standard deviation	Decision
1.	Lecture	179	153	9	16	4.39	0.78	Agree
2	Demonstration	134	116	53	43	2.96	1.05	"
3	Experimental	116	132	43	50	2.93	1.04	"
4	Discussion	131	123	45	49	2.95	1.14	"
5	Fieldtrip	85	77	86	88	2.19	1.13	Disagree
6	Discovery/injury	60	55	105	118	2.21	1.09	"
7	Co-operative	56	62	115	104	2.21	1.06	"
8	Concept mapping	62	49	110	116	2.16	1.09	"
9	Project	82	86	75	93	2.47	1.14	"
10	Scaffolding	59	57	112	108	2.20	1.08	"
11	Games and play	55	61	108	112	2.18	1.07	"
12	Programmed learning	75	81	99	81	2.45	1.09	"
13	Computer assisted	51	63	124	98	2.20	1.02	"
14	Questioning/Socratic	69	85	105	77	2.43	1.06	"
15	Target task	47	53	127	109	2.11	1.02	"
	Grand mean =					**2.49**	**1.06**	

From table one above, the mean response of items 1, 2, 3 and 4 of 4.39, 2.96, 2.93 and 2.95 respectively, were greater than the cutoff point. This implies therefore that the methods adopted by the teachers in teaching science were lecture, demonstration, experimental and discussion methods. Also, the SD for each item is low which means that the scores are more concentrated or clustered around the mean.

Research Question 2

What methods/tools of evaluation are employed by teachers in evaluating science lesson?

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Table 2: Mean ratings of science teachers on the methods of evaluation employed by them in evaluating science lessons.

		N = 436						
S/N	Items	SA (4)	A (3)	D(2)	SD(1)	Mean	Standard deviation	Decision
16	Rating scales	114	112	61	51	2.86	1.05	Agree
17	Criterion references	82	76	85	97	2.45	114	Disagree
18	Observation schedule	79	88	89	80	2.49	1.10	"
19	Inventories	77	76	86	98	2.39	1.13	"
20	Performance test	93	81	88	75	2.57	1.12	Disagree
21	Checklist	66	97	85	88	2.22	1.08	"
22	Project	57	59	120	100	2.22	1.05	"
23	Assignment	97	70	92	77	2.56	1.13	"
24	Questionnaire	53	54	133	101	2.19	1.04	"
25	Stoichiometry	76	78	90	92	2.41	1.12	"
26	Anecdotal	46	68	125	97	2.19	1.00	"
27	Interview (scheduled)	86	82	65	103	2.45	1.17	"
28	Attitudes scale	79	85	87	85	2.47	1.11	"
	Grand mean =					**2.44**	**1.09**	"

From table two above, items 16, 20, and 23 had mean responses of 2.86, 2.57 and 2.56 respectively which were greater than the cut-off point. Hence, the methods of evaluation adopted by the science teachers included rating scale, performance test and assignment. Also the SD for each item is low which means that the scores are more concentrated or clustered around the mean.

Hypotheses 1

There is no significant difference in the mean ratings of male and female teachers on their method of teaching science.

Table 3: t-test on the mean rating of male and female teachers on their method of teaching science.

Gender	N	Mean	Standard deviation	t-cal	d.f	Sign.	Decision
Male	287	2.46	0.28	1.66	334	0.98	NS
Female	149	2.51	0.27				

From table 3 above, the obtained p-value 0.98 is higher than the set value of 0.05. Hence, the null hypothesis (Ho) was not rejected.

This means that a significant difference does not exist in the mean rating of male and female teachers on their method of teaching science.

Hypothesis 2

There is no significant difference in the mean rating of male and female science teachers on their methods of evaluating science lesson.

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Table 4: t-test on the mean rating of male and female science teachers on their methods of evaluating science lessons

Gender	N	Mean	Standard deviation	t-cal	d.f	Sign.	Decision
Male	287	2.45	0.31	1.16	334	0.25	NS
Female	149	2.51	0.27				

Data in table 4 above show that the obtained p-value 0.25 is higher than the set value of 0.05, Hence the null hypothesis was not rejected. This means that there is no significant difference in the mean rating of male and female science teachers on their methods of evaluating science lessons.

Discussion of Findings

The two research questions and the two hypotheses that guided the study were anchors around which the major findings of the study have been discussed. This discussion is presented under the following sub-heading.

- Teaching methods/tools and science curriculum implementation
- Evaluation techniques used by science teachers in assessing their students

Teaching Methods and Science Curriculum Implementation

The result of the study is that in secondary schools in Enugu State, the teachers employed only four (4) out of the fifteen (15) teaching methods identified (see table 1). It was also revealed that lecture method is the most widely emphasized method of teaching science. The result is in disagreement with the opinion of Bowyer (1990) in Jack (2010) that science subjects required effective student's participation and motivation in the teaching/learning of science due to these demerits.

- It is teacher centered and does not take care of individual differences, slow learners ad slow writers are in trouble.
- It does not motivate learner to learn since the teacher concentrates on the content with little or no attention paid to whether the learner is listening and or following or not etc.

The result also contradicts the views of Gagne (1976) in Iloputaife, Maduewesi and Igbo (2010) that the prevalence of chalk-talk lecture method of science teaching in public school indicates that the teaching methods and skills of teaching are obsolete and therefore, hinder the achievement of the goal of science education. This may be due to the large content taught in science which lends itself to lecture method.

The result in table 2 for the t-value calculated on difference in mean rating of male and female teachers on their method of teaching science shows no significant different. This agreed with the findings of Iyang and Archibong (1998), and Kanu (2004) in their independent studies, that gender does not influence method of teaching. This may be attributed to the changes in self-concept of females about their capability in coping on women empowerment.

Evaluation Techniques used by Science Teachers in assessing their Students

The result supports the findings of Idoko (2001) who reported that some teachers lack some of the professional competencies necessary for the execution of instruction; they have all these required for planning and evaluation of instructions. For the evaluation technique to be effective, teachers of science should give assignments that are of high quality. Tests that elicit more understanding of subject matter and basing students "final evaluation on sufficiency of appropriate assignments and test could be emphasized to achieve optimum goal in science teaching and learning".

This therefore requires that an effective evaluation technique must be based on appropriate evaluation model. When appropriate evaluation models are used, they yield useful information for programme improvement. According to Idoko (2001), an evaluation model or framework may be regarded as set steps or system of thinking which if followed or implemented will result on the generation of information which can be used by decision makers in the improvement of educational programmes. Evaluation models are of great importance to evaluators because they provide a general guide which can be adopted or modified to each specific programme being evaluated. The purpose of the evaluation should guide the evaluator in determining the appropriate statistical analytical procedures and tools to be employed.

In the end, the result of evaluation will be used to improve the quality of the curriculum.

Conclusion

Based on the findings of the study, the following conclusion was made;

- The implementers of science curriculum mostly employed few of the teaching methods in the implementation process.
- The implementers of science curriculum mostly employed few of the evaluation techniques recommended on assessing or determining learning outcomes.

Recommendation

Based on the findings of the study, it is recommended as follows;

- The science teachers should very often utilize the available instructional materials for teaching and learning science.
- The science curriculum for secondary schools should be reviewed periodically to make sure it meets the needs of the society. To achieve this, topical contents of the science curriculum for senior secondary school should be strengthened to meet the needs of the society.
- In-service training, workshops and seminars should be organized by the government and professional bodies like Science Teachers Association of Nigeria (STAN),Nigerian Educational Research and Development Council (NERDC) etc. at intervals for science teachers.
- Government should give incentives to science teachers to enhance their performance in the teaching.

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