

## Competency Gaps Among Basic Science Teachers: A Factor Affecting the Implementation of Science Curriculum in Nigerian Secondary Schools

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### Abstract

Many Nigerian basic education graduates enroll into senior secondary level of education standing on weak foundation for science learning. The Basic Science Curriculum (BSC) which they went through in the upper basic education is relatively new, and the teachers appear to be ineffective in the implementation of the curriculum. It therefore becomes important to find out the aspects of required teaching competencies which BSC teachers lack for effective implementation of the Basic Science Curriculum of the junior secondary school. This will help to organize competency-based capacity development for BSC teachers who would be in position to give graduates of BSC strong foundation for science learning at senior secondary school level. Thus, this paper investigated the competency gaps of basic science teachers in implementing the basic science curriculum. To guide the study, two research questions were posed and answered and two null hypotheses were tested at  $P < 0.05$  level significance. The study is a descriptive survey. The study was carried out in Enugu state, Nigeria. The population of the study comprised 306 basic science teachers and 135 science teacher educators. The sample for the study consisted of 148 respondents. Two instruments were used for data collection. The instruments include Basic Science Teachers Competency Needs Questionnaire (BSTCNQ), and Basic Science Teachers' Competencies Observational Rating Scale (BSTCORS). The BSTCORS had inter-rater reliability index of 0.97. There were three research questions and three hypotheses. The research questions were answered using mean and standard deviation while the hypotheses were tested using t-test statistic at  $p < 0.05$  level of significance. Results showed that all the competencies listed in BSTCNQ were assessed to be needed by BS teacher for implementing the Basic Science Curriculum and that there was no significant difference in the mean rating scores of Basic Science teachers and science teacher-educators on competencies needed for implementing the Basic Science Curriculum. The educational implications of the findings of the study were highlighted and recommendations were proffered that stakeholders in basic education should provide funds appropriate human resources for organizing in-service training BS teachers to enhance their competencies and effectiveness in teaching of Basic Science.

**Keywords:** Basic Science Curriculum, Competences Needed, Competency Gaps, Capacity Development.

### Introduction

The Universal Basic Education (UBE) programme, an educational reform programme of the Federal Government of Nigeria was introduced to enhance skills and knowledge development among Nigerian youths (Federal Government of Nigeria, FGN, 2000). The main goal of the nine (9) year Basic Education (BE) as stipulated in the curriculum document is that every learner who has gone through the programme should have acquired appropriate levels of literacy, numeracy, manipulative, communicative and life skills as well as the ethical, moral and civic values required for laying a solid foundation for lifelong learning as a basis for scientific and reflective thinking (Nigeria Educational Research and Development Council, NERDC, 2008). In line with the philosophy, the Nigerian Educational Research and Development Council (NERDC, 2008) developed the nine (9) years Basic Education curricula for the primary and junior secondary school level of education. The old system, the 6:3:3:4 system of education

was not properly implement and hence most of the objectives could not be achieved in the learner. Also Nigeria offered free and compulsory primary education which was started in 1999 by the then president of Nigeria, Olusegun Obasanjo. This means that free and compulsory primary education was for only six years of formal education. Nigeria was desirous of increasing the number of years of free formal education in order to ensure that the desired level of skills and knowledge was achieved by the learners. Based on these national needs, the old primary school curriculum was reviewed and expanded to include three years of junior secondary school curriculum. Thus Nigeria currently operates 9 year free basic education consisting of 6 years of primary and 3 years of junior secondary education. In sum, Nigeria's current education system is composed of 9 years of basic education, 3 years of senior secondary education and 4 years of tertiary education, (9:3:4 system).

Among the science-related subjects approved for the 9 year basic education include: Basic Science, Basic Technology, Computer Education and Home Economics. These subjects indicate Nigeria's desire for rapid scientific and technological development of the country, since more citizens would be taught science and technology at basic education level, making them ready to become science and technology professionals at higher education levels. Before the emergence of the Basic Science of the junior secondary school, Integrated Science was taught at that level. The Basic Science which has replaced Integrated Science is broader and deeper than Integrated Science. This is because the needs of the learners have changed considerably over time, and the new Basic Science is designed to enable them acquire vital life skills for adapting and surviving in the society, as well as academic scientific knowledge necessary for more advanced science learning at senior secondary school level. From the curriculum document (Federal Ministry of Education FME, 2008), one deduces that the objectives of the new Basic Science curriculum include, but not limited to:

- development of learners' interest in science,
- application of basic scientific knowledge and skill to meet personal and societal needs
- taking advantage of the numerous career opportunities offered by the study of science, and,
- preparation for further studies in science and technology.

In curriculum implementation or teaching and learning activities, the teacher is a critical factor because without him/her, progress in education would be minimal or absent completely. This is why the capacity of the teacher for effectiveness is of utmost important. Teachers not only teach students, they are expected to lay good examples for their students in many aspects of life. Their duty and authority range from designing instructional strategies of the subject matter to determining the student's graduation standards in their schools (Etkina, 2010). Therefore, basic science teachers must exhibit a distinctive set of competencies to ensure the achievement of the goals of Basic Science Curriculum (BSC). Competency is the ability of an individual to perform a task effectively and efficiently. It is a set of defined behavior that provide a framework that enables the identification, evaluation and development of the behavior in individuals (Ravan & Stephenson, 2001). Robinson (2010) sees competence as a combination of knowledge, skills and behavior needed to improve performance, or a state of quality of being adequate, or well qualified in having the ability to perform a specific role or task effectively and efficiently.

Teacher competency refers to the ability of teachers to address the learning needs of all students including those students who learn differently because of individual peculiarities such as state of

disability, culture, language or socio-economic status. In addition, Wassong & Biehler (2010) stated that teacher competency is characterized by teacher's knowledge of contents as well as developed pedagogical skills necessary for effective curriculum implementation. The Mexico College of Education (2011) identified science teacher's competencies to include: teacher's accuracy to demonstrate knowledge of the content area of approved science curriculum, teacher's appropriate utilization of a variety of teaching methods/strategies and resources for teaching the subject matter content, teacher's effectiveness to communicate with and obtain feedback from students in a manner that enhances student learning and understanding of basic science concepts and practical skills, and teacher's ability to comprehend the principles of students' growth, development and learning and the appropriate applications of these to enhance learning. Other teachers competencies according to Mexico college of Education include, teachers' level of utilization of appropriate assessment technique and procedures, teachers' level of management of the educational setting in a manner that promotes positive students' behavior, safe, and healthy interactions with one another and the physical environment, teachers' ability to recognize student diversity thereby creating an atmosphere conducive to the promotion of positive student involvement in learning process and self concept development. Etkina (2010) identified some basic science teachers' competencies to include teachers' level of demonstration of the willingness to examine and implement changes in Basic science as appropriate, and teachers' level of collaboration with colleagues, parents and community members in carrying out the job of teaching of Basic Science. Personal competence refers to the integrity and personality that the teacher should exhibit during teaching and learning process. Personal competence also has to do with whether the teacher is democratic or autocratic during teaching (Edmond & Hayler, 2013). The Basic Science teacher competencies are needed to give the teacher the expertise to perform efficiently in the classroom for enhanced students' achievement and interest in science.

The state of teaching of Basic science in the UBE programme seems discouraging. Odubum (2011) observed that Basic Science teachers do not seem to understand the philosophy of the Basic Science curriculum (BSC). In addition, Danmole (2011) reported that basic science teachers across Nigeria seem to demonstrate ignorance of the objectives of Basic science teaching, especially at the junior secondary school levels. Though the structure of Basic Science Curriculum in schools have been designed for inculcating essential knowledge, skills and attitudes for enhanced achievement and positive attitude in science related courses, the graduates of the programme do not seem to adequately possess the envisioned skills (Danmole, 2011). According to Ahmed, (2003) students' performance in basic science calls for concern among stakeholders in basic education. Ahmed stated that WAEC carried out 35 studies in performance of candidates, which revealed that students performed poorly in science subjects and the high failure rate was traced to their poor background in basic science. Ahmed further stated that the problem of poor performance of students could be due to lack of adequate preparation, shortage of qualified and competent teachers, inadequate instructional materials, lack of good school environment and infrastructural facilities. Other issues related to poor performance of students include their inability to understand questions that demand high level of thinking, indicating that the candidates lack of depth in their understanding of concepts in science. The questions that arise from inadequate understanding of basic concepts in science include: do the basic science teachers have adequate knowledge of the science concepts they are expected to teach; do basic science teachers teach these concept at all; how adequately do the teacher teach the concepts; do the teachers adopt appropriate teaching strategies in their classroom interaction (Njoku 2020)?

In view of the deplorable state of the students' achievement in Basic Science (BS), the focus of this study is on the identification of competency gaps of Basic Science teachers for teaching of Basic Science in upper basic education schools. It is important to identify the competency gaps, which tend to make teachers underperform in their teaching responsibilities. The quest for effective teaching and students' high achievement begins with the question of the teachers possessing the necessary competencies. BS teachers' competency gaps have to do with what the teachers should know and be able to do while implementing the BSC but which they lack and therefore become unable to effectively implement the BSC curriculum as planned. These gaps are weakness in the capacity of the BS teachers to successfully implement the subject matter contents prescribed the curriculum.

Educational objectives cannot be achieved without determining whether the teachers have the necessary operational knowledge, skills and attributes for effective instructional delivery (Ahmed 2003). There is need to identify those areas in Basic Science Curriculum where teachers lack competence with a view to providing intervention strategies for bridging the gap and thus improve teaching and learning of basic science in secondary schools. This study is geared towards determining the competency gaps of basic science teachers in effective implementation of the Basic Science Curriculum. Competences gaps in teaching are the differences between the needed competences and possessed competences. Gender is one of the variables of the study, you need to discuss it in this introduction.

In intellectual matters gender influences the performance of people in carrying on activities. Gender is the socio-cultural expectations of males and females in playing roles in the society. Some roles are culturally ascribed to females while others are ascribed to males. This roles ascription is often arbitrary and has little to do with people's effectiveness in playing their roles in society. For instance, some people feel that it is the males that are the bread winners in the family, and therefore females need not work but focus on raising their children. In education science subjects like Mathematics and Physics are ascribed to males while language and art subjects are ascribed to females. This is why in a study like this it is important to investigate if BS teachers indicate gender-based differences in the competencies they possess for effectiveness in implementing the BS curriculum. The result of such investigation would be useful during the planning and implementation of in-services capacity building programmes for BS teachers.

### **Research Questions**

The following research questions guided the study:

1. What are the competencies needed by the Basic Science teachers in the implementation of Basic Science curriculum at the upper basic education level?
2. What are the competencies possessed by the Basic Science teachers currently implementing the BSC at upper basic education level?
3. What is the influence of gender on the competencies possessed by Basic Science teachers at upper basic education level?

The following null hypotheses further guided the study:

**Ho<sub>1</sub>**: There is no significant difference in the mean rating of Basic Science teachers and science teacher educators on competencies needed for implementing the Basic Science curriculum.

**Ho<sub>2</sub>:** There is no significant difference in the mean rating of male and female teachers on competencies they possess for implementing the Basic Science curriculum.

### **Methodology**

The design for the study is descriptive survey design. Descriptive survey is a research design that involves the collection of information from a representative sample of the population in order to describe the entire population. The population for the study comprised all 306 Basic Science teachers in all 278 public secondary school in Enugu state and 135 science educators in four public tertiary institutions in Enugu State that produce science teachers for the state, (Enugu State Ministry of Education 2020). The sample of the study consisted of 148 respondents, comprising 128 Basic Science teachers from 60 sample public junior secondary schools in the three education zones in Enugu state, and 20 science teacher-educators, five (5) from each of the four public teacher education tertiary institutions in Enugu State.

### **Instruments for Data Collection**

Two instruments were developed by the researchers for data collection in this study. The first was Basic Science Teachers' Competency Needs Questionnaire (BSTCNQ) which was used for identifying and validating the competencies needed by the BS teachers for effective implementation of the BSC in their schools. This instrument has 36 items distributed unevenly among five clusters. The five clusters are: Subject Content Knowledge (SCK), Pedagogic Skills/Competencies (PS/C), Classroom Management Skills/Competencies (CMS/C), Teacher Resourcefulness (TR), and Learning Assessment/Evaluation Skills (LA/ES). The scale points of the BSTCNQ are: Very Highly Needed (VHN) (4 points), Highly Needed (HN), (3 points); Needed (N), (2 points) and Not Needed (NN), (1 point). The BSTCNQ was validated by science teacher educators and experienced BS teachers currently in the field.

The second instrument, called Basic Science Teachers' Competency Observational Rating Scale (BSTCORS), was derived from the first. It is a 36-item 4-point rating scale which was used by the researchers and their assistants to rate the level of various competencies possessed by BS teachers. An internal consistency reliability of 0.97 was established for the whole instrument. The different clusters of the instrument yield the following reliability indices: Cluster A - Subject Content Knowledge (SCK) - 0.89, Cluster B - Pedagogical Skills/ Competencies (PS/C) - 0.89, Cluster C - Classroom Management Skills/Competencies (CMS/C) - 0.83, Cluster D - Teacher Resourcefulness (TR) - 0.82, and Cluster E - Learning Assessment/Evaluation Skills (LA/ES) - 0.86. The overall reliability of the scale as well as that of the subscales or clusters indicates that the instrument was reliable enough to collect credible data for the study.

### **Development of BSTCNQ and BSTCORS:**

At the outset of instrument development, and after copious review of literature and detailed study of the BSC a list of 87 items was produced as the competencies needed by BS teachers for effective implementation of the BSC. This list was reviewed and the items were grouped under five clusters called competency clusters. Each competency cluster was homogeneous as it was made up competency items that are related. This list was given to five science teacher educators to sift through remove all competency items that are not necessary for BS teachers to do their work effectively. The two teacher educators pruned the checklist from 87 to 36 which they agreed are critical for BS teacher effectiveness. The 36 items that survived this validation were reframed and a 4-point scale was attached to it so that science teacher educators and experienced BS teacher would rate them on the level at which they are needed. The instrument at this stage was called Basic Science Teachers' Competency Needs Questionnaire (BSTCNQ). The

BSTCNQ is a checklist containing all the possible competences which BSC teachers are expected to possess for effectiveness in the implementation of the BSC.

The BSTCNQ was again restructured to convert it to observation rating scale. In this way the second instrument with which to rate the level of competencies possessed by BS teachers was produced. It is called Basic Science Teachers Competency Observation Rating Scale (BSTCORS). It was estimated using Kendal's Coefficient of Concordance (w) method to have inter-rater reliability index of 0.65.

### Validation and Reliability of the Instruments

Five Science Educators validated the instrument (BSTCNQ) to ensure that all the competency items were the very important ones needed by the BS teachers. Thirty (30) Basic Science teachers in secondary schools in Anambra state, which is not within the area of the study were administered with BSTCNQ. Cronbach's alpha internal consistency method was used to determine the reliability of the instrument. An internal consistency reliability of 0.97 was established for the instrument. The different clusters of the instrument yielded the following reliability indices: cluster A 0.89, cluster B 0.89, cluster C 0.83, cluster D 0.82 and cluster E 0.86. Thus the BSTCNQ was adjudged to be reliable, as well as its clusters or subscales.

To determine the inter-rater reliability of BSTCORS eight research assistants thoroughly trained through practice and repetition in rating 5 teachers during staged classroom interactions. The research assistants come to nearly 70% agreement in the use of BSTCORS. The final ratings of the five teachers at work were used to determine the inter-rater reliability of the instrument (BSTCORS) using Kendal's Coefficient of Concordance (w). This yielded inter-rater reliability index of 0.65. This was considered a good enough agreement that it was assumed that different persons using the BSTCORS rate one teacher of BS they would be at least 65% in agreement.

### Data Analysis

The research questions were answered using mean and standard deviation. A criterion mean of 2.50 was used as a bench mark for decision rule. Any item with a mean score that is equal to or above the criterion mean of 2.50 is considered to be accepted as competencies needed, or competencies possessed as the case maybe. Any item that scores below this criterion mean is a competency that is not needed or not possessed. Hypotheses 1 and 2 were tested using t -test statistic.

### Results

**Table 1: Mean ( $\bar{x}$ ) and standard deviation (SD) of score on competencies needed by Basic Science Teachers for Implementing the Basic Science Curriculum at the Upper Basic Education Level. (BS Teachers:  $N_1 = 128$ , Science Teacher Educators:  $N_2 = 20$ ).**

S/N	Competencies Items in Clusters	$\bar{x}_1$	SD	$\bar{x}_2$	SD	$\bar{x}_g$
<b>A</b>	<b>Subject Content Knowledge</b>					
1	Linking teaching objectives to lesson content	2.81	.63	2.80	.61	2.81
2	Linking lesson objectives to the assessment	2.93	.71	2.95	.32	2.94

3	Providing appropriate learning resources to achieve lesson objectives	3.18	.32	3.35	.52	3.26
4	Planning the content of a lesson	3.03	.61	3.25	.45	3.14
5	The proper knowledge of the subject matter	3.39	.23	3.05	.89	3.22
6	Planning the summary of the lesson	2.79	.55	2.65	.34	2.73
7	Engaging students in assessing their learning outcome	2.61	.76	2.70	.61	2.66
8	Using variety of instructional methods to address individual students' learning style during the learning process	2.96	.51	2.60	.32	2.78
9	Engaging students actively during the lesson	2.58	.61	2.65	.72	2.62
10	Presenting the lesson contents sequentially	2.68	.43	2.80	.64	2.74
	Cluster mean	2.89	.51	2.88	.53	2.89
<b>B</b>	<b>Pedagogical Skills/Competencies</b>					
11	Using variety of instructional strategies	3.03	.61	2.95	.67	2.99
12	Providing learners with appropriate practices	2.14	.21	2.10	.59	2.12
13	Using inquiry based instructional approach	3.27	.76	3.15	.58	3.21
14	Using problem solving instructional approaches	2.77	.55	3.10	.70	2.94
15	Providing examples of task to be completed	3.12	.43	3.25	.54	3.19
16	Offering slow learners extra instruction time	2.68	.76	3.00	.60	2.84
17	Monitoring learning and re-teaching when necessary	2.94	.72	2.94	.64	2.94
18	Using culturally appropriate materials(visuals, relia, oral and written texts) to teach basic science	2.54	.58	2.90	.67	2.72
19	Giving clear instructions and explanations	3.27	.50	3.20	.49	3.24
20	Ensuring the orderly progression of the lesson	2.81	.67	2.95	.53	2.88
21	Planning suitable instructional objectives	3.00	.72	3.05	.50	3.03
22	Using set inductions	2.87	.74	2.95	.61	2.91
	Cluster mean	2.87	.58	2.96	.64	2.92
<b>C</b>	<b>Classroom Management Skills/Competencies</b>					
23	Creating safe classroom environment	3.19	.50	2.95	.60	3.07
24	Ensuring appropriate seating arrangement in the classroom	3.41	.43	3.35	.62	3.38
25	Creating general class orderliness	3.37	.69	3.20	.34	3.29
26	Creating appropriate student teacher classroom interaction	3.28	.72	3.35	.55	3.32
27	Encouraging students to ask question	3.08	.34	3.00	.49	3.04
28	Being familiar with learner's learning styles	3.19	.21	3.00	.53	3.09
29	Minimizing distractions and interruptions	2.90	.34	3.15	.48	3.03
30	Treating all students equitably in the classroom	3.21	.68	3.10	.50	3.16
31	Creating a safe and stimulating classroom climate	3.01	.72	3.35	.60	3.18
	Cluster mean	3.19	.58	3.16	.49	3.18
<b>D</b>	<b>Teacher Resourcefulness</b>					
32	Using improvised instructional materials in teaching Basic science	3.38	.74	3.10	.45	3.24
33	Constructing improvised instruction material	2.78	.72	2.80	.34	2.79

34	Using audio-visual devices for instructions	2.66	.58	2.85	.55	2.76
	Cluster mean	3.46	.67	3.37	.48	3.42
<b>E Learning Assessment/Evaluation Skills</b>						
35	Using quiz assessment tools in evaluating students' learning outcome	2.96	.34	2.85	.55	2.91
36	Choosing/selecting assessment methods	2.56	.58	2.65	.49	2.61
	Cluster mean	2.72	.72	2.75	.76	2.75
	Grand mean	2.97	.56	2.98	.55	3.04

**Key:**  $\bar{x}_1$  = Mean of Basic science teachers,  $\bar{x}_2$  = mean of science educators:  $x_g$  = overall mean, number of the respondents = 128 Basic Science teachers and 20 science educators

Data in Table 1 shows that the respondents (128 Basic Science teachers and 20 science teacher educators) have mean rating score that ranged from 2.12-3.42. It was only in item 12 (providing learners with appropriate practices, under pedagogic skills) that the respondents had a mean score of 2.12 which is below the criterion mean score of 2.50. Therefore, the respondents showed that item 12 on providing learners with appropriate practices is not part of the competencies needed for implementing the basic science curriculum effectively. In all the rest of the identified competency items, the respondents had mean ratings that are greater than the criterion mean, showing that the Basic Science teachers need all the identified competencies for effective implementation of the Basic Science Curriculum at the upper basic education level.

In all, the Basic Science teacher (128) had mean score that is greater than the criterion mean of 2.50 in all the identified 36 competency items except in competency number 12. This indicates that they consider all the items as competencies needed by basic science teachers for effective implementation of the basic science curriculum at the upper basic education level. In the same vein, all the science teacher-educators scored means that are greater than 2.50 except in competency number 12. This indicates that the science teacher-educators agreed that the identified competency items are needed by basic science teachers for the implementation of basic science curriculum at the upper basic education level. The standard deviation scores for Basic Science teachers range from 0.21-0.76 while those of science teacher-educators ranged from 0.32 - 0.89. These SDs are small for the respective groups, showing that the scores in both cases tend to converse around the means. These indicate that the respondents are generally in agreement that the identified competencies are needed by Basic Science teachers for the implementation of the Basic Science Curriculum at the upper basic education level. The cluster mean for Basic Science teachers is 2.89 while it is 2.88 for science teacher-educators. The overall mean was 2.89, which shows that the mean scores of both groups tend to converse around the means indicating that the respondents are generally in agreement that the identified competencies are needed by Basic Science teachers for the implementation of basic science curriculum at the upper basic education level



**Table 2: Mean (X) and Standard Division (SD) on Competencies Possessed by Basic Science Teachers for Implementation of the Basic Science Curriculum at the Upper Basic Education Level.**

S/N	ITEMS: CONTENT KNOWLEDGE	Mean	SD
1	Linking teaching objectives to lesson content	1.51	0.71
2.	Linking lesson objectives to the assessment	1.54	0.70
3.	Providing appropriate learning resources to achieve lesson objectives	1.55	0.70
4.	Planning the content of a lesson	1.59	0.79
5.	Demonstrating the proper knowledge of the subject matter	1.60	0.76
6.	Planning the summary of the lesson	1.69	0.82
7.	Engaging students in assessing their learning outcome	1.64	0.67
8.	Using variety of instructional methods to address individual students'	1.66	0.80
9.	learning style during the learning process Engaging students actively during the lesson	1.69	0.73
10.	Presenting the lesson contents sequentially	1.68	0.82
	<b>Cluster Mean</b>	<b>1.61</b>	<b>0.75</b>
	<b>PEDAGOGICAL SKILLS/COMPETENCIES</b>		
11.	Using variety of instructional strategies	1.74	0.79
12	Providing learners with appropriate practices	1.65	0.82
13	Using inquiry based instructional approach	1.79	0.85
14	Using problem solving instructional approaches	1.58	0.89
15	Providing examples of task to be completed	1.59	0.70
16	Offering slow learners extra instruction time	1.47	0.71
17	Monitoring learning and re-teaching when necessary	1.55	0.71
18	Using culturally appropriate material (visuals, relia, oral and written texts) to teach basic science	1.46	0.62
19	Giving clear instructions and explanations	1.58	0.63
20	Ensuring the orderly progression of the lesson	1.54	0.71
21	Planning suitable instructional objectives	1.56	0.77
22	Using set inductions		
	<b>Cluster Mean</b>	<b>1.61</b>	<b>0.74</b>
	<b>Classroom Management Skills/Competencies</b>		
23	Creating safe classroom environment	1.69	0.75
24	Ensuring appropriate seating arrangement in the classroom	1.57	0.84
25	Creating general class orderliness	1.78	0.78
26	Creating appropriate student-teacher classroom interaction	1.64	0.78
27	Encouraging students to ask questions	1.69	0.74
28	Being familiar with learner's learning styles	1.56	0.72
29	Minimizing distractions and interruptions	1.53	0.63
30	Treating all students equitably in the classroom	1.49	0.63

31	Creating a safe and stimulating classroom climate	1.53	0.63
	<b>Cluster Mean</b>	<b>1.61</b>	<b>0.72</b>
	<b>Resourcefulness</b>		
32	Using improved instructional materials in teaching basic science	1.47	0.63
33	Constructing improvised instruction materials	1.64	0.61
34	Using Audio-visual devices for instructions	1.50	0.63
	<b>Cluster Mean</b>	<b>1.54</b>	<b>0.62</b>
	<b>Assessment/Evaluation Skills</b>		
35	Using quiz assessment tools in evaluating students' learning outcome	1.56	0.63
36	Choosing/selecting assessment methods competencies needed	1.61	0.69
	<b>Cluster Mean</b>		

**Key:**  $X_1$  = Mean of basic science teachers: Number of the Respondents = 128

Data in Table 2 shows the mean ratings of research subjects on competences possessed by Basic Science teachers for implementing the BSC at the upper basic education level. The BS teachers scored mean ratings that are below 2.50 in all the items in clusters A, B, C, D, and E, indicating that they do not possess the various competencies needed for the implementation of the BSC. This finding is both unexpected and surprising. It has far reaching implications for BS teaching Enugu State. Some of these implications are:

- Enugu State would be recording high failure rate in BS examinations in the schools,
- Schools in Enugu State are likely to record low student enrolment in senior secondary school science subjects,
- Fewer products of Enugu State schools would qualify for careers in science and technology-based profession,
- Enugu State needs massive retraining of BS teachers to enable them acquired required knowledge attitudes and skills needed for effective implementation of BS curriculum, and
- There is urgent need to invest more resources in BS in Enugu State.

**Table 3: Mean (X ) and Standard Deviation (SD) of scores in the Competencies Possessed by Basic Science Teachers for Implementation of Basic Science Curriculum at the Upper Basic Education Level by Gender.**

S/N	Items Contents Knowledge	Male		Female	
		Mean	SD	Mean	SD
1	Linking teaching objectives to lesson content	1.59	.59	1.46	.52
2	Linking lesson objectives to the assessment	1.63	.59	1.48	.53
3	Providing appropriate learning resources to achieve lesson objectives	1.65	.58	1.48	.53
4	Planning the content of a lesson	1.67	.66	1.52	.58
5	Demonstrating the proper knowledge of the subject matter	1.67	.64	1.54	.58
6	Planning the summary of the lesson	1.61	.70	1.75	.60
7	Engaging students in assessing their learning outcome	1.59	.53	1.69	.55
8	Using variety of instructional methods to address individual	1.56	1.62	1.76	.62

	students' learning style during the learning process				
9	Engaging students actively during the lesson	1.59	.56	1.73	.69
10	Presenting the lesson contents sequentially	1.63	.64	1.73	.68
	<b>Cluster Mean</b>				
	<b>Pedagogical Skills/Competencies</b>				
11	Using variety of instructional strategies	1.70	.57	1.73	.69
12	Providing learners with appropriate practices	1.58	.65	1.72	.66
13	Using inquiry based instructional approach	1.79	.62	1.77	.74
14	Using problem solving instructional approaches	1.53	.71	1.69	.71
15	Providing examples of task to be completed	1.64	.52	1.55	.60
16	Offering slow learners extra instruction time	1.47	.54	1.55	.60
17	Monitoring learning and re-teaching when necessary	1.56	.54	1.55	.60
18	Using culturally appropriate materials (visuals, relia, oral and written texts) to teach basic science	1.39	.49	1.56	.49
19	Giving clear instructions and explanations	1.58	.49	1.54	.50
20	Ensuring the orderly progression of the lesson	1.56	.63	1.55	.50
21	Planning suitable instructional objectives	1.84	.59	1.62	.54
22	Using set inductions	1.61	.67	1.55	.56
	<b>Cluster Mean</b>				
	<b>Classroom Management Skills/Competencies</b>				
23	Creating safe classroom environment	1.74	.61	1.58	.58
24	Ensuring appropriate seating arrangement in the classroom	1.67	.66	1.56	.67
25	Creating general class orderliness	1.81	.61	1.70	.64
26	Creating appropriate student-teacher classroom interaction	1.72	.56	1.61	.64
27	Encouraging students to ask questions	1.68	.57	1.70	.62
28	Being familiar with learner's learning styles	1.65	.61	1.48	.53
29	Minimizing distractions and interruptions	1.45	.50	1.56	.49
30	Treating all students equitably in the classroom	1.49	.50	1.47	.50
31	Creating a safe and stimulating classroom climate	1.46	.50	1.56	.49
	<b>Cluster Mean</b>	<b>1.63</b>	<b>.51</b>	<b>1.58</b>	<b>.50</b>
	<b>Resourcefulness</b>				
	Using improvised instructional materials in teaching basic science	1.47	.50	1.44	.49
	Constructing improvised instruction materials	1.53	.50	1.69	.47
	Using Audio-visual devices for instructions	1.54	.50	1.58	.50
	<b>Cluster Mean</b>	<b>1.51</b>	<b>.50</b>	<b>1.54</b>	<b>.49</b>
	<b>Assessment/Evaluation Skills</b>				
	Using quiz assessment tools in evaluating students' Learning outcome	1.51	.50	1.59	.49
	Choosing/Selecting assessment methods competencies needed	1.64	.52	1.58	.58

<b>Cluster Mean</b>	<b>1.58</b>	<b>.51</b>	<b>1.59</b>	<b>.54</b>
<b>Overall Mean</b>	<b>1.61</b>	<b>.52</b>	<b>1.59</b>	<b>.50</b>

**Key:**  $X_1$  = Mean of male teachers (42):  $X_2$  = Mean of female teachers (86): Number of the Respondents = 128 basic science teachers

Data in Table 3 on competences possessed by Basic Science teachers by gender, for implementation of BSC at the upper basic education level showed that male teacher had mean rating that ranged from 1.39-1.81, which are below the criterion, mean score of 2.50; female teachers had mean rating score that ranged from 1.44-1.77, which is below the criterion, mean score of 2.50. Therefore, the respondents (male and female teachers) do not possess that competences needed to effectively implement the basic science curriculum.

**Table 3: t-test comparing the mean rating scores of science teacher- educators and Basic Science teachers on competencies needed for implementing of Basic Science Curriculum**

Groups	N	Mean	SD	t-cal	df	Sign of t	Decision
BS teachers Science Teacher- Educators	128 20	2.98 2.97	0.55 0.56	0.048	146	0.962	Not Sig.

Data on Table 3 shows the summary of independent sample t-test to compare the mean rating scores of science teacher educators and Basic Science teachers on competencies possessed for implementing the BSC. There was no significant difference in the mean rating scores for science educators (M=2.97, SD =.56) and basic science teachers (M=2.98, SD=.55,  $t(126)=0.48$ ,  $p > .962$  two tailed). The null hypothesis was therefore not rejected indicating that there was no significant difference in the mean rating of scores science educators and basic science teachers on competencies needed for implementing the basic science curriculum. This is an indication that both BS teachers and science teacher – educators have the same views about the competencies needed by BS teachers for effective implementation of BSC in Enugu State.

**Table 4 t-test on the Mean Ratings of Male and Female Teachers on Competencies Possessed for Implementing Basic Sciences Curriculum.**

Gender	N	Mean	SD	T	df	Sig	Decision
Male	42	1.61	.52	1.170	126	.246	NS
Female	86	1.59	.50				

In Table 4, hypothesis 2, an independent samples t-test was conducted to compare the mean rating scores of male and female teachers on competencies they possessed for implementing the basic science curriculum. There was no significant difference in the mean rating scores for male (M=1.61,SD =.52) and female (M= 1.59, SD=.50,  $t(126) = 1.170$ ,  $p > 0.245$  two tailed). The null hypothesis was therefore not rejected, indicating that there no significant difference in the mean rating scores of male and female teachers on competencies they possessed for implementing the basic science curriculum. Thus, male and female BS teachers have similar views about the competencies they have for effectiveness in implementing the BSC in Enugu State.

### Discussion of Findings

The findings of this study showed that respondents (Basic Science teachers and science teacher educators) agreed that 35 out of the 36 items in the rating scales are needed by basic teachers for effectively implementing the Basic Science Curriculum at the upper basic education. There was no significant difference in the mean rating scores of BS teachers and science educators on competencies needed for implementing the Basic Science Curriculum. BS teachers currently in the field and science teacher educators in sample institutions in Enugu State have similar view about the level of performance competencies which BS teachers in the state need for teaching the BSC curriculum. They differed in only one out of 36 items of the instrument. Indeed BS teachers need to be competent in subject matter content, pedagogical knowledge, teaching/learning resources provision, classroom management, as well as assessment and evaluation skills.

The results of the study have shown that generally BS teachers lack the requisite competencies for performing their BS teaching jobs creditably in the area of study. Both male and female BS teachers lack the required competences for implementing the basic science curriculum. There was no significant difference in the mean rating scores of male and female teachers on competencies possessed for implementing the BSC. This could be as a result of the fact that since the introduction of BSC the teachers have never been given any training opportunity on the BSC to prepare them for the onerous job of effective implementation of BSC. They are not yet well prepared to handle the BSC effectively to the satisfaction of the stakeholders Basic Science at the upper basic education level. The teachers would invariably find it difficult to handle the subject until they are retrained and prepared to with the required competences teaching the subject. Teachers of BS need lots of training workshops on the BSC to get acquainted with the contents of the curriculum and the strategies for its effective implementation.

### Recommendations

1. Government, stakeholders of education, curriculum planners should organize regular in-service training for teachers so as to get BS teachers informed about the Basic Science Curriculum
2. Government should ensure that teaching and learning materials needed for teaching basic science curriculum are provided
3. Institutions, Colleges of Education and Universities should ensure that they equip Basic Science teachers adequately with knowledge and skills needed for effective teaching and learning of BSC.
4. Teachers on their part should put more effort in teaching and learning of BS so as to internalize and perfectly understand the contents of the subject and its pedagogies.

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