PHYSICS TEACHERS' PERCEIVED CONSTRAINTS IN THE IMPROVISATION OF INSTRUCTIONAL MATERIALS FOR SENIOR SECONDARY SCHOOLS' QUALITY TEACHING DELIVERY IN THE FEDERAL CAPITAL TERRITORY – ABUJA.

By

UWADILEKE OBI

Nigerian Educational Research and Development Council (NERDC)
Sheda, P.M.B. 91, Garki, Abuja.

Abstract

The study was conducted to investigate senior secondary school physics teachers' perceived constraints in improvising instructional materials in federal capital territory in Abuja.This is with a view to addressing issues related to acute shortage of instructional materials in teaching of physics. A descriptive research survey design was adopted. The population of the study comprised senior secondary school physics teachers in 6 Area Councils in Abuja while the sample consisted of 90 physics teachers from three the councils. A structured questionnaire was used for data collection. The instrument was validated by three university of Abuja lectures from the faculty of education. The instrument had a reliability index of a 0 .79 using Cronbah Alpa technique. Results obtained revealed that physics teachers' are of the view that they do not sufficiently have enough time, inaccessibility to fabrication tools, shortage of qualify physics teachers , lack of opportunity to for self development among others. Recommendations include provisions of qualifies physics teacher, access to fabrication tools, sponsorship to seminars, and conferences and workshop on improvisation techniques.

Keywords: Science, Instructional Materials, Teaching and Learning Physics, Quaity Teaching

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Introduction

Science is the foundation upon which the bulk of present day technological breakthrough is built. Nowadays, nations all over the world including Nigeria are striving hard to develop technologically and scientifically, since the world is turning scientific and all proper functioning of lives depend greatly on science.

Isola (2010) defines science as an integral part of human society. Its impact is felt in every sphere of human life, so much that it is intricately linked with a nation's development. Science as a field of study has done a lot for mankind. Scientific knowledge is used to control our environment. Science comprises the basic disciplines such as Physics, Chemistry, Mathematics and Biology. Physics involves the study of matter, energy and the relation between them. Physics is in some senses, the oldest and most basic pure science; its discoveries find applications throughout the natural sciences, since matter and energy are the basic constituents of the natural world. MKpanang (2011)) states the objectives of teaching physics at the secondary school level as namely: to eanable the students acquire scientific knowledge; to present physics to the students as a stimulating subject, intellectually satisfying and significantly related to their experiences of life;to develop in the students an awareness of the structure of physics and an understanding of the fact that physics is an expanding field; to familiarize the students with fundamental principles,theories,and concepts of physics modern among others.

Despite these lofty objectives of teaching physics at secondary school level, the subject has been view as one of the toughest subject that ever existed and evidence of this could be seen in the paucity of enrolment (Crispen, Kusure, Munodawafa, Sana & Gwizangwe ,2010) mass failure (Jegede &

Adedayo ,2013).) inter alia. As result, according to Angell and Ogunniyi(2004), many students have develop negative attitude towards the subject and hence find physics difficult because they have to contend with different representations such as experiment, formulae, calculations, graphs as well as conceptual explanations at the same time. Also, Olumorin Yusuf A & Ajidagba (2010) observed a general belief among students that physics is an abstract subject and hence too difficult to learn. Ogbondah, (2008) attributed the ugly situation in physics education to the following factors which include: inadequacy of materials and personnel with respect to teaching the subject ,lack of laboratories and equipment. This situation needs to be assessed especially in the area of improvisation of instructional materials.

The teaching of physics without learning materials will certainly culminate in poor performance in the subject. Toivanen, Komulainen, & Ruismäki, (2011) stressed that a professionally qualified science teacher no matter how well trained would be unable to put his ideas into practice if the school setting lacks the equipment and necessary materials for him or her to translate his competence into realities.Furthermore, in the a period of economic recession, it will be very difficult to adequately find some the electronic gadgets and equipment for physics in senior secondary schools. A situation that is further compounded by the galloping inflation in the country and un-relatedness of some the imported sophisticated materials and equipment, hence the need to produce material locally.

Researchers (Aina, 2013; Usman, & Adewunmi, 2006.; Olumorin, Yusuf & Ajidagba,2010) reported that there were inadequate resources for teaching of science subjects in secondary schools in Nigeria.They further stated that where there were little resources at all, they are not usually in good conditions, while the few that were in good condition were not enough to go round those who needed them .Hence there is need for improvisation..

Improvisation is making or producing materials for teaching and learning of science with available local materials. To Kurumech (2012), improvisation is the art of designing a replica of something to make it function or play the role of the real thing using available materials. Improvisation was also defined by Nchunga, (2015) as the act of using an equipment obtained from local environment ,designed by either the teacher or with the help of local personnel to enhance instruction.
The National Policy on Education NPE (2013), advocates the use of improvised materials in schools. Substantiating this assertion the senior secondary school physics curriculum (2008) encouraged teachers to enrich the contents with relevant materials and information from their immediate environment.

Statement of the Problem

Instructional materials are very important because what students hear can easily be forgotten but what they see, touch cannot be easily forgotten and it remains ever fresh in their memory (Aina, 2013). Despite the emphasis on the usefulness of instructional materials in the teaching and learning processes, it has been observed that Secondary School Physics teachers in Federal Capital Territory teach the subject without instructional materials for the simple fact that they are not available in schools (Nchunga,2015) . No wonder the failure rate among learner is high. Physics teachers' inability to improvise resource materials has been blamed on several factors ranging from time constraint, inadequacy of fund, lack of skills and strategies for improvisation, large class size, inability to identify relevant local materials, lack of exposure on improvisation techniques, insufficiency of adequate and appropriate instructional materials guide among others. However, one area that seems to be lacking is a scale of preference to prioritize the factors. It is therefore the problem of this study to provide empirical data to fill this knowledge gap.

Purpose of the study

The study was undertaken to:

i) investigate physics teachers' perceived constraints in improvising instructional materials;
ii) determine the influence of gender on the perceived constraints and,
iii) obtain physics teachers' views and suggestions for meeting shortfalls in improvising instructional materials.

Research Questions

The study is guided by the following research questions:

i) What are the scores of senior secondary school physics teachers on the perceived constraints to improvising instructional materials?
ii) What are the score of male and female physics teachers on the constraints in improvising instructional materials ?
iii) What remedies can be proffered for meeting the shortfalls if any?

Research Hypothesis

This study is further guided by the following null hypothesis tested at a 0.05 level of significance.

H_{o1}: There is no significant difference in the scores of male and female senior secondary school physics teachers' perception of constraints encountered in improvising instructional materials .

Method

The study adopted a descriptive survey research design. The population for the study consisted all senior secondary school physics teachers in Federal Capital Territory (F.C.T) – Abuja.The method was deemed appropriate as it involved the collection of extensive and cross-sectional data for the purpose of describing and interpreting an existing situation under study. The study adopted a multi-stage sampling technique. At the Area Council Level, three Area Councils were randomly selected namely, Gwagwalada Area Council (GWAC), Kwali Area Council (KWAC), Abuja Municipal Area Council(AMAC). At the school level, out of 500 schools, 15 were purposely selected from each of the three Area Councils making 45 schools. At the teachers' level, two(2) teachers consisting of a male and female physics teachers made up the sample size of 90 physics teachers. Instrument for data collection was a structured questionnaire entitled 'Physics Teachers' Perceived Constraints in Improvising Instructional Materials Questionnaire (PTPCIIMQ) '. The questionnaire had two sections only, namely, section A and section B. Section A solicited information on the respondents' demographic variables while section B elicited information on such variables as time constraint, inadequacy of fund, deficiency on improvisation techniques, lack of motivation among others.

The instrument was validated by three (3) University lecturers from sub department of science education in the Faculty of Education the University of Abuja. Corrections in respect of face validity was effected. The reliability of the instrument was obtained by pilot testing it on equivalent respondents from other schools not involved in the sample. Cronbach Alpha estimation was used for estimation and a 0.79 co-coefficient was obtained. The responses were measured on a modified four point Likert Scale of very high extent (4 points), High Extent High (3 points) , Moderate Extent (2 points), Low extent (1 point), such that for each item on the questionnaire a mean of above 2.5 indicates favourable disposition to the item while that less than 2.5 indicates a negative disposition. The same goes for the cluster mean. The null hypothesis was tested at a 0.05 level of significance to find out the difference in mean opinions of male and female teachers on the scale.

Results

Research Question 1: What are the scores of senior secondary school physics teachers on the perceived constraints to improvising instructional materials?

Table 1 : Mean Ratings of Perceived Constraints to Improvising Instructional Materials

S/N	Perceived Constraints to Improvisation	VHE	HE	ME	LE	Mean(x)	SD	Remark
1	Lack of expertise knowledge	50	23	14	3	3.33	.85	Agreed
2	Poor funding	35	37	7	11	3.07	.96	Agreed
3	Insufficient time .	48	34	3	5	3.39	.80	Agreed
4	Defective training given to physics teachers	23	39	17	11	2.82	.95	Agreed
5	Fear of stress and rigors involved .	28	45	10	7	3.04	.74	Agreed
6	Large class size	47	34	6	3	3.39	.75	Agreed
7	Non commitment of physics teachers	40	45	3	2	3.37	.65	Agreed
8	Inadequate power supply	56	23	7	4	3.38	.81	Agreed
9	Unavailability of fabrication tools	34	39	11	6	3.12	.86	Agreed
10	School location	34	29	21	6	3.01	.93	Agreed
11	Incompetence to identify local material	11	7	39	33	1.95	.97	Disagreed
12	Inadequate exposure to improvisation technique.	45	28	6	11	3.19	1.00	Agreed
	Cluster mean/SD					3.08	.39	

From table 1, it can be seen that the most positively favourably disposed item are item 3 namely, insufficient time and item 6, large class each with a mean score of 3.39 followed by item 8 namely, inadequate power supply with a mean score of 3.38. The least positively disposed item is item 11 namely, incompetence to identify local materials , with a mean rating score of 1.95, followed by item 4 namely, defective training given to physics teachers with a mean score of 2.82. The cohort has a cluster mean of 3.08 and represents 55 percent a modified 4-point Likert scale.

Research Question 2: What are the score of male and female physics teachers on the constraints in improvising instructional materials?

Table 2: **: Mean Ratings of male and female physics teachers Perceived constraints in improvising instructional materials.**

S/N	*Perceived Constraints to Improvisation*	*VHE*		*HE*		*ME*		*LE*		*Mean*		*Remark*
		M	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	
13	Lack of expertise knowledge	3	19	21	2	2	12	-3		3.54	2.69	A constraint
14	Poor funding	24	11	20	17	2	5	8	3	3.11	3.00	A constraint
15	Insufficient time .	31	17	17	17	3	-	2	3	3.45	3.27	A constraint
16	Defective training given to physics teachers	18	5	20	19	10	7	6	5	2.93	2.67	A constraint
17	Fear of stress and rigors involved .	17	11	28	17	5	5	4	3	3.07	3.99	A constraint
18	Large class size	25	22	21	13	5	1	3	-	3.43	3.26	A constraint
19	Non commitment of physics teachers	22	18	33	12	2	1	1	1	3.41	3.53	A constraint

20	Inadequate power supply	43	1	7	16	7	-	3	1	3.04	4.80	A constraint
21	Unavailability of fabrication tools	20		24	12	5	6	2	4	3.20	3.00	A constraint
		14										
22	School location	22		19	10	12	9	2	4	3.15		A constraint
		12								2.86		
23	Incompetence to identify local materials	6	5	4	3	29	10	15	18	2.08	1.86	Not a constraint
24	Inadequate exposure to improvisation technique.	33	12	14	14	4	2	3	8	3.48	2.83	A constraint
	Cluster mean/SD									3.21	3.15	

Table 2 shows the mean ratings of the male and female physics teachers on the constraints in improvising instructional materials. Twelve (12) items constitute this subscale. Of the twelve (12) items, the male teachers were positively disposed to ten (10) items constituting 92 percent of items in this subscale, with a mean disposition greater than 2.5 while they were less favourably disposed to 1 item which represents 8 percent of items in the subscale. Of the positively disposed items, the most favourably disposed item ,is item 13 namely, lack of expertise knowledge with a mean rating of 3.54 while the least favourably disposed item is item 23 which specifies incompetence to identify local material with a mean rating score of 2.08.On the other hand the females were more favourably disposed to item 20 namely, inadequate power supply with a mean rating of 4.80 while they were less favourably disposed to item 23 namely, incompetence to identify local materials with a mean rating of 1.86.

Research Question 3: What remedies can be proffered for meeting the shortfalls if any?

Table 3 :Mean Dispositions to Proffered Solution for Tackling Shortfalls in Improvising Instructional Materials

S/N	Proffered solutions	Mean(x)	SD
24	Need for Sponsorship to seminars/worships	3.05	.89
25	Need for funding from government/non governmental organization (NGO)/PTA	3.23	.76
26	Need to work extra hours on weekends	3.12	.56
27	Need for access to fabrication tools	3.10	.54
28	Need for regular power supply	3.32	.86
29	Need to provide teachers with special bonus	3.25	.78
30	Need for qualified teachers	2.98	.69
31	Need for reduction in class size to 1: 35	2.71	.86
	Cluster mean/SD	3.09	

Table 3, reveals the item that has the highest favourable disposition is the need to provide teachers with special bonus with a mean score of 3.25.while the least is the item on the need for reduction in class size to 1:35 .A cluster mean of 3.09 on four –point scale shows a percentage of 61.8.

Hypothesis 4: There is no significant difference in the scores of male and female senior secondary school physics teachers' perception on constraints encountered in improvising instructional materials.

Table 4: t-est of the Responses of Male and Female Physics Teacher on Perceived Constraints in Improvising Instructional Materials .

Variable	Number(N)	Mean(x)	SD	Df	t-cal	t-cri	Inference
Male teachers	49	3.21	.57				
				88	.17	2.00	Accept Ho
Female teachers	41	3.12	.85				

From table 4, the calculate value of 0.17 lies within the tabulated value of -2.00 to 2.00.Therefore, the null hypothesis is accepted. This means that there is no significant difference between perception of the male and female physics teachers on the constraints encountered in improvising instructional materials. In other words, the constraints teachers encounter in improvising instructional materials are not gender based

Discussion of findings

The study investigated senior secondary school physics teachers' perceived constraints in improvising instructional materials in the Federal Capital Territory Abuja.

The first findings of this study on the constraints senior secondary school physics teachers encounter in improvising instructional materials revealed that the study participants unanimously agree to the listed item statements as constraints and indicated by a mean score of 3.08 . Analysis of items in this cohort showed that all the items have their mean score above 2.50.indicating that the all items are perceived obstacles. For instance, item 1 namely, lack of expertise knowledge has a mean rating of 3.33.This implies the respondents' favourable disposition to this item. This finding corroborates the argument made by some researchers (Crispen, Kusure, Munodawafa, Sana, & Gwizangwe, 2010), whose findings indicated some schools use unqualified teachers to teach physics. Such choice of a round peg in a square hole is adversely affecting the academic performance of students , aside this ugly trend, such teachers cannot improvise instructional materials when the need arises.

The second finding on the scores of male and female physics teachers on the constraints they encounter in improvising instructional materials revealed that male teachers were positively favorably disposed to items in this subscale with a cluster mean rating of 3.21 while the female counterparts had a mean rating of 3.15.

Furthermore, the study reveals that the respondents agreed to the statement that there is need for sponsorship to seminars/ conferences organize by Science Teachers Association of Nigeria(STAN).The need to attend such conferences is key to acquiring improvisation skills. This finding is similar to those of other studies. For instance, Abolade (2004) study on utilization of educational research findings in Nigeria reported that most science teachers barely attend science conferences, and consequently, lag behind in scientific and technological acquisition of innovative techniques.

Finally, on the test of hypothesis, the study reveals that the scale is not gender sensitive.

Conclusion

The short supply or absence of standard instructional materials in schools has been the unhappiness to fulfilling Physics teaching-learning process. Also, some of the few standard instructional materials that find their ways to laboratories do not reflect the local background of students for easy comprehension. The study has shown that senior secondary physics teachers in Abuja grapple with several challenges in their efforts to improvising instructional materials and should therefore be encouraged to overcome the perceived constraints by implementing the following suggestions advanced.

Recommendations

Based on the findings of the study, the following recommendations are proffered :

i. Physics teacher should be given opportunity to upgrade and update themselves through attendance at workshops and seminars especially those organized by STAN.
ii. All tires of government as well as NGOs should make commitment to providing supports for physics teachers
iii. There be should adequate incentives for physics teachers to encourage them put in their best.

iv. Teacher –student ratio of 1:35 as stipulated in NPE(2013) should be maintained in physics class.

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