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Biology Teachers' Misconceptions Of Biology Concepts Implication For Biology Teacher Education

By

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Abstract

This study identified misconceptions of biology concepts held by selected biology teachers. A total of 40 biology lessons delivered by 32 biology teachers were analysed in the study. A total of 251 misconceptions related to biology concepts taught by the selected teachers were identified in the study. The researcher called for restructuring of biology teacher Education Programme in such a manner that will ensure production of highly knowledgeable and skillful biology teacher.

Introduction

Biology teachers are integral component of the science education community charged with the responsibility of developing manpower in the field of science for sustainable national development. To successfully accomplish this task, biology teachers need a good mastery of biology knowledge and pedagogic skills. Indeed teaching and learning in classroom setting can only take place if there is a wide knowledge gap between the teacher and the students in favour of the teacher. Hence, teacher education programmes usually expose trainee teachers to both curricular and pedagogic knowledge. Teachers' mastery of disciplinary knowledge is undoubtedly sine qua-non to meaningful learning by the students

Evidence abounds in science education literature that Nigerian secondary school students' performance in public examinations in biology are poor. Students' misconceptions of biology concept have equally been identified as one of the major factors responsible for students' poor performances in biology. Several study on misconceptions, and alternative conceptions related to scientific concepts had been carried out. (Abimbola and Baba 1996; Bello, 1998 and 2001). However there is a draught of studies on science teachers' conceptions scientific concepts. This may not he unconnected with the fact that most teachers may not be willing to subject themselves to knowledge assessment for mere research purpose. The task undertaken in this study was therefore an indirect assessment of biology teachers conceptions of biology concepts through identification of their misconceptions related to biology concepts.

In 1992,, Ameh and Gunstone carried out a study on the understanding of selected science concepts among Nigeria science teachers using clinical interview and achievement test as data gathering instruments. Results of the study revealed that teachers understanding of the selected scientific concepts was very poor. The teachers exhibited the same range of misconceptions as found among the students. Bello, (1997) conducted a similar study among pre-service science teachers to determine their understanding of the concept of living things. A total of 73 final year students from two colleges of education took part in the study. Finding from the study indicated that the trainee science teachers' knowledge of concept of living things was very poor. They equally held many misconceptions related to the concepts of living things and its subordinate concepts

Results of the study carried out by Bello (1998) also revealed that pre-service NCE biology teachers held several misconceptions and alternative related to the theory of evolution. The trainee biology teachers' knowledge of theory of evolution was noted to be very poor due to the misconceptions of several biology concepts related to evolution. Recently, Bello, (2001) also carried outs a study on the conceptions of science and science teaching held by practising, science teachers A total of 87 practising science teachers took part in the study An open-ended essay test was used as data gathering tool in the study. Finding from the study clearly indicated that the teachers, conceptions of science teaching were not congruent with science educators' conceptions of science and science and teaching.

Statement of the Problem

The dearth of supplementary textual materials such as journals, textbooks, library services, access to the internet etc., compelled most Nigerian secondary school students to depend almost entirely on their teachers' lecture notes. Therefore, teacher's knowledge to a large extent determine student's level of acquisition of knowledge since teacher can only teach what they know . Biology teachers' misconceptions and alternative conception related to biology concepts can readily be diffused into the student's cognitive structure under this situation. It is therefore, imperative to probe biology teacher's conceptions of concepts as part of effort teaching and learning of biology.

Purpose of The Study

This study attempted to determine whether or not biology teachers held misconceptions related to biology concepts that they teach to students.

Research Questions

1 Do biology teachers hold misconceptions related to biology concepts?

2. How prevalent are biology teachers' misconceptions related to biology concepts?

Sample Selection

A total of 32 biology teachers from 20 secondary schools randomly selected from schools in Ilorin town were used as representative sample of the target population of the study. Simple random sampling technique was used to select the sample.

Research Instrument

The instrument used for data gathering in this study was Audio-cassette tape recorder. This was used for audio-recording of biology lessons

Data Gathering and Analysis

Data gathering in this study was carried out through the help of some students in College of Education Ilorin. They used Audio cassette recorder to record 40 biology lessons in twenty selected secondary schools and equally transcribed the recorded lessons under the supervision of the investigator.

The data gathered in this study were 40 biology lessons delivered by 32 biology teachers in twenty secondary schools. The data were subjected to both qualitative and quantitative analyses. The qualitative analysis involved identification of misconceptions of biology concepts held by biology teachers as contained in the recorded biology lessons. This was done through repeated reading of each transcribed lessons and listening to the audio- cassette recording of each lesson.

The quantitative analysis was carried out throughout counting of the number of biology concepts taught in the lessons and the number of misconceptions of biology concepts in the lessons. Simple percentage calculation and mean computation were then used to analyse the data statistically

Validation of Identified Misconceptions

The identified misconception of biology concepts held by the teachers were submitted to two biology lecturers for validation. This was in addition to all the transcribed biology lessons. They were asked to judge the correctness of the investigator's classification of the teacher' concepts as misconceptions in accordance with the definition of misconceptions. (Misconceptions are ideas that are conflicting and incompatible with current scientists' conceptions of scientific concepts). The validators were also asked to check the transcribed biology lessons for identification of misconception that the investigator might have failed to identify. The comments of the validators were used by the investigator to produce a final list of misconceptions of biology concepts held by the biology teacher shown in table I

Results

The results of the study are presented in the tables below

Table 1 Selected Misconceptions of Biology Concepts held by Biology Teachers

CONCEPTS	MISCONCEPTIONS HELD BY THE TEACHERS
Seed Germination	1) Sunlight is necessary *for* seed germination 2) Soil is necessary for seed germination 3) Good seed sleep and germinate in good conditions
Digestion	1) We need mineral salts to help us digest food 2) The organ responsible for absorption of food is called villi *3)* Assimilation is storage of digested flied into require storage organ *4)* Digested food replaces worn out tissues *5)* Digestion is a process whereby large food molecules are broken into simple molecules
Food and Balanced diet	1) Balanced diet is foodstuff that is composed various categories of nutrient 2) Balanced diet is the combination of food to provide body need. 3) Mineral salts form the hard part of our skeleton usually the bone and teeth. 4) Protein is the important part our body. 5) Protein helps to make our body and hand to move well. 6) Fats are substances found in both plants and animals. 7) Vitamins are always present in any food we eat. 8) Food is made up of three types of elements namely carbon hydrogen and oxygen. 9) Vitamins control chemical activities in our body. 10) Plants feed through water.
Excretion	Kidney draws water from large intestine to the blood stream.
Hormones	Liver conveys hormone to the limb when it used for two days, the liver holds it for one hour.
Pollution	Pollution is discharge of unwanted materials into the environment.
Living thing	1) Characteristics of living thing are what living thing do. 2) Amoeba is the smallest animal.

CONCEPTS	MISCONCEPTIONS HELD BY THE TEACHERS
	3) All living things give birth i.e reproduce. 4) when something is moving we say it is living.
Respiration	1) Respiration mean breathing. 2) All animals breathe in oxygen and breath out cabondioxide and water vapour. 3) Plants breath-out oxygen. 4) Plant breath-in cabondioxide gas.
Reproduction	Reproduction is the act of giving birth to young ones alive
Communicable Disease	Leprosy is not a communicable disease it affect only hands and legs.

A total of 251 misconceptions related to biology concepts taught to students by the teachers were identified in the 40 biology lessons analyzed in this study. The finding provides answer to question I raised in this study.

Table 2: Quantitative Analysis of the identified Misconceptions

No of Teachers	32
No of biology teachers	40
No of biology concepts taught in the lessons	1043
No of biology misconceptions in the lessons	251(24.1%)
No of biology lessons with misconceptions	40{100%)
No of teachers that held misconceptions of biology concepts	32(100%)
Average number of misconceptions per teacher	7.8
Average number of misconceptions per lesson	6.2

As shown on table 2, the average number of misconceptions per lesson and per-teacher are 6.2 and 7.8 respectively. Approximately one a every four biology concepts (24.1%) taught by the teachers were misconception of biology concepts held by the teacher. All the biology teachers held some misconceptions related to biology concepts that they taught their students. Hence, done of the forty biology lesson was free teachers misconception of biology concepts. It is the submission, of

the investigator that the level of prevalence of misconception of biology concepts held by biology teacher is high. This findings provided answer to research question 2 posed in this study.

Discussions

The existence of misconceptions of biology concepts in biology teachers cognitive structure, suggest that the teachers' are probable major source of students' misconceptions of biology concepts Misconceptions interferes with learners attempt at anchorage of new concepts to relevant concepts in the cognitive structure. This results into poor cognitive restructuring and poor assimilation. It is obvious from the results of this study that individual biology teacher held personally constructed meanings of biology concepts in addition to those memorized from text books and other source. Their misconceptions equally reveal the teachers poor cognitive reconstruction The existence of misconception of biology concepts in the biology teacher cognitive structure is the major challenge ahead of biology teacher education programme.

Conclusions

Based on the findings in this study, it can be concluded that biology teachers held many misconceptions of biology concepts that they teach students. Hence, they constitute a major source of students' misconception of biology concepts and to a large extent account for students poor performance in biology.

Findings from this study provides science educators with useful insight to the quality of their products and consequently stimulate them to devise strategies to improve upon the quality of their products. The result of this study could equally sensitize biology teachers to the need to constantly update their curricular knowledge. Similarly the results of this study could serve as empirical evidence for the need to reform biology teacher education programme.

Implication for Biology Teacher education

Results of this study among others (Ameh & Gutlstone.1992. Bello 1997. 1998, etc.) reveals that the quality of biology teachers of the class needs to be improved urgently. This implies that the current biology teacher education programme is inadequate and incapable of producing highly knowledgeable and skillful biology teacher. A reformation of the pragramme to enhance production of high quality biology teachers is therefore imperative. This is a major challenge facing biology teacher educators. The programme should be structured to make it mandatory for biology teachers to enroll for refresher courses periodically. This world provides avenue for biology teacher educators to identify and eliminate the teachers' misconception of biology concepts and update their biology knowledge and pedagogic skills. An upward review of the curriculum of the programme to keep the trainee biology teacher abreast of the knowledge explosion in biology should equally be part of reformation. Close interactions between trainee biology teachers practising research biologist and biology teacher educator should be integrated into the programme to

further enhanced the teacher mastery of biology concepts.

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