

Original Article

AWARENESS AND UTILIZATION OF IMPROVISATION STRATEGIES IN TEACHING BIOLOGY IN SECONDARY SCHOOLS IN EBONYI NORTH EDUCATION ZONE

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Abstract The purpose of study is to ascertain the awareness and utilization of improvisation strategies in teaching Biology in secondary schools in Ebonyi North Education Zone of Ebonyi State. Two research questions and four null hypotheses were formulated and tested at .05 level of significance. Descriptive survey research design was employed for the study. The population for the study consisted of 103 Biology teachers in the governments owned secondary schools in Ebonyi North Education Zone. No sampling was done because the population is small manageable. The researcher developed structured instrument with the title “Awareness and utilization of Improvisation Strategies in Teaching Biology Questionnaire” (AUISTBQ). The instrument was validated by three research experts. Cronbach Alpha reliability estimate was used to determine the internal consistency of the instrument. Reliability indices of .69, and .80 respectively. The overall reliability index stood at .74 indicating that the instrument is highly reliable and suitable for the study. Data collected were analyzed using mean with standard deviation to answer the two research questions. The null hypotheses were tested using t-test statistics at .05 level of significance. From the discussion of the findings, it was concluded that Biology teachers to a high level are aware of improvisation and small scale experiment strategy in teaching Biology in secondary schools in Ebonyi North Education Zone. The findings of the study indicated that Biology teachers to a low extent utilize improvisation strategy and small scale experiment in teaching Biology in secondary schools in Ebonyi North Education Zone. There is no significant difference in the mean response scores of male and female Biology teachers on their level of awareness and utilization of improvisation strategy in teaching secondary schools Biology in Ebonyi North Education Zone. Similarly, there is no significant difference in the mean response scores of urban and rural Biology teachers on their level of awareness and utilization of improvisation strategy in teaching secondary schools Biology in Ebonyi North Education Zone. Based on the findings, the researcher recommended among others that deliberate efforts should be made by education supervisors in ensuring that the Biology teachers utilize improvisation strategies in teaching Biology in secondary schools in Ebonyi North Education Zone of Ebonyi State.

Keywords: Awareness, Utilization, Improvisation, Strategies, Teaching, Biology

Introduction

Education is a major instrument for tackling unemployment, poverty and ignorance. It is on this basis that the Federal Republic of Nigeria (FRN, 2013), outlined in her National Policy on Education, the cardinal aims of education which include among others;

- *the development of the intellectual capacity of individuals to understand and appreciate their environment; and*
- *the acquisition of both physical and intellectual skills which will enable individuals develop into useful members of the community.*

These skills are acquired in formal education settings from primary, secondary and tertiary institutions such as universities, polytechnics and colleges of education. For the purpose of this study, the focus will be on secondary education. The secondary education is one aspect of educational institutions in Nigeria that is designed specifically to train and prepare students for middle-level services in both manufacturing and service industries. One of the objectives of secondary education according to Atuyi (2019), is the acquisition of both physical and intellectual skills which will enable individuals to be self-reliant and useful members of the society. It must be emphasized that secondary education in Nigeria is for six years duration, junior secondary school (3 years) and senior secondary school (3 years). The two stages are both vocational and academic in nature. The broad goal of secondary education as stated in the National Policy on Education is to prepare the individual citizen for useful living within the society and preparation for higher education (FRN, 2013). Significant to this preparation are the secondary school science subjects.

Science is a branch of knowledge or study dealing with a body of facts or truth systematically arranged and showing the operation of general laws. Burnie

(2017), posited that classifying science involves arbitrary decisions because to him the universe is not easily split into separate compartment. Burnie, however divides science into five major branches: Mathematical science, Physical science, Social science, Earth science and Life science. It must be emphasized that Science is thus more than the presentation or acquisition of scientific facts and skills. It includes the development of new ways of thinking, reacting and behaving - a development that reveals itself in increased skills, knowledge and thinking capacities to tackle problems of life, in new habits of action, in more desirable attitudes, in benefited personality and in improved character (Nwagbo & Uzoma, 2014). There are various Science subjects being taught at the secondary school level. These include Biology, Chemistry, Physics and others. For the purpose of this study, emphasis is on Biology.

Biology is a science subject which aims at equipping students with appropriate scientific attitude, competence and ability to apply scientific knowledge to every challenge in life. It is a natural science that deals with living world: how the world is structured, how it functions and what these functions are, how it develops, how living things came into existence and how they react to one another and with their environment (Umar, 2021). Debra (2016), asserted that Biology is a prerequisite subject for many fields of learning that contributes immensely to the technological growth of the nation. This includes Medicine, Pharmacy, Nursing, Agriculture, Forestry, Biotechnology and many other areas (Ahmed and Abimbolas, 2021).

In spite of the importance and popularity of Biology, research reports by Udoka (2020) and Agbo (2021) indicated students' low performance in Biology as contained in the Chief Examiners report of 2017, 2018, 2019, 2020 and 2021 respectively. According to these researchers, in 2017 for the WAEC Examination, the percentage of Secondary School

Biology students who had between A₁-C₆ was 36.55% while 63.45% had between D₇-F₉. In 2018, 34.50% had between A₁-C₆ while 65.50% had between D₇-F₉. In 2019 36.91% had between A₁-C₆ while 64.09% had between D₇-F₉. In 2020, 34.52% had between A₁-C₆ while 65.48% had between D₇-F₉. In 2021, 33.55% has between A₁ – C₆ while 64.45% had between D₇ – F₉. The implication of this is that Nigeria may have shortage of man power in science and technology in the near future. It has been observed that biology is a veritable tool for scientific advancement of any nation. This fact is enshrined in the National Policy of education (FRN, 2013), which stated that science education should be among the subjects taught to students to equip the students to live in the modern age of science and technology. To achieve this, the teaching of biology should be done in such a way that it will be meaningful to the students. This can only be achieved through proper use of instructional materials (Udoka, 2020). This implies that there must be availability of the necessary teaching resources, which in most cases are not there due to paucity of funds.

It must be emphasized that to ensure effective teaching and learning of Biology, lots of chemicals and equipment are required. It is on this basis that Nwobodo (2021), posited that equipment can be used over and over again but the chemicals are expendables which are normally poured into sink after practical lessons. Sadly, most of the expendables are costly and always in short supply. Nwobodo, added that the high cost and scarcity of chemicals do not permit effective teaching and learning of Biology in secondary schools. It is an obvious fact that chemicals or expendables are in short supply and practical lessons are being omitted as a result. Such being the case, there is need to seek for an alternative strategies of teaching Biology. Alternative teaching strategies that permit the use of locally available materials need to be sought to

ensure that students are exposed to requisite Biology experiences. Such alternative teaching strategies is referred to as cost reducing teaching strategies.

Cost reducing teaching strategies includes improvisation, Role simulation, conscious use of locally available materials, judicious application of expendables, uses of recycling procedures, control over the possibility of glassware casualty, ability to minimize the contamination of reagents, repairs and maintenance of equipment by teachers themselves, production/ marketability / profitability of Biology produce, locally manufactured and sold for profit by the students themselves under guidance, use of small scale experiment and the reduction of pilferage of laboratory materials. Each of these characteristics is in its own right cost reducing. Cost reducing strategies may help to ameliorate the difficulties encountered by teachers during instructional delivering (Ibe, 2017). Iheanyi (2015), stated that Biology teachers are to a reasonable level aware of the cost reducing strategies but are hindered by both personal reasons and environmental constraints. Cost reducing strategies according to Ezeano in Nwobodo (2021), include judicious application of expendables, small scale experiment and improvisation among others. In this study, emphasis will be laid on improvisation as researchers such as Uzoechi (2016), and Nwobodo (2021), believes that these strategy can be applied so that students will be effectively taught even during scarcity of teaching materials.

Improvisation is a method of cost reducing strategy in teaching and learning of biology. Balogun (2015), defined improvisation as the act of using alternative materials and resources to facilitate instruction wherever there is lack or shortage of specific firsthand teaching aid. It is the use of products of look-alike object to facilitate instruction. Adeniyi (2016), viewed improvisation as to adopt materials for use where normally other conventional items are employed. Nwaeze (2017), advocated two forms of improvisation, role substitute and role simulation.

The role substitution form entails modification of the original materials in order to perform its function in an experimental setting. The role simulation form involves the actual construction of apparatus discarded materials or preparation of a new but a substitute material that can stand in place of the conventional one.

Improvisation involves the production of alternative materials to serve as a substitute in place of an existing but not available laboratory materials. According to Chukwunyeremunwa (2013), improvisation is a technique of originating a very new tool, materials device or modifying existing ones for serving a particular purpose. Improvisation is the process of making equipment and materials by the students or by engaging the services of others in the absence of the real or manufactured ones (Bassey, 2019). Adeniyi (2016), stated that improvised materials which can be used in teaching practical science among others include: Malta bottles for reagents bottles, hibiscus flower pigment for indicator, methylated spirit lamp for Bursen burner and other collection of chemical reagents from local resources. Mogbo in Nweze (2017) noted that Biology teachers in Nigeria use substitutes when the conventional chemicals are not found. Aronson (2013), asserted that broomsticks with plasticine rolled into ball can be used for molecule models and ear or eye-drops containers can serve as dropping pipette for indicators. Improvisation when applied helps to make available the needed materials for teaching and learning of biology in general and practical in particular (Nwobodo, 2021). Improvised materials are cheaper than the conventional ones, it replaces the costly unavailable materials and helps in the achievement of learning objective. Generally, improvisation of instructional materials is an attempt to adapt makes use of local resources in teaching/learning process when the ready- made materials are not available or are in shortfall or not within the reach of users.

Improvisation presents to the learners the properties as the real instructional materials in teaching learning process. Improvised materials according to Ubaka (2017),

- Provide very rich visual experiences to all learners and afford them the opportunity of teaching and manipulating materials for direct concrete experiences.

- Promote quick understanding by arresting learner's attention and give firsthand experience which are not easily forgotten by students, stimulate creative expressions in pupils and encourages active participation in the lesson.

- Afford the students the opportunity of individualized study and hence promote individualized instruction in Biology teaching and learning.

Improvised materials are cheaper than the conventional ones, it replaces the costly unavailable materials and helps in the achievement of learning objective. However, the extent of awareness and utilization of improvisation strategy in teaching of Biology in Ebonyi North Education Zone remains a gap of serious concern. This is the focus of this study. The question still remains whether the Biology teachers are aware of these improvisation strategies and the extent to which they utilize them in instructional delivery to enhance teaching of Biology.

Biology teachers need to be aware of these cost reducing strategies and utilize them for effective teaching and learning of Biology to improve students' understanding of Biology. Reimer and Haines (2013), defined awareness as "knowing who is around, what activities are going on and who is talking with whom". Awareness is defined as a human perception and cognitive reaction to a condition or event (Nwobodo, 2021). Awareness is having knowledge that something exists, or understanding a situation or subject at the present time based on information or experience. It is very

important that the Biology teachers are aware of these cost reducing strategies and as well utilize them so as to fill the gap created by scarcity of teaching materials and enhance effective teaching of Biology.

Utilization is the primary method by which asset performance is measured and business determined. According to Raghu (2019), utilization is the transformation of a set of input into goods and services. Utilization means the act or process of using a particular thing, idea or method for the actualization of a purpose (Udoka, 2020). Utilization of improvisation strategies in instructional delivery by Biology teachers requires teachers' knowledge of the various alternative instructional facilities, as well as an understanding of how students learn using varied improvisation strategies in teaching and learning. Petterson (2021), opined that the none use or underutilization of instructional facilities in school is attributable to the teacher, explaining that facilities in education do not on their own achieve any meaningful values without being utilized. Thus, improvisation strategy may not on its own achieve any meaningful goal without being put into effective use by the Biology teacher. One influencing factor in the context of awareness and utilization of any resources, method or strategies in teaching and learning that includes improvisation strategies in instructional delivery is gender.

Gender is the range of characteristics pertaining to and differentiating between masculinity and femininity (Ibe, 2018). Gender refers to the socially constructed characteristics of women and men. Gender is a characteristic that distinguish between male and female in the aspect of their behaviour, activities and attitudes which need to be considered in the investigation process of work. Research has shown that gender issues affect all aspect of society as regarding their profession, competencies in higher institution and so on, which actually reflect biasness in their performance level (Onuzulike, 2021).

Although dependent researches by Onuzulike (2021), and Ibe (2018), have found that male perform better than female especially on higher order knowledge, a few others like Iyod & Gressand (2020), discovered that female outperformed the male, while some others establish no significant difference particularly, during early education (Adeleke, 2016). Onuzulike (2021), stated that, gender has been identified as a critical factor that affects teachers' work output in the use of computer in teaching Biology. Therefore, considering gender in this study could yield useful practical information based on the controversy on issue of gender. There could be a significant difference in the level of awareness and utilization of improvisation strategies between male and female Biology teachers. Therefore due to lack of consensus regarding the issue of gender and Biology and science in general, there is need to investigate awareness and utilization of improvisation strategies for teaching Biology by male and female Biology teachers in both rural and urban secondary schools in Ebonyi North Education Zone.

Another factor that may influence the awareness and levels of utilization of improvisation strategies in instructional delivery in secondary school Biology is location. This has to do with the area or place the school is located. The school location also refers to whether the school is in urban or in the rural areas. Location may be defined as a place of settlement, activity or residence. Ibe (2018), noted that schools located at the urban areas are better financed and funded than those in rural areas. Wagner, Hassanein and Head (2014), pointed out that the utilization of instructional resources, improvisation strategies inclusive in institution is influenced by schools location which could make the procurement of instructional resources by those institutions difficult or easy, as the case may be. Noteworthy is the fact that availability would go a long way in determining the extent of awareness and the existence of the

improvisation strategies. Thus, the awareness and utilization of improvisation strategies in secondary schools might differ. The rural and urban may differ in the quality of improvisation strategies applied in teaching and learning of Biology (Leem & Lim, 2017). Considering the fact that the use of improvisation strategies may go a long way to improve teaching and learning of Biology as well as practical teaching of Biology, therefore it is essential to determine the extent to which Biology teachers are aware of and the extent of utilization of improvisation strategies in teaching and learning of Biology in secondary schools in Ebonyi North Education Zone of Ebonyi State.

Statement of the Problem

Biology as a science subject should be taught practically to help the students know and understand theory aspect of it clearly. Most students are unable to perform in practical when needed due to lack of Biology equipment. Some of these teaching materials are harmful while some are very costly that the school authorities are unable to purchase them, and effective teaching is not possible in the absence of important teaching materials. The poor performance of students in Biology has been attributed to poor teaching methods in form of excessive talking, copying of notes and rote learning of textbooks materials adopted by science teachers. The students are exposed to expository (than inquiry methods in Biology) which does not predispose students to experimentation.

However, the teaching and learning of biology is an activity whose success is determined by host of factors among them are the nature and availability of necessary facilities. The issue may not only be availability but rather the awareness and use of the facilities, depending on the specific features of that particular topic. Therefore, if this is the case for conventional materials then there is need to explore alternative strategies with regards to teaching of practical which can allow effective teaching of

biology even when the conventional teaching materials are not available. Alternative strategies such as cost reducing strategies which allow the use of improvisation of inadequate materials, and small scale experiment. More so, with cost reducing strategies, Biology could be taught even during the period of scarcity of conventional instructional materials and can help to remove the lapses that have led to poor exposure of students to practical experiences, but the question is whether teachers are aware and can they utilize these cost reducing strategies in teaching biology. The problem of the study, put in question form, to what extent are the teachers aware of cost reducing strategies and to what extent have the Biology teachers of Ebonyi North Education Zone used them in teaching.

Purpose of the Study

The main purpose of study is to ascertain the awareness and utilization of cost reducing strategies in teaching of Biology in secondary schools in Ebonyi North Education Zone of Ebonyi State. Specifically, the study seeks to;

1. Ascertain the level of Biology teachers' awareness of improvisation strategy as cost reducing strategy in teaching Biology.
2. Investigate the extent of Biology teachers' utilization of improvisation strategy in teaching of Biology.

Research Questions

The following research questions guided the study.

1. To what level are the biology teachers aware of improvisation strategy in teaching biology in secondary schools in Ebonyi North Education Zone?
2. To what extent do biology teachers utilize improvisation strategy in teaching biology in secondary schools in Ebonyi North Education Zone?

Hypotheses

The following null hypotheses were formulated for the study and were tested at 0.05 level of significance:

H01: There will be no significant difference in the mean response scores of male and female biology teachers on their level of awareness of improvisation strategy in teaching secondary schools biology in Ebonyi North Education Zone.

H02: There will be no significant difference in the mean response score of male and female biology teachers on their utilization of improvisation strategy in teaching secondary schools biology in Ebonyi North Education Zone.

H03: There will be no significant difference in the mean response scores of urban and rural biology teachers on their level of awareness of improvisation strategy in teaching secondary schools biology in Ebonyi North Education Zone.

H04: There will be no significant difference in the mean response scores of urban and rural biology teachers on their extent of utilization of improvisation strategy in teaching secondary schools biology in Ebonyi North Education Zone.

Method

Descriptive survey research design was utilized for this study. Descriptive survey research design according to Nworgu (2015), is one in which a group of people or items is studied by collecting and analyzing data from only a few people or items considered to be representative of the entire group. The descriptive survey research design is considered suitable since the study solicited information from the respondents directly and afford all the respondents equal chance of being chosen for the study. The area of the study is Ebonyi North Education Zone of Ebonyi State. Ebonyi State is located in the South Eastern part of the Nigeria. Ebonyi has 13 Local Government Areas with 3 Education Zones namely: Afikpo Education Zone, Ebonyi North Education Zone, and Ebonyi Central Education Zone. It is also known for its rich cultural heritage, commercialization and artifacts. The major occupation of its citizens is farming while the predominant tribe is Igbo and English. Specifically,

this study covers only the 78 governments owned schools in Ebonyi North Education Zone of Ebonyi State. Ebonyi North is made up of 10 urban and 68 rural secondary schools with Abakaliki, Ebonyi, Izzi, and Ohaukwu Local Government Areas. The choice for Ebonyi North Education Zone is informed by the fact that it is allegedly characterized by students' low performance in Biology external and internal examinations. The population for the study consisted of 103 Biology teachers currently serving in the governments owned secondary schools in Ebonyi North Education Zone. Among them are 42 male and 61 female teachers. This is based on the data obtained from the Secondary Education Board Abakaliki (SEBA, 2023). The total population of 103 was used for the study. No sampling was done because the population is small manageable.

The researcher developed structured instrument with the title "Awareness and utilization of Improvisation strategy in teaching Biology Questionnaire" (AUISTBQ). The instrument has two sections, A and B. Section A contains the respondents' personal information as well as the instructions while section B is divided into four(4) clusters with 42 items structured to assist the researcher in providing clues to the research questions that guided the study. Cluster 1 is on the level of biology teachers' awareness of improvisation strategy with 13 items. Cluster 2 is on the extent of biology teachers' utilization of improvisation strategy in teaching biology with 13 items. The response format for cluster 1 is a 4 point scale of Very High Level (VHL) High Level (HL), Low Level (LE), and Very Low Level (VLL), while clusters 2 is Very Great Extent (VGE), Great Extent (GE)Low Extent (LE) Very Low Extent (VLE). Each response option has a numerical value assigned to it thus:

| | |
|-------------------------|-----------------------|
| Very Great Extent (VGE) | Very High Level (VHL) |
| | = 4 points |
| Great Extent (GE) | High Level (HL) |
| | = 3 points |

Low Extent (LE)

= 2 points

Very Low Extent (VLE)

(VLL) = 1 point

Low Level (LE)

Very Low Level

The instrument was validated by three experts, two from the Department of Science Education, and one from Measurement and Evaluation Unit, Mathematics and Computer Department, Faculty of Education, Enugu State University of Science and Technology (ESUT). To this end the researcher attached the purpose of study, scope of study, research questions, and hypotheses that were formulated to guide the study. They used them to assess the instrument in terms of clarity, relevance and suitability of the items within the instrument. The comments, suggestions and advices from the experts were used in restructuring the final drafted instrument.

The researcher conducted a trial test using 20 Biology teachers from secondary schools in Ebonyi Central Education Zone. The choice for Ebonyi Central Education Zone was due to the fact that both Education Zones have the same educational characteristics in terms of administration, and environment. The respondents were assured of complete confidentiality of all information they supplied, they were allowed to complete the instrument at their own convenience. The responses to the various items of the questionnaire were used in computing its reliability using Cronbach Alpha reliability estimate. The choice for Cronbach Alpha is in line with the assertions of Daniel (2019) that Cronbach Alpha is used when multiple choice items are used in questionnaire. Thus, the researcher used Cronbach Alpha reliability estimate to determine the internal consistency of the instrument. Reliability indices of .80, and .79 were obtained for clusters 1 and 2 respectively. The overall reliability index stood at .71 indicating that the instrument is highly reliable and suitable for the study. The researcher administered the instrument directly to the 103

respondents using three briefed research assistants. Appointments were booked with the respondents for collection at a later day for those who were not able to fill their own copies of the instrument because of the nature of their job. The data collected were analyzed using mean with standard deviation in order to answer the four questions. The null hypotheses were tested using t-test statistics at .05 level of significance. The decision rule; real limit of the mean scores was applied, therefore, the upper and lower limits of the mean is as follows;

Mean scores from 3.50 – 4.49 Very Great Extent (VGE)

Mean scores from 2.50 – 3.49 Great Extent (GE)

Mean scores from 1.50 – 2.49 Little Extent (LE)

Mean scores from 0.50 – 1.49 Very Little Extent (VLE)

The null hypotheses were rejected when the significant level is less than .05 and were not rejected when the significant level was more than 0.05 level of significance.

Results

Research Question 1

To what level are the Biology teachers aware of improvisation strategy in teaching Biology in secondary schools in Ebonyi North Education Zone?

Table 1: Mean Ratings and Standard Deviation of the Respondents on the Level Biology Teachers are Aware of Improvisation Strategy in Teaching Biology in Secondary Schools in Ebonyi North Education Zone

N= 103

| S/ N | Level biology teachers are aware of improvisation strategy in teaching biology in secondary schools includes; | Male N=42 | | Female N=61 | | Overall | | Decisi on |
|------------------------|---|-------------|-----------------|-------------|-----------------|-------------|-----------------|--------------|
| | | \bar{X}_1 | SD ₁ | \bar{X}_2 | SD ₂ | \bar{X}_G | SD _G | |
| 1 | kerosene stove can stand for bunsen burner | 3.14 | 0.90 | 3.15 | 0.89 | 3.15 | 0.89 | HL |
| 2 | used plastic bottle open at base can stand for funnel | 3.43 | 0.67 | 3.42 | 0.67 | 3.43 | 0.67 | HL |
| 3 | stripped cardboard can stand for D.N.A model | 3.10 | 0.62 | 3.11 | 0.61 | 3.11 | 0.61 | HL |
| 4 | used electric bulb can stand in place of round bottom flask | 3.14 | 0.57 | 3.16 | 0.55 | 3.16 | 0.56 | HL |
| 5 | cloth peg can stand for test tube holder | 3.00 | 0.62 | 3.02 | 0.61 | 3.01 | 0.62 | HL |
| 6 | malt bottle can replace reagent bottles | 3.05 | 0.58 | 3.04 | 0.59 | 3.05 | 0.58 | HL |
| 7 | biro case, cardboard tube can replace photo meter | 3.24 | 0.76 | 3.23 | 0.76 | 3.23 | 0.76 | HL |
| 8 | metal, iron, washer ring bolt and nut spring can replace reptile hook | 2.95 | 0.85 | 2.95 | 0.86 | 2.95 | 0.85 | HL |
| 9 | used vaseline bottle, straw, biro case can replace porter | 2.86 | 0.78 | 2.85 | 0.79 | 2.85 | 0.78 | HL |
| 10 | cut handle of table spoon can replace spatula | 3.14 | 0.78 | 3.15 | 0.79 | 3.15 | 0.78 | HL |
| 11 | feeding bottle can replace measuring cylinder | 3.33 | 0.65 | 3.34 | 0.66 | 3.34 | 0.65 | HL |
| 12 | dropping load of used ear/eye drop can take place of pipette | 3.10 | 0.82 | 3.13 | 0.81 | 3.12 | 0.81 | HL |
| 13 | disused cream cover can serve as petri-dish | 3.19 | 0.59 | 3.23 | 0.56 | 3.21 | 0.57 | HL |
| Cluster Mean/SD | | 3.13 | 0.71 | 3.14 | 0.70 | 3.14 | 0.70 | HL |

Note: X=Mean; SD=Standard Deviation; HL = High Level

From the Table 1 above, the results of data analysis for research question 1 indicated that male and female Biology teachers agreed that all the items are of high level, which had mean responses of (2.85 to 3.43), that where higher than the cut-off point of 2.50. The Standard deviation values are small indicating that the respondents' responses are closely clustered around the mean, signifying that their responses are homogenous. The overall cluster mean of 3.14 in Table 1 indicated that the items are of high

level on the Biology teachers' awareness of improvisation strategy in teaching Biology in secondary schools in Ebonyi North Education Zone. This implies that Biology teachers to a high level are aware of improvisation strategy in teaching Biology in secondary schools in Ebonyi North Education Zone.

Research Question 2

To what extent do Biology teachers utilize improvisation strategy in teaching biology in secondary schools in Ebonyi North Education Zone?

Table 2: Mean Ratings and Standard Deviation of the Respondents on the Extent Biology Teachers Utilize Improvisation Strategy in Teaching Biology in Secondary Schools in Ebonyi North Education Zone

N=103

| S/N | Biology teachers' utilization of improvisation strategy in teaching Biology are as follows; | Male N=42 | | Female N=61 | | Overall | | Decision |
|-----|---|-------------|-----------------|-------------|-----------------|-------------|-----------------|-----------|
| | | \bar{X}_1 | SD ₁ | \bar{X}_2 | SD ₂ | \bar{X}_G | SD _G | |
| 13 | kerosene stove can stand for bunsen burner | 2.19 | 0.51 | 2.18 | 0.50 | 2.18 | 0.50 | LE |
| 14 | used plastic bottle open at base can stand for funnel | 1.95 | 0.58 | 1.95 | 0.59 | 1.95 | 0.58 | LE |
| 15 | stripped cardboard can stand for D.N.A model | 2.00 | 0.62 | 2.02 | 0.62 | 2.01 | 0.62 | LE |
| 16 | used electric bulb can stand in place of round bottom flask | 1.81 | 0.67 | 1.82 | 0.67 | 1.82 | 0.67 | LE |
| 17 | cloth peg can stand for test tube holder | 1.90 | 0.69 | 1.90 | 0.70 | 1.90 | 0.69 | LE |
| 18 | malt bottle can replace reagent bottles | 1.95 | 0.66 | 1.97 | 0.66 | 1.96 | 0.66 | LE |
| 19 | biro case, cardboard tube can replace photo meter | 1.81 | 0.74 | 1.82 | 0.74 | 1.82 | 0.74 | LE |
| 20 | metal, iron, washer ring bolt and nut spring can replace reptile hook | 1.76 | 0.76 | 1.77 | 0.76 | 1.77 | 0.76 | LE |
| 21 | used vaseline bottle, straw, biro case can replace porter | 1.52 | 0.67 | 1.52 | 0.67 | 1.52 | 0.67 | LE |
| 22 | cut handle of table spoon can replace spatula | 1.48 | 0.67 | 1.49 | 0.67 | 1.49 | 0.67 | VLE |
| 23 | feeding bottle can replace measuring cylinder | 1.33 | 0.48 | 1.34 | 0.48 | 1.34 | 0.48 | VLE |
| 24 | dropping load of used ear/eye drop can take place of pipette | 1.43 | 0.50 | 1.44 | 0.50 | 1.44 | 0.50 | VLE |
| 25 | disused cream cover can serve as petri-dish | 1.67 | 0.72 | 1.67 | 0.72 | 1.67 | 0.72 | LE |
| | Cluster Mean/SD | 1.75 | 0.58 | 1.76 | 0.64 | 1.76 | 0.64 | LE |

Note: X=Mean; SD=Standard Deviation; LE= Low Extent; VLE= Very Low Extent

Data presented in Table 2 indicates that items have an overall item mean ratings for items 22, 23 and 24 were 1.49, 1.34 and 1.44 indicating very low extent. The remaining items mean score ranges from 1.52 to 2.18, which were below the cut-off point of 2.50 as indicated in the decision rule. The Standard deviation values are small indicating that the respondents' responses are closely clustered around the mean, signifying that their responses are homogenous. The overall cluster mean rating (1.76)

indicated low extent. This implies that Biology teachers to a low extent utilize improvisation strategy in teaching biology in secondary schools in Ebonyi North Education Zone.

Hypothesis 1

There is no significant difference in the mean response scores of male and female Biology teachers on their level of awareness of improvisation strategy in teaching secondary schools Biology in Ebonyi North Education Zone.

Table 3: Summary of t-test Analysis of Mean Response Scores of Male and Female Biology Teachers on their Level of Awareness of Improvisation Strategy in Teaching Secondary Schools Biology in Ebonyi North Education Zone

| Variables | N | t | df | Sig. (2tailed) | Mean Difference | Std. Error Difference | Decision |
|-----------------|----|------|-----|----------------|-----------------|-----------------------|----------|
| Male Teachers | 42 | .137 | 101 | .891 | -.13661 | .99616 | NS |
| Female Teachers | 61 | | | | | | |

NS= Not Significant

The result of t-test analysis in Table 3 shows that the t-value at 0.05 level of significant and 101 degree of freedom for the items is 0.137 with a significant value of 0.891. Since the significant value of 0.891 is more than the 0.05 level of significant the null hypothesis is not significant. This means that there is no significant difference in the mean response scores of male and female Biology teachers on their level of awareness of improvisation strategy in teaching

secondary schools Biology in Ebonyi North Education Zone.

Hypothesis 2

There is no significant difference in the mean response score of male and female Biology teachers on their extent of utilization of improvisation strategy in teaching secondary school Biology in Ebonyi North Education Zone.

Table 4: Summary of t-test Analysis of Mean Response Score of Male and Female Biology Teachers on their Utilization of Improvisation Strategy in Teaching Secondary School Biology in Ebonyi North Education Zone

| Variables | N | t | df | Sig. (2tailed) | Mean Difference | Std. Error Difference | Decision |
|-----------------|----|-------|-----|----------------|-----------------|-----------------------|----------|
| Male Teachers | 42 | -.101 | 101 | .920 | -.09212 | .91469 | NS |
| Female Teachers | 61 | | | | | | |

NS= Not Significant

The data obtained from the t-test analysis in Table 4 shows that the t-value at 0.05 level of significant and 316 degree of freedom for the items is 0.091 with a significant value of 0.928. Since the significant value of .928 is more than the .05 level of significant the null hypothesis is not significant. This means that there is no significant difference with respect to the items on the mean response score of male and female Biology teachers on their utilization of improvisation

strategy in teaching secondary schools Biology in Ebonyi North Education Zone.

Hypothesis 3

There is no significant difference in the mean response scores of urban and rural Biology teachers on their level of awareness of improvisation strategy in teaching secondary schools Biology in Ebonyi North Education Zone.

Table 5: Summary of t-test Analysis of Mean Response Scores of Urban and Rural Biology Teachers on their Level of Awareness of Improvisation Strategy in Teaching Secondary Schools Biology in Ebonyi North Education Zone.

| Variables | N | t | df | Sig. (2tailed) | Mean Difference | Std. Error Difference | Decision |
|-----------|---|---|----|----------------|-----------------|-----------------------|----------|
|-----------|---|---|----|----------------|-----------------|-----------------------|----------|

| | | | | | | | |
|----------------|----|------|-----|------|--------|---------|----|
| Urban Teachers | 71 | .040 | 101 | .969 | .04181 | 1.05791 | NS |
| Rural Teachers | 32 | | | | | | |

NS= Not Significant

The result of t-test analysis in Table 5 shows that the t-value at 0.05 level of significant and 101 degree of freedom for the items is 0.040 with a significant value of 0.969. Since the significant value of 0.969 is more than the 0.05 level of significant the null hypothesis is not significant. This means that there is no significant difference in the mean response scores of urban and rural Biology teachers on their level of awareness of improvisation strategy in teaching

secondary schools Biology in Ebonyi North Education Zone.

Hypothesis 4

There is no significant difference in the mean response scores of urban and rural Biology teachers on their extent of utilization of improvisation strategy in teaching secondary schools Biology in Ebonyi North Education Zone.

Table 6: Summary of t-test Analysis of Mean Response Scores of Urban and Rural Biology Teachers on their Extent of Utilization of Improvisation Strategy in Teaching Secondary Schools Biology in Ebonyi North Education Zone

| Variables | N | t | df | Sig. (2tailed) | Mean Difference | Std. Error Difference | Decision |
|----------------|----|------|-----|----------------|-----------------|-----------------------|----------|
| Urban Teachers | 71 | .063 | 101 | .950 | -.06118 | .97134 | NS |
| Rural Teachers | 32 | | | | | | |

NS= Not Significant

The data obtained from the t-test analysis in Table 6 shows that the t-value at 0.05 level of significant and 101 degree of freedom for the items is 0.063 with a significant value of 0.950. Since the significant value of .950 is more than the .05 level of significant the null hypothesis is not significant. This means that there is no significant difference with respect to the items on the mean response scores of urban and rural Biology teachers on their extent of utilization of improvisation strategy in teaching secondary schools Biology in Ebonyi North Education Zone.

Discussion

Research question 1 attempted to elicit the perception of the respondents on level biology teachers are aware of improvisation strategy in teaching biology in secondary schools in Ebonyi

North Education Zone. The finding revealed that Biology teachers to a high level are aware of improvisation strategy in teaching Biology in secondary schools in Ebonyi North Education Zone. This finding is in consonance with Iheanyi (2015), who stated that Biology teachers are to a reasonable level aware of the cost reducing strategies which includes improvisation but are hindered by both personal reasons and environmental constraints. Therefore, there is need for an increased emphasis on improvisation strategy in teaching and learning secondary schools Biology in Ebonyi North Education Zone.

Comparison of the male and female Biology teachers showed that there is no significant difference in the mean response scores of male and female Biology

teachers on their level of awareness of improvisation strategy in teaching secondary schools Biology in Ebonyi North Education Zone. This finding agrees with Utibe – Abasi (2015), who noted that problems faced by teachers in the awareness and utilization of improvisation were not gender sensitive. The finding however disagrees with Onuzulike (2021), who stated that, gender has been identified as a critical factor that affects teachers' work output, the use of computer in teaching Biology. This could be because female science teachers see improvisation, repairs and maintenance of equipment as a function for their male counterparts. Therefore, there is need for in-service training on improvisation for male and female Biology teachers in Ebonyi North Education Zone. This will help improve biology teachers' awareness of improvisation strategy in teaching Biology in Ebonyi North Education Zone.

Similarly, on the influence of location of schools, it was found in this study that there is no significant difference in the mean response scores of urban and rural Biology teachers on their level of awareness of improvisation strategy in teaching secondary schools Biology in Ebonyi North Education Zone. This finding disagrees with Nwobodo (2021), who noted that cost reducing strategies in the urban areas are more efficient than those of the rural areas. The finding also disagrees with Adeniyi (2016), who posited that urban based Biology teachers are aware and apply cost-reducing strategies to a large extent and laboratory management techniques more efficiently than their rural counterparts. The finding also contradicts Leem and Lim (2017), which stated that rural and urban schools may differ in the quality of awareness and utilization of cost reducing strategies applied in the teaching and learning of chemistry. Thus serious efforts should be made at creating more awareness of improvisation strategy in the rural and urban secondary schools in Ebonyi North Education Zone.

The findings in research question 2 indicated that Biology teachers to a low extent utilize improvisation strategy in teaching Biology in secondary schools in Ebonyi North Education Zone. This finding disagrees with Nweze (2017), who noted that Biology teachers in Nigeria use substitutes when the conventional chemicals are not found. There is therefore an indication of Biology teachers' knowledge of improvisation with low extent of utilization. It should be noted that improvisation when applied helps to make available the needed materials for teaching and learning of Biology in general and practicals in particular.

Investigation for significant difference between the mean response scores of male and female Biology teachers on the extent to which they utilize improvisation strategy in teaching secondary schools Biology, showed that there is no significant, difference in the mean rate of male and female Biology teachers on the extent to which they utilize improvisation strategy in teaching secondary schools Biology in Ebonyi North Education Zone. This finding is in consonance with Utibe-Abasi (2015), who stated that problems faced by teachers in the awareness and utilization of improvisation were not gender and location sensitive. Utilization of improvisation as a cost reducing strategy in instructional delivery by both male and female Biology teachers requires teacher's knowledge as well as understanding of how students learn using varied cost reducing strategy in teaching and learning.

Comparism between the mean rating of urban and rural Biology teachers on the extent to which they utilize improvisation strategy in teaching secondary schools Biology in Ebonyi North Education Zone, indicated that there is no significant difference in the mean rating of urban and rural Biology teachers on the extent of utilization of improvisation strategy in teaching secondary schools Biology in Ebonyi North Education Zone. This finding agrees with Utibe-

Abasi (2015), who revealed that gender and location do not constitute constraints in the use of improvisation in teaching and learning. Utibe-Abasi further noted that problems faced by teachers are not gender and location sensitive.

Conclusion

From the discussion of the findings, it was concluded that Biology teachers to a high level are aware of improvisation strategy in teaching Biology in secondary schools in Ebonyi North Education Zone. However, the findings of the study indicated that Biology teachers to a low extent utilize improvisation strategy in teaching Biology in secondary schools in Ebonyi North Education Zone. There is no significant difference in the mean response scores of male and female Biology teachers on their level of awareness of improvisation strategy in teaching secondary schools Biology in Ebonyi North Education Zone. Similarly, there is no significant difference in the mean response scores of urban and rural Biology teachers on their level of awareness of improvisation strategy in teaching secondary schools Biology in Ebonyi North Education Zone.

The study also indicated male and female Biology teachers to a low extent utilize improvisation strategy in teaching Biology in secondary schools in Ebonyi North Education Zone. Similarly, there is no significant difference in the mean response scores of urban and rural Biology teachers on their extent of utilization of improvisation strategy in teaching secondary schools Biology in Ebonyi North Education Zone.

Educational Implications of the Findings

The finding of this study holds implication for the Biology teachers, students and the government as well.

The Biology teachers through the study are now equipped and encouraged in the use of cost reducing strategies thereby improving teaching of Biology in secondary schools. The nature of Biology demands

that it should be taught practically but the practical Biology lessons are rarely done effectively due to insufficiency of laboratory materials in the secondary schools. Since the instructional materials for teaching Biology are in short supply, cost reducing strategies will promote quick understanding by assisting learner's attention and give first-hand experience which are not easily forgotten to students, stimulate creative expression in students and encourage active participative and practical knowledge of Biology.

The findings of this study holds a strong implication for students as they are provided with very rich visual experience and are afforded the opportunity to manipulate materials for direct concrete experience which will definitely boast students achievement in both internal and external examinations.

The findings of this study hold strong educational implication to the government which is saddled with the responsibility of ensuring quality education as a vital tool for human and economic development. Efficient adoption of cost reducing strategies in teaching Biology will help to accelerate, close up the gap and inability of government in giving expected attention to provision of educational facilities and instructional materials for teaching Biology in secondary schools in Ebonyi North Education Zone of Ebonyi State.

Recommendations

Based on the findings of the study the following recommendations were made.

1. Improvisation strategy should be highly emphasized and encouraged by the stake holders in education for secondary schools Ebonyi North Education Zone of Ebonyi State.
2. Deliberate efforts should be made by education supervisors in ensuring that the Biology teachers utilize improvisation strategies in teaching and learning of Biology in secondary schools in Ebonyi North Education Zone of Ebonyi State.

3. The school authorities should, on a regular basis, organize In-service training, seminars, workshop and enlightenment programmes on utilization of improvisation strategies in teaching Biology in secondary schools Ebonyi North Education Zone of Ebonyi State.

4. There should be an increased awareness of improvisation strategies by the ministry of education in secondary schools in Ebonyi North Education Zone of Ebonyi State.

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