

Study of Usage of Research Information on Modern Teaching Techniques among Secondary School Biology Teachers.

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Abstract

The study goal was to investigate how Biology teachers make use of research findings and technological innovations in their biology classrooms activities. The study involved the use of 24 item questionnaire, which was validated by experts and administered to ascertain the views of 40 biology teachers in 10 secondary schools. The finding shows that in general, biology teachers do not utilize research findings in their science classroom practices and are relatively unconscious of the usefulness of it, the existence of some journals and how to have access to such materials/resources. Furthermore, it was revealed that majority of the teachers are willing to attend workshops, seminars, conferences and even in-service training for professional growth and development if sponsored. The study also revealed that most teachers were familiar with the modern techniques but were unable to use most of them in their classroom teaching due to apathy, lack of basic teaching skills and inaccessibility to the current research findings. It was recommended that teachers at every level of Nigerian education should be encouraged to attend seminars, workshops, conferences, refresher courses and provided with adequate funds, modern teaching aids/materials, good structures, laboratory facilities and equipment and be properly and regularly supervised during their classroom activities/lessons.

Introduction

The concern in science teaching is to enhance learner's achievement in science concepts and at the same time make the teaching easier and motivating. The consistent poor performance in and negative attitudes toward science attest to the fact that science teaching has not been properly done (Katcha, 2007). Hence, the concepts being taught are not properly understood. For a nation aspiring towards sustainable science and technology development in the 21st century, science and technology in Nigeria, relative to the development profiles of other countries in Africa and the rest of the World is unimpressive (Okebukola, 1997). It has been emphasized that the survival of any nation is highly dependent on science and technology development. It is for this reason and for the fact that many studies have reported students misunderstanding and lack of proper comprehension of several science concepts culminating into underachievement and low enrolment in science (Aghata, 1981; Ogunleye, 1995), that science education researchers have in recent times concentrated their

research effort on finding teaching strategies that would promote teaching and learning of science.

Emphasis has now been shifted completely from traditional methods that are more teacher centre and only encourage rote learning and knowing of facts, memorization and superficial knowledge of concepts to strategies that are more child-center involving the use of minds, hands and all the sense organs of the body on science activities (Nzewi and Osisioma, 1995). Some of these activity based teaching methods advocated by scientists include-Discovery/Inquiry, Concept and Vee-Mapping, Problem Solving approach, Individual and Cooperative learning, Computer Instructional methods among others. These innovative strategies encourage involvement of and participation by the learners, arouse their interest and capture their attention and the acquisition of science process skills of observation, identification, description, classification, designation, investigation, collection of data, interpretation of data, communication of results and formulation of conclusions. All these bring about greater depth of

understanding of facts and concepts in sciences which signifies a more complex multidimensional integration of information into learners' own conceptual framework. This in effect will make the learners the much needed good scientists and technologists of tomorrow for nation building. Moreover, Akubuilu (1995) stated that the acquisition of science process skills is tremendously influenced by the method of teaching adopted by the teachers.

Literature review, indicated that for the past two decades vigorous research activities paid much attention to biology curriculum development, development of teaching resources, teaching approaches/skills, instructional strategies and professionalism in teaching. The studies reported in the literature have tried to emphasize which could be best used in teaching and learning biology; on application of innovative strategies (Nwosu and Nzewi, 1997; Onyegegbu, 1999; Lung, 1999); provision of facilities in biology classrooms (Onyegegbu, 2001); on curriculum and manpower development to biology curriculum (Swadesh and Baghavan, 2001; Bajah, 1999; Besong, 2001).

Despite the wealth of research discoveries/findings and technological innovations in biology teaching and learning, solutions to some fundamental challenges faced in the Nigerian biology classroom are yet unmet. Worse still, there does not seem to be much effort by researchers toward discovery whether research findings and technological innovations in biology education are actually being put into practice by classroom biology teachers. It is based on this that the present study seeks to investigate how secondary school biology teachers make use of research findings and technological innovations to improve the learning experiences of their students.

Research Questions

The following research questions guided the study:

1. In what ways have secondary school classroom biology teachers professionally developed themselves?
2. How familiar are biology teachers with the learner friendly instructional techniques in their classroom teaching and the laboratory usage and how often do they use them?
3. What methods do classroom biology teachers use in their day to day teaching?
4. What problems do biology teachers encounter in applying the innovative instructional strategies in their teaching learning process?

Methodology

In order to achieve the purpose of this study, a survey design was employed. The population of the study comprises of all the science teachers in the science secondary schools of Niger State. The only data collecting instrument was a teacher questionnaire designed to investigate the extent to which secondary school science teachers are abreast of research findings in biology. The purposive sample of the study consist of all the teachers who have taught for five years and above, leaving out those who have taught for less than one year. This brought the sample size for the study to forty (40).

Sample and Sampling Technique

The population for this study consisted of all the biology teachers in all the educational zones in Niger state. Using simple random sampling technique, one out of all the three zones was selected with special interest in Bida Local Government Area of Niger State with a total number of 18 secondary schools. Using simple random sampling, 8 schools were selected. There were a total number of 40 biology teachers in the sampled schools.

Instrument for data collection

A survey instrument which was adopted by the researcher and face validated by three science educators was utilized to elicit responses from biology teachers required to answer the research questions. The instrument used for the data collection was Usage of Research Finding with Innovative Instructional Techniques (URFIIT) questionnaire developed by the researcher and validated by three science educators. The questionnaire consists of three sections; section one concerned the biology teachers personal data which included their years of experienced. For the purpose of the study, a biology teacher with working experience of more than five years is considered as experienced and less than five years of service is inexperienced; section two of the questionnaire comprises of list of some modern instructional techniques,

familiarity with those methods, level of daily usage and some probable reason's for their not being used in the teaching of biology concepts. Section three elicited comment on any other reasons which form part of the problems and was not contained in sections one and two.

Method of data collection and analysis

Out of 45 copies of the questionnaire administered, 40 were completed and returned. This brings the number of the respondents for this study to 40. The data analysis was done using frequency and percentage frequency. The researcher organized the analysis according to the research questions.

Results and Discussions

In what ways have secondary school classroom biology teachers' professionally developed themselves?

Table 1: Frequency Distribution of Teachers Based on Qualification and Experience (N=40)

	Qualification		Experience	
	Professionals	Non-professionals	Experienced (> 5 years)	Inexperienced (< 5 years)
Number	35	5	28	12
Percentages	87.5%	12.5%	70%	30%

The results revealed that most of the teachers in the classroom now are professionals and experienced teachers efficiently equipped with all the pre-requisite knowledge.

Their responses to the operational definition of the currently selected innovative instructional strategies was used as basis for assessing familiarity with these techniques. 19 teachers (47.5%) shows that they were not precisely sure of or never heard of what concept mapping, vee mapping, cooperative and analogy entails at all. Thus the mean score using a 4 point

likert scale of strongly agree (4 points), agree (3 points), seldom (2 points), and never (1 points) revealed their level of acquaintances with the indicated strategies. Mean score of 2.00 and above shows that the teachers agreed with what the innovative instructional techniques involve and are familiar with the strategies indicated.

How familiar are biology teachers with the learner friendly instructional techniques in their classroom teaching and the laboratory usage and how often do they use them?

Table 2: Familiarity with the Instructional Strategies.

S/NO	STRATEGIES	X	REMARK
1.	Lecture	3.08	Agree
2.	Talk-chalkboard	3.23	Agree
3.	Demonstration	3.38	Agree
4.	Analogy	1.48	Never
5.	Concept mapping	1.95	Never
6.	Vee mapping	1.73	Never
7.	Cooperative competitive	1.85	Never
8.	Inquiry/guided discovery	3.18	Agree
9.	Fieldtrip/excursion	2.78	Agree
10.	Problem solving	3.23	Agree
11.	Project method	2.43	Agree
12.	Laboratory investigation approach	3.70	Agree

The results revealed that teachers were familiar with some of the teaching methods employed in the teaching of biology. Nonetheless item numbers 1(lecture method) 2 (talk chalkboard), 3 (demonstration), 8 (guided discovery), 10 (problem solving) and 12 (laboratory investigation) were more familiar to teachers than others items (these items scored 3.00 points and above) while items 4 (analogy), 5 (concept mapping),

6 (vee mapping) and 7 (cooperative competitive) were not familiar to teachers like other techniques. The items scored between 2.00 and 3.00 points are items 9(fieldtrips/excursions) and 11 (project method) with scores of 2.78 and 2.43 respectively were equally relatively familiar to the teachers.

What methods do classroom biology teachers use in their day to day teaching?

Table 3: Methods used by Biology Teachers (N=40)

S/NO	Strategies	Number used	%	Number not using	%
1.	Lecture	32	80	8	20
2.	Talk-chalkboard	34	85	6	15
3.	Demonstration	29	73	11	27
4.	Analogy	10	25	30	75
5.	Concept mapping	19	48	21	52
6.	Vee mapping	14	35	26	65
7.	Cooperative competitive	17	43	23	57
8.	Inquiry/guided discovery	33	83	7	17
9.	Field trips/Excursion	20	50	20	50
10.	Problem solving	27	68	13	32
11.	Project method	28	70	12	30
12.	Laboratory investigation	40	100	0	0

The result on table 3 shows that all the respondents employed the use of laboratory investigation approach in teaching biology. Majority of the teachers relatively utilized lecture, talk chalk board, and inquiry/guided

discovery in teaching Biology. Cooperative competitive, concept mapping, vee mapping and Analogy were rarely used in the teaching of biology concepts.

The teachers were, however, requested to show the level to which

they utilize the instructional techniques (Research question 2). 4 point likert-scale indicating frequently (4),

occasionally (3) rarely used (2) never (1) was used. The mean scores were also calculated.

Scores < 1.49 never.

Scores 1.50-2.49 rarely used

Scores 2.00-2.50 occasionally

Scores > 2.51 frequently used

The result is shown in table 4 as

How often do biology teachers use the modern innovative instructional strategies in their classrooms/laboratories?

Table 4: The Level of Usage of Instructional Strategies by the Teachers.

S/NO	Strategies	Mean(X)	Remark
1.	Lecture	2.89	Frequently
2.	Talk chalk board	2.93	Frequently
3.	Demonstration	3.68	Frequently
4.	Analogy	1.50	Rarely used
5.	Concept mapping	1.78	Rarely used
6.	Vee mapping	1.60	Rarely used
7.	Cooperative competitive	1.83	Rarely used
8.	Inquiry/guided discovery	2.90	Frequently
9.	Field trips/excursion	2.40	Occasionally
10.	Problem solving	2.78	Frequently
11.	Project method	2.35	Occasionally
12.	Laboratory/ investigation	2.90	Frequently

From the analysis the most widely and frequently used innovative instructional strategies were demonstrations, talk-chalk board and

What problems do biology teachers encounter in applying the innovative instructional strategies in their teaching learning process?

Research question 4 sought to find out why some modern techniques are not frequently employed and used by biology teachers. The researcher put up some possible reasons and requested the respondents to indicate the ones applicable to them for the various reasons as shown in table V

laboratory investigative methods while analogy, vee mapping, concept mapping and cooperative competitive were rarely or never used by the teachers.

Table 5: Reasons why Some Methods not Frequently Used.

S/N	Probable reason	METHODS	Lecture	Talk chalk board	Demonstration	Analogy	Concept mapping	Vee mapping	Cooperative competitive	Inquiry/guided discovery	Field trip/excursion	Problem solving	Project mapping	Laboratory investigation	Total
1.	Difficult to apply	8 (20%)	5 (13%)	-	2 (5%)	-	1 (2.5%)	-	-	-	-	-	-	-	16
2.	Cannot effectively use it	6 (15%)	12 (50%)	3 (8%)	1 (2.5%)	4 (10%)	4 (10%)	4 (10%)	4 (10%)	1 (2.5%)	-	2 (5%)	-	1 (2.5%)	38
3.	Method is time consuming	-	1 (2.5%)	6 (16%)	3 (7%)	7 (16%)	6 (15%)	4 (10%)	4 (10%)	11 (28%)	2 (5%)	4 (10%)	6 (15%)	4 (10%)	54
4.	Not very effective	21 (53%)	19 (48%)	1 (2.5%)	1 (2.5%)	-	-	-	1 (2.5%)	3 (8%)	1 (2.5%)	1 (2.5%)	-	-	48
5.	Never heard of it before	-	-	2 (5%)	25 (63%)	16 (40%)	16 (40%)	16 (40%)	18 (45%)	-	-	-	-	-	77
6.	Lack of instructional materials	3 (8%)	2 (5%)	19 (48%)	7 (16%)	9 (23%)	9 (23%)	9 (23%)	9 (23%)	17 (43%)	1 (2.5%)	14 (35%)	5 (13%)	6 (15%)	101
7.	Students population is too large	1 (2.5%)	-	8 (20%)	1 (2.5%)	3 (8%)	3 (8%)	3 (8%)	3 (8%)	8 (20%)	2 (5%)	18 (45%)	3 (8%)	25 (63%)	75
8.	Method is too expensive	-	-	-	-	-	-	-	-	-	29 (73%)	-	26 (56%)	5 (13%)	60
TOTAL		39	39	39	40	39	39	39	39	40	35	40	40	40	469

From the table 5, the highest frequency on the lack of instructional materials is 19 (48%) and this is on demonstration method. 63% of teachers indicated that they never heard of the method Analogy, while 40-45% never heard of concept mapping and Vee mapping and cooperative competitive methods, respectively. The highest percentage responses on student's population being too large was (63%) followed by (45%) for the following methods, laboratory investigation and problem solving respectively. High cost of using the methods recorded 29 (73%) and 26 (65%) which are on field trips/excursion and project methods the reason that it takes too much time is 11 (28%) and this is on inquiry /guided discovery. The method is unsuitable for teaching biology concepts recorded 21 (53%) and this is on lecture method. The method that cannot be effectively used in teaching biology recorded 12 (30%) and it is on talk chalk board method. The reason that it is difficult to apply in teaching biology is 8 (20%) and it is still on lecture method.

Apart from the reasons given on table 1, it was identified that laboratory investigation and field trip/excursion methods are not frequently used because of the risky nature in their application as they are prone to accidents.

Discussion of findings

The results of this finding clearly revealed that all the science teachers especially the biology teachers use laboratory investigation approach and inquiry/guided discovery in teaching biology concepts. This is vividly evident that the teachers realized that laboratory exercise is of great importance in science education. These two techniques had the highest number of responses on each reason against each strategy except in two reasons, the reasons that the methods

have not been heard of especially analogy, vee mapping, cooperative competitive and concept mapping and that the method is not suitable for teaching biology concept which is on lecture and talk chalk board methods. This by implication implies that the major techniques which will help the student practice the theories learnt and acquired the much needed process skills in science education are not frequently utilized by the teacher. This will thus grossly affect the quality of science education received in the science classroom in our schools in general and the country in particular and therefore requires urgent attention. The finding that student's population is too large for the use of laboratory investigation technique, that the field trips/excursion method is not frequently used because of lack of materials and the cost and that demonstration, talk-chalk board method is not suitable for teaching biology concepts are in agreement with Osuafor's (1999) findings on the use of these methods in teaching. The finding on field trips/ excursion also agreed with the statement of Dienye and Gbarmanja (1990) who stated that one of its disadvantages is that it takes too much time. Analogy, concept and vee mapping as well as cooperation competitive had never been heard of by many teachers and these methods are very effective in teaching several biology concepts.

Another factor on field trip/excursion and laboratory investigation techniques is the potential risk involved in them. However, these two methods should not be avoided especially the laboratory investigation since it's involves students for the acquisition of science process skills.

The study on lecture and talk chalk board techniques which obviously indicated that the methods are not suitable for teaching biology concepts is in agreement with that of

Osuafor's (1999) finding which revealed that lecture/expository methods is not suitable in teaching biology. In addition, the fact that most teachers could not apply some of the techniques in teaching especially analogy vee mapping, concept mapping and cooperative competitive in this study gives further credence to this (Osuafor1999) findings too. The number of respondents on "I have not heard of the techniques" (disagrees with that of Nzewi and Osisioma (1995) which emphasized that the results of research finding remain buried in the journals. The problem lies on how to effectively apply the techniques.

Conclusion and Recommendations

Results of this finding revealed that Field trips/excursion; Project and Laboratory Investigation methods are not frequently employed in teaching Biology because of their high cost and expensive nature, lack of materials needed, large class size and the risk involved in using them. The researcher therefore recommended that more time should be allocated to Biology classes by extending time in schools from 1.30 and 2.00 to 3.00pm everyday to enable the teachers to effectively utilize these methods. Both the federal and state governments should recruit and post more teachers to schools to solve problems of large population. The teachers should also be encouraged to improvise the needed materials for use in teaching while government at various levels should endeavor to equip science laboratories and make provisions for the running cost of the laboratories at regular intervals. There is need for organization of workshops, conferences and symposium at least once a year where teachers should be amply taught and exposed to various modern instructional techniques, manipulating and handling of some of instructional materials, laboratory facilities and

equipment as well as means and method of improvisation. These should be made compulsory for science teachers and they should be given incentives for their effective and continuous participation.

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