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Towards Improving Teachers' Competences in the Use of Instructional Materials in Senior Secondary Schools' Physics in Port Harcourt Metropolis, Rivers State

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ABSTRACT
This study was undertaken to determine the strategies for improving the competence of Physics teachers in the utilization of instructional resources for effective Physics subject delivery in secondary schools in Port Harcourt metropolis, Rivers state. The study sample was 87 physics teachers. A structured questionnaire was the instrument used to collect data for the study. The instrument was validated and a reliability coefficient of 0.83 obtained. Mean and standard deviation were used to analyze the research results. The findings revealed among other things that the use of instructional materials in physics subject delivery is adjourned beneficial to the teachers and the students. Some problems teachers encounter in instructional material usage such as insufficient instructional materials, finance and time constraints for improvisation of materials were identified. Based on the findings, the researcher therefore recommended some strategies for improving teacher's competence in instructional materials utilization to include among others, teachers developing positive attitude towards the use and their improvisation of instructional materials.
Keywords: Competence, Physics, instructional materials, improvisation, utilization, selection, development

INTRODUCTION

The impact of science is felt in every sphere of human life so much that it is intricately linked with a nation's development. It is in line with this belief that the Nigeria's national policy in education (2013) stipulates that a greater proportion of educational expenditure will be devoted to science and technology. This is in line with the trend world over where the development of any society is judged by the technological level attained. Science is regarded as the foundation upon which the bulk of present day technological breakthrough is built (Onasanya & Omosewo, 2011).

Science comprises the basic disciplines such as Physics, Chemistry, Mathematics and Biology (Oladejo, Olosunde, Ojebisi & Isola, 2011); all taught as component subjects in the senior secondary schools. Jegede and Adedajo (2011) believe that physics education is a major factor in enhancing technology development. The objectives of studying physics in our schools as contained in the national education scheme designed for secondary school physics (Jegede & Adedajo, 2011) include among others, is to provide basic literacy in physics for functional living in the society and to acquire essential scientific skills and attitudes as a preparation for the technological application of physics. Thus, physics as a science

subject is activity or practical-oriented and the appropriate methods of teaching it is resource base. This suggests that the mastery of physics concepts cannot be fully achieved without the use of practical instructional materials.

The concept of instructional materials also referred to as instructional aids, have gone beyond simple aids, instructional technology, and media to communication and educational technology. Instructional resources are regarded as educational inputs that are vital to the teaching of any subject in the school curriculum. They include those objects that are commercially acquired or improvised by the teacher to make conceptual abstraction more concrete and practical to the learner (Iwu, Ijioma, Onoja & Nzewuihe, 2011). They are relevant materials utilized by the teacher during instructional proceeds for the purpose of making the contents of the instructions more practical and less vague. Instructional materials are also described as concrete or physical object which provide sound, visual or both to the sense organs during teaching (Agina-Obu, 2005). Thus, instructional materials could be regarded as the information dissemination devices used in the classroom for easy transfer of learning. They provide first-hand experience where possible or of vicarious one where only that is feasible. Teachers are considered as the major implementing factors of effective resource utilizations in any teaching-learning process.

Instructional materials can be purchased, locally made, imported or even improvised when necessary for effective instructional delivery ((Okwelle & Allagoa, 2014). The professional physics teacher needs to note that every instructional material has its definite unique strength in teaching-learning situation. Furthermore, better teaching and faster learning of physics concepts can be facilitated by careful selection, development and skillful utilization of appropriate instructional materials by the competent teachers.

Utilization to a large extent judges the value of instructional materials by the degree in which it singly or collectively satisfies the derived instructional needs (Okwelle & Allagoa, 2014). Instructional materials are not ends in themselves but means of attaining specific instructional functions. The ability of the teacher to effectively utilize the available instructional materials optimizes the attainments of instructional situation; this varies with the level of utilization. Hence, the competency of the physics teacher is a determining factor in the effective utilization of instructional materials in a physics instruction.

Competence as a concept is defined by Eraut (as cited in Orji & Abolarin, 2012) as the ability to perform the task and roles required to the expected standards. According to Weinert (2001) competencies are the positive combinations of knowledge, ability and willingness in the ability of the individual to cope successfully and responsibly with changing situation. Similarly, Orji and Abolarin (2012) refer to competence as the effectiveness or ability of anyone concerned to apply the acquired knowledge and skill to achieve desired results.

These definitions express competence as changing over time, experience and setting. Thus, competence as a concept cannot be communicated but developed. In this regard, Urevbu (2006) views teacher competencies as knowledge, skills and values which a teacher possess. They are tools of teaching and only teachers who possess all the skills, knowledge and values needed to function effectively in the classroom situation are competent to teach in the situation (Okwelle & Allagoa, 2014). Therefore teacher competence in instruction delivery is key necessary input in realizing the objective of physics education.

Statement of the Problem

Effective instruction in physics subjects cannot be fully accomplished without the use of instructional materials. Their use promotes closer and effective communication between the teacher and the learners. Instructional materials for Physics instruction at secondary schools are available in large quantity but how to make the best instructional use of those available with the modern innovation are grossly lacking and faced with a lot of problems in its use by Physics teachers (Iwu, Ijioma, Onoja & Nzewuihe, 2011; Okeke & Okoye, 2013). A situation where a physics teacher pays "lip service" to activity-oriented instructional methods and resources that could enhance creative thinking in the learners negates the objectives of physics education at the secondary school. The need to fashion out ways of improving the use of

instructional materials by teachers in order to provide students with practical experiences in learning physics is the concern of this study.

Purpose of the Study

The purpose of this study is to determine the strategies for improving physics teachers' competences in the use of instructional materials for effective Physics subject delivery in secondary schools in Port Harcourt metropolis, Rivers state. Specifically, the study sought to;

1. Determine the usefulness of instructional materials to the physics teacher in teaching
2. Determine the usefulness of instructional materials to the physics students in learning
3. Determine the problems encountered by teachers in the utilization of instructional materials
4. Determine the strategies for improving the physics teachers' competences in the use of instructional materials

Research Questions

The following research questions were posed in the study:

1. How useful are instructional materials to the physics teacher in teaching?
2. How useful are instructional materials to the physics students in learning?
3. What are the problems physics teachers' encounters in the utilization of instructional materials?
4. What are the strategies for improving the physics teachers' competence in the use of instructional materials?

MATERIALS AND METHODS

The study was carried out in Port Harcourt metropolis of Rivers State of Nigeria. The design of the study was a descriptive survey study. The population of the study comprised all the Physics teachers in senior secondary schools in Port Harcourt metropolis of Rivers state. At the period of this study, there were 87 Physics teachers in the study area who were purposively sampled for the study. The instrument for data collection in the study was a structured 46 item questionnaire titled "Strategies for Improving Physics Teachers' Competence in the Use of Instructional Materials Questionnaire"(SIPTCUIMQ). The SIPTCUIMQ was patterned in a 5-point Likert scale of Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree, with assigned values of 5,4,3,2 and 1 respectively.

The reliability of the instrument was determined through Cronbach Alpha reliability coefficient method for a measure of internal consistency of the instrument. A total of 10 respondents who were not part of the sample were used in testing the reliability of this study. The reliability coefficient of 0.83 was obtained. Copies of the instrument were administered and retrieved by the researchers at the spot.

The instrument was face validated by two lecturers in Science Education and one in Measurement and Evaluation in Rivers state university, Port Harcourt, Nigeria. The reliability of the instrument was determined through Cronbach Alpha reliability coefficient method for a measure of internal consistency of the instrument. A total of 10 Physics teachers who were not part of the sample were used in testing the reliability of this study. The reliability coefficient of 0.89 was obtained. Copies of the instrument were administered and retrieved by the researchers and two research assistants at the spot. Mean and standard deviation were used to answer the research questions. A mean value of 3.00 was the cut-off point used to determine the acceptability or otherwise of an item in answering the research questions. Standard deviation values close or wide apart were used to determine the homogeneity in opinion among the respondents.

RESULTS

The analysis of data in relation to each of the research questions are presented in tables 1-4.

Research Question 1

How useful are instructional materials to the physics teacher in teaching?

Table1: Mean and Standard Deviation on Usefulness of instructional Materials to Physics Teachers

S/N	Usefulness of instructional Materials to Teachers	$\overline{X}$	SD	Remark
1.	They provide the physics teacher with interesting and competing platforms for conveying information to learners	4.34	0.91	Agree
2.	They help the teacher to overcome physical difficulties that could have hindered his effective presentation of a given topic.	4.20	0.95	Agree
3.	They are used to explain points, create reality and supply events to learners.	4.23	0.83	Agree
4.	They are used to encourage active participation of learners.	4.30	0.90	Agree
5.	Their use saves the teachers' time.	4.02	1.02	Agree
6.	They provide meaningful and useful sources of informatior teachers	4.15	1.04	Agree
7.	They help teachers to emphasize on realistic learning rather rote learning	4.32	0.91	Agree

Analysis of data in Table 1 show that all the physics teachers are in agreement with all the items with mean values above the cut-off point of 3.00 as the usefulness of instructional materials to teachers in Rivers state. The standard deviation of the items ranged from 0.83 to 1.04, implying that the respondents were close in their opinions.

Research Question 2

How useful are instructional materials to the physics students in learning?

Table2: Mean and Standard Deviation on Usefulness of instructional Materials to Physics Students

S/N	Usefulness of instructional Materials to Students	$\overline{X}$	SD	Remark
8.	They motivate learners to learn more and more.	4.24	0.96	Agree
9.	They help to develop positive attitude in students	4.21	0.91	Agree
10.	They help to develop healthy self concept in learners	3.79	0.85	Agree
11.	Their use make students to enjoy and appreciate Physics topics	4.30	0.90	Agree
12.	They help to develop understanding and judgment abilities in students.	4.12	1.01	Agree
13.	They help to develop functional knowledge and manipulative skill in students	4.15	0.99	Agree
14.	Aid students visualize or experience things during study.	4.13	0.91	Agree
15.	Facilitate different learning styles by students	4.15	0.95	Agree
16.	Stimulate learners' interest and curiosity	4.13	0.97	Agree
17.	They help to develop continuity of reasoning and coherence of thoughts in students	4.19	0.96	Agree
18.	Reduce Students' verbalism or repetition of words	4.05	0.93	Agree
19.	Provide opportunities for students' private study	3.50	0.96	Agree

Table 2 shows all the respondents accepted all the items as usefulness of instructional materials to Physics students in secondary schools in Rivers State. The standard deviation of the items ranged from 0.85 to 1.01 which signifies closeness in the opinions of the respondents.

Research Question 3

What are the problems physics teachers' encounters in the utilization of instructional materials?

Table 3. Mean and Standard Deviation on problems physics teachers encounters in the utilization of instructional materials

S/N	problems of utilization of Instructional materials	$\overline{X}$	SD	Remark
20.	Poor teachers' professional knowledge and technical know-how to teach practical skill content areas of Physics	2.24	0.82	Disagree
21.	Low teacher competence in the area of effective instructional resource utilization	2.34	0.93	Disagree
22.	Failure to appreciate the importance of using instructional materials in promoting and understanding of Physics concepts	2.49	0.83	Disagree
23.	Insufficient awareness of types of instructional materials for use in teaching different Physics contents.	3.01	0.90	Agree
24.	Insufficient time allocation to accommodate effective instructional materials utilization in Physics instruction	4.12	1.04	Agree
25.	Lack of finance to acquire needed instructional materials	4.15	1.06	Agree
26.	Lack of finance to improvise needed instructional materials	4.54	0.91	Agree
27.	Non-availability of equipped laboratories affects effective utilization of instructional materials.	4.15	0.95	Agree
28.	Non-availability of electricity also affects effective utilization of instructional materials.	3.53	1.01	Agree
29	Poor maintenance culture of existing instructional materials especially projected and manipulative types	3.48	0.96	Agree
30	Lack of opportunities for in-service training/refresher course for serving physics teachers to update their knowledge periodically.	3.62	0.96	Agree

In Table 3, the data analysis showed that the respondents disagreed with items 20, 21 and 22 while the rest of the items were accepted by the respondents as problems of utilization of instructional materials faced by physics teachers in senior secondary schools in Rivers state. The standard deviation indicates that the respondents were close on their response with values range from 0.82 to 1.04.

Research Question 4

What are the strategies for improving the physics teachers' competence in the use of instructional materials?

Table 4: Mean and Standard Deviation of strategies for improving the physics teachers' competence in the use of instructional materials

S/N	Strategies for the use of instructional materials	$\overline{X}$	SD	Remark
29.	Teachers to develop positive attitude towards the development and use of instructional materials utilization in physics instructional delivery in schools.	4.24	0.96	Agree
30.	The instructional objectives, content learning activities and evaluation instruments should be taken into consideration by the teacher in the selection, development and utilization of instructional materials.	4.34	0.93	Agree
31.	The subject content for which the instructional materials is being selected, where in doubt, the physics teacher should consult.	4.34	0.83	Agree
32.	The teacher needs to reflect individual differences of learners' characteristics in the use of instructional materials.	4.30	0.90	Agree
33.	Multidimensional presentation should be encouraged as the use of variety of the materials will increase curiosity and may appeal to more than one sense of the learner.	4.12	1.04	Agree
34.	Economic factor should be considered in selecting instructional materials for use in physics lesson delivery.	4.15	1.06	Agree
35.	There are a lot of resources in the local neighborhood which innovative teacher can exploit for the benefit of their students.	4.22	0.91	Agree
36.	The teacher must consider the cost of financial implications of the resource to be selected for classroom utilization.	4.15	0.95	Agree
37.	Before selecting or developing any resource, consideration should be given on the number of teaching/learning situations to which the resource can be applied.	4.13	1.01	Agree
38.	It is more economical to buy or develop a material which has dual usage than one that can be applied in a single learning situation.	4.18	0.96	Agree
39.	The teachers should realize the need for improvisation if the cost of purchasing is high.	4.22	0.96	Agree
40.	The teacher needs to develop or improvise teaching materials regularly.	4.19	0.96	Agree
41.	Improvisation by teachers could be done concurrently with the students such as project or group assignment in designing some gadgets of learning.	4.22	0.93	Agree
42.	Size of the target audience, sitting, viewing, listening arrangement and available time space are to be seriously considered in the decision, selection and development of instructional materials for use in physics lesson delivery.	4.20	0.96	Agree
43.	Preview the material before they are brought to the class to determine the operational state of the intended material, especially the manipulative aids, before the actual presentation	3.98	0.97	Agree
44.	At the end presentation with the teaching aids, measure outcomes to evaluate the effectiveness of instructional delivery.	4.15	0.99	Agree

The data presented in Table 4 show that the respondents agreed on all the items as strategies for improving the physics teachers' competence in the use of instructional materials in secondary schools in Rivers state. The standard deviation values range from 0.83 to 1.04 shows that the response of respondents are close to each other.

DISCUSSION OF FINDINGS

The findings presented in Table 1 concerned with the usefulness of instructional materials to the physics teacher in teaching. The items agreed by the respondents as usefulness of instructional materials among others include helping the teacher to explain points, create reality and supply events, encourage active participation of learners as well as saves the teachers' time. This finding is in line with Okwelle and Allagoa (2014) that the use of these resources in teaching promote closer and effective communication between the teacher and the learners.

In Table 2 the findings concerned with the usefulness of instructional materials to the students in Physics instruction. It was found among other things that the respondents agreed that the use of instructional materials help the students to appreciate physics as a subject, develop functional knowledge and manipulative skill, visualize or experience something and stimulate learners' interest and curiosity. This finding is supported by Agina-Obu (2005) who described instructional materials as concrete or physical object which provide sound, visual or both to the sense organs during lesson delivery.

The data presented in Table 3 show that the problems physics teachers encounter in the utilization of instructional materials were mainly focused on time constraint, lack of finance to acquire or improvise needed instructional materials, environmental factors such as non-availability of equipped laboratories, electricity and poor maintenance culture of existing instructional materials especially projected and manipulative types. This findings is consistent with that of Iwu, Ijioma, Onoja and Nzewuihe (2011); Okwelle and Allagoa (2014) that time constraints, financial constraints, poor maintenance culture and environmental factors are some of the problems hindering effective instructional delivery in science subjects. On the other hand, low teacher competence in the area of instructional resource utilization, insufficient awareness of types of instructional materials and failure to appreciate the importance of using instructional materials in promoting and understanding of Physics concepts were not rated as problems by the physics teacher in this study. This findings contradicted Iwu, Ijioma, Onoja and Nzewuihe (2011); Okoye and Okoye (2013)who reported that teachers' professional knowledge and technical know-how were constraints to the use of instructional materials in science subjects instruction delivery.

The findings from Table 4 revealed that the respondents agreed with all the suggested strategies as measures for improving physics teachers' competence in the use of instructional materials in instructional delivery. This is in line with Oladejo, Olosande, Ojebisi and Isola, (2011) that there is need for Physics teachers to be resourceful in instructional materials selection and utilization, development of positive attitude by teachers and regular low cost of procuring instructional materials. The teaching of Physics without instructional materials is an ineffective instructional delivery approach that may result to poor academic achievement. .

CONCLUSION

The delivery of quality instruction in the classroom in any education system depends largely on the quality and competence of the teachers. This is because the teachers are expected to perform the important function of guiding, directing, evaluating, imparting, asking and answering questions among others for maximum benefits of the learners. The implication is that the teacher is the stronghold on which the business of educators rests upon the world over. The competent physics teacher who is curious of effective instructional delivery sees instructional materials not as a gadgets like textbooks, chalks, chalkboard but as every necessary resources and objects which the teacher develops and improvises for use in the process of instructional delivery to concretize his lesson for effective and more reliable understanding by the learner about abstract concepts of physics lesson.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made;

- Physics teachers need to develop positive attitude towards the development and use of instructional materials utilization in physics instructional delivery in schools.
- The teachers should maintain appropriateness of the materials to instructional objectives.
- Government should regularly supply instructional materials to schools
- Before selecting or developing any resource, consideration should be given on the number of teaching/learning situations to which the resource can be applied. This is because it is more economical to buy or develop a material which has dual usage than one that can be applied in a single learning situation. Therefore, acquisition of teaching aids having a wide range of practicability is essential.
- There are a lot of resources in the local neighborhood which innovative teacher can exploit for the benefit of their students.
- Teachers should be encouraged to improvise instructional materials in the face of non-availability of commercial types
- The teachers should realize the need for improvisation if the cost of purchasing is high. Such improvisation is a way of increasing inquiry, curiosity, creativity and productive application of intellect.
- The teacher needs to develop or improvise teaching materials which could also be done concurrently with the students such as project or group assignment in designing some gadgets of learning. This also promotes creativity among students.

REFERENCES

Agina-Obu, T. N. (2005). The relevance of instructional materials in teaching and learning. In Robert-Okah. I & Uzoeshi, K. C. (EdS). *Theories and practice of teaching.* Port Harcourt: Harey Publication.

Bozimo, O. (2002). *Social studies theories and perspectives*. Onitsha: Outright Publisher.

Federal Republic of Nigeria (2004). *National curriculum for senior secondary schools.* Volume 3 Science. Lagos.

Federal Republic of Nigeria (2013). *National policy on education* (Revised).Yaba, Lagos: NEDRC.

Iwu, R. U. Ijioma B. C., Onoja, A. I. & Nzewuihe, G. U. (2011). Teaching aids. A panacea for effective instructional delivery in biology. *Researcher*, 3(2), 62 -65. Retrieved online from http://www.sciencepub.net/researcher/research0302/08_4388research0302_62_65_teach.pdf on 24/06/2014.

Jegede, S. A. & Adedajo, J. O. (200). Enriching physics education in Nigeria towards enhancing a sustainable technological development. *Greener Journal of Research*, 3(2), 80 – 84. Retrieved online from http://www.gjournals.org/GJER/GJER%/.../Jegede%20andAdedayo.pd on 24/06/2014.

Oladejo, M. A.; Olosande G. R., Ojebisi, A. O. & Isola, O.(2011). Instructional materials and students academic achievement in physics: Some policy implications. *European Journal of Humanities and Social Sciences*, 2(1), 112 – 123. Retrieved online from http://www.journalsbank.com/ejhss_2_4.pdf on 25/06/2014.

Okeke, S. O. & Okoye, N. E. (2013). Effective resource utilization. A better approach to teaching and learning of physics. *Academic Journal of Interdisciplinary Studies*, 2 (6), 35 – 39. Retrieved online from http://www.mcser.org/journal/index.php/ajis/article/view/615 on 24/06/2014.

Okwelle, P. C. & Allagoa, F. O. N. (2014). Enhancing teachers' competence in the use of instructional materials in electronics education in senior secondary schools in Nigeria. *Research on Humanities and Social Sciences*, 4(28), 20 – 25.

Onosanya, S. A & Omosewo, E. O. (2011). Effect of improvised and standard instructional materials on secondary school students' academic performance in physics in Ilorin, Nigeria. Singapore Journal

of Scientific Research, 1(1), 68 – 76. Retived online from http://www.scialert.net/fultext/?doi+sjsres.2100.68.76 on 01/07/2014.

Orji, U. E., & Abolarin, E. (2012). Strategies for enhancing teacher competence and quality of classroom instruction. *Global Voice of Educators, 1(1), 1 - 6.* Retrieved online from http://www. globaleducators.org/downloads/global…/Journal%202012-%2028.pdf on 25/06/2014.

Urevbvu, A. O. (2006): Research on teaching as a basis for teaching practice: Problems and possibilities for teacher education in Nigeria. The 3rd Faculty of Education Distinguished Lecture Series, University of Benin, Benin City, Nigeria.

Weinert, F. E. (2001). Concept of competence: a conceptual clarification, in: D.S. Rychen & L. H. Salganik (Eds) *Defining and selecting key competencies* (Gotingen, Hogrefe).