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## CONTENTS

# Teachers' Understanding of Biology Curriculum Content and Required Practices

**Apollonia A. Nwosu**

## Abstract

*This study investigated the extent of availability of certain teacher knowledge and practices needed for adequate understanding of senior secondary school biology curriculum contents. A team of qualified biology teachers (all graduates), who marked Senior Secondary Certificate Examination (SSCE) were used for the study. Results showed that these teachers lacked the knowledge of the curriculum objectives as indicated by their failure to implement them. Although these teachers indicated their use of some of appropriate teaching strategies such as discussion and inquiry, findings indicate that these teachers could neither adequately list both the concept taught using these strategies and the science process skills known nor carry out some important practices that favour activity which is needed for students' meaningful understanding of the curriculum contents. These results were discussed and conclusions were made.*

## Introduction

Education, including that in science, technology and mathematics is a social institution. The various subject curricular are the means by which schools endeavour to realise the hopes and aspirations of the society. These curricular materials embrace purposeful experiences that should be provided and directed by the schools for the purpose of achieving set educational goals and objectives which are the translations of the societal goals, hopes, needs and aspirations. The senior secondary biology curriculum is one of such curricular materials – an innovation developed at the directives of the Federal Government of Nigeria for the societal and individual development It has as its cardinal objectives, the preparations of pupils to acquire:

1. Adequate laboratory and field skills in biology
2. Meaningful and relevant knowledge in biology
3. Ability to apply scientific knowledge to everyday life in matters of personal and community health and agriculture.
4. Reasonable and functional scientific attitude.

The concepts of the curriculum, include those of: Concept of Living; nutrition; Ecology, Evolution and Adaptation, Variation and Variability, Genetics. These concepts studied through the activity as directed in the curriculum together with the objectives are geared towards the intellectual, socio-economic development of the individual and the society. An adequate and meaningful understanding of them as well their effective implementation are therefore desirable and necessary.

The teacher has been found to be a very important factor in the implementation of any curriculum (Ume 1983, Harlem 1984). Jegede (1982) asserted that what the student knows/does not know does/do not do depends mainly on the teacher. As the curriculum user and implementer at the classroom level, the teacher should adequately know and understand the curricular contents – its objectives, concepts and stipulated teaching strategies – for him to be able to help the student acquire meaningful, relevant and functional knowledge – a pre-requisite for scientific literacy and development of both the individual and nation.

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In this paper, an attempt was made to investigate the extent of availability of such knowledge and understanding among the teachers. Specifically the following questions and hypothesis were answered and tested respectively.

1. To what extent do biology teachers try to implement the objectives of the biology curriculum?
2. To what extent do biology teachers use each of the various required teaching strategies?
3. To what extent do biology teachers carry out practices that favour students activities in biology?
4. To what extent do biology teachers possess the knowledge of practical/science process skills?
5. Which concepts do the biology teachers find difficult to teach?

## Hypotheses

There is no significant difference at $P<0.05$ in

1. the extent of implementation of biology curriculum objectives
2. the use of various teaching strategies due to variation in teachers years of experience

## Procedure

The target population for the study consisted of graduate biology teachers in Nsukka educational zone. A purposive sample made up of the biology teachers marking SSCE Biology papers 1 and 2 at WAEC marking centre at Nsukka in Enugu state (December 1995) was taken. There were 32 such teachers. They were graduates teaching in 20 secondary schools in Enugu State. Of these 11 (Group A) had teaching experience of 1 – 5 years; 9 (Group B) of 6 – 10 years and the remaining 12 (Group C) above 10 years (19 years was the highest observed).

A questionnaire was administered to these teachers. The questions elicited responses of teachers on

1. The curriculum objectives they tried to implement or achieve and the extent of their achievement.
2. The extent of usage of various teaching strategies and concepts taught with these strategies
3. Inquiry Science process skills they know, and
4. The concepts in the curriculum that they find difficult to teach.

Response to questionnaire items involving the listing of objectives of science process skill (SPS) correctly named. For the items involving options, a weighted scale of 3, 2, 1, 0 was used with the most desirable outcome weighted 3, while the least desirable was weighted 0.

## Presentation of Results

1. Knowledge of and extent of implementation of biology Curriculum objectives

**Table 1:**
**Frequency count of respondents each group implementing various numbers of objectives of the biology curriculum**

| No. of curriculum Objectives teachers Try to implement | No. of respondents | | | |
|---|---|---|---|---|
| | Group A | Group B (n = 1) | Group C (n = 9) | All (n = 12) |
| (n = 12) | | | | |
| 0 | 9 | 6 | 4 | 19 |
| 1 | 2 | 2 | 5 | 9 |
| 2 | 0 | 1 | 3 | 4 |
| 3 or 4 | 0 | 0 | 0 | 0 |
| Mean Number | 0.18 | 0.44 | 0.92 | 0.53 |
| Standard deviation | 0.4045 | 0.7265 | 0.7930 | 0.7177 |

Table 1 shows that on the average, most of the teachers irrespective of their years of experience do not know/implement any of the curriculum objectives. However most of those who have taught

for 10 years and above (group C) could implement about one of the curriculum objectives

Table 2: ANOVA for number of objectives implemented

| Source | df | SS | MS | F.ratio |
|---|---|---|---|---|
| Between Group | 2 | 3.19349747 | 1.596749 | 3.6246 |
| Error | 29 | 12.77525253 | 0 | 0.440525 |
| Total | | 31 | 15.96875 | |

F critical = 3.32 Hence reject H

Table 2 (ANOVA) shows that the difference in group means is significant. Hence hypothesis is rejected. A Newman Keul's range test indicates that group C mean is significantly better than group A means while other differences in means are not significant.

2 Extent of usage of various teaching strategies.

Table 3: Percentage of respondents in group selecting the various response levels of usage of the teaching methods

| Teaching Method | Very Much | | | Much | | | Little | | | Never | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | A | B | C | A | B | C | A | B | C |
| Inquiry | 18.2 | 11.1 | 8.3 | 54.5 | 55.6 | 66.7 | — | 11.1 | 25.0 | 18.2 | — | — |
| Field Trip | — | 11.1 | 16.7 | 18.2 | 11.1 | 16.7 | 54.5 | 55.6 | 58.3 | 18.2 | 22.2 | 8.3 |
| Duscussion | 45.5 | 66.7 | 25.0 | 27.3 | 22.2 | 58.3 | 18.2 | 11.1 | 8.3 | — | — | — |
| Lecture | — | 22.5 | 8.3 | 36.4 | 11.1 | 33.3 | 45.5 | 11.1 | 16.7 | 18.2 | 44.2 | 25.0 |
| Fieldwork | 36.4 | — | 8.3 | 36.4 | 44.4 | 58.3 | 9.1 | 33.3 | 25.0 | 9.1 | — | — |

Table 4: Mean and standard deviations of scores by various teacher group for the usage of different teaching methods

| Teaching Method | | Group A | Group B | Group C | All Teachers |
|---|---|---|---|---|---|
| Inquiry | m | 1.136 | 1.556 | 1.833 | 1.688 |
| | s | 1.12006 | 1.01379 | 0.57735 | 0.89578 |
| Field Trip | m | 0.909 | 1.111 | 1.417 | 1.156 |
| | s | 0.70065 | 0.92795 | 0.90034 | 0.84660 |
| Discussion | m | 2.091 | 2.556 | 2.000 | 2.188 |
| | s | 1.04447 | 0.72648 | 0.85280 | 0.89578 |
| Lecture | m | 1.818 | 1.667 | 1.417 | 1.625 |
| | s | 0.75076 | 1.41421 | 1.16450 | 1.09985 |
| Field work | m | 1.909 | 1.222 | 1.667 | 1.625 |
| | s | 1.13618 | 0.83333 | 0.77850 | 0.94186 |

Results show that teachers irrespective of their years of teaching experience claim to use to a great extent mostly discussions, followed by inquiry, field work and lecture in their teaching.

Field trip was used the least by the various groups. However most teachers could not state the concepts taught using these strategies. Indeed 81.8, 66.7 and 58.3 percent of groups A, B and C respectively did not mention any concepts for any teaching method.

**Table 5: ANOVA for Usage of field work**

| Source | df | SS | MS | F ratio |
|---|---|---|---|---|
| Between | 2 | 2.36868686 | 1.18434343 | 1.367 |
| Error | 29 | 25.13131314 | 0.866597004 | |

F critical = 3.32 Hence accept $H_0$

Table 5 (ANOVA) shows that there was no significant difference in the usage of field work due to years of experience. The tests for the other four methods gave the same results. Hence hypothesis (2) is accepted.

3. On the extent to which teachers carry out practices that favour students activity in biology

**Table 6: Precentages of respondent selecting various response levels for availability of each factor in their school and the mean of their scores for each factor**

| Factor | Percentages | | | | | | | | Means | | Standard deviation | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number | | | | Frequency | | | | | | | |
| | All | Many | Few | None | Very often | Often | Seldom | Never | No | Fre | No. | Fre |
| Teachers: | | | | | | | | | | | | |
| Use local resources | 12.5 | 54.2 | 29.2 | 4.2 | 21.6 | 47.8 | 26.1 | — | 1.75 | 2.00 | 0.7372 | 0.7385 |
| Ask students to help collect materials | 17.9 | 78.6 | 3.6 | — | 38.7 | 54.8 | 6.5 | — | 2.14 | 2.32 | 0.4484 | 0.5923 |
| Improvise non-available resources | 10.7 | 42.9 | 46.4 | — | 22.2 | 55.6 | 22.2 | — | 1.64 | 2.00 | 0.3563 | 0.6794 |
| Together with students improvise non-available resources | 7.4 | 55.6 | 37.0 | — | 15.4 | 53.8 | 30.8 | — | 1.70 | 1.85 | 0.6068 | 0.6748 |
| Ask student to investigate on their own | 6.9 | 31.0 | 58.6 | 3.4 | 15.4 | 34.6 | 50.0 | | 1.41 | 1.65 | 0.6823 | 0.7152 |
| Students: | | | | | | | | | | | | |
| Collect materials for study from environment | 3.7 | 55.6 | 40.7 | — | 19.2 | 46.2 | 34.6 | | 1.63 | 1.85 | 0.5649 | 0.7317 |
| Are surrounded with to manipulate and investigations | 10.7 | 32.1 | 53.6 | 3.6 | 18.2 | 27.3 | 45.5 | 9.1 | 1.50 | 1.55 | 0.7454 | 0.9117 |
| Are willing to carry out investigation on their own | — | 23.1 | 39.2 | 7.7 | 12.5 | 37.5 | 45.8 | 4.2 | 1.15 | 1.58 | 0.5435 | 0.7755 |
| Posses prerequisite knowledge needed for activities based learning | 3.2 | 22.6 | 71.0 | 3.2 | 12.5 | 29.2 | 58.3 | | 1.26 | 1.54 | 0.5755 | 0.7211 |

Results show that while most teachers often ask students to help collect materials and use local resources most teachers hardly ask them to investigate on their own. Most teachers also responded that students are not willing to carry out investigations on their own and that they do not possess the pre-requisite knowledge needed for activity based learning.

4. On the knowledge of process skills

**Table 7: Frequency count for respondents in each teacher group correctly naming various numbers of science process skills**

| No. of skills named | No. of respondents so naming | | | |
|---|---|---|---|---|
| | Group A (n = 11) | Group B (n = 9) | Group C (n = 12) | All (n = 32) |
| 0 | 6 | 3 | 6 | 15 |
| 1 | 3 | 2 | 5 | 10 |
| 2 | 2 | 4 | 1 | 7 |
| 3 or 4 | 0 | 0 | 0 | 0 |
| Mean | 0.64 | 1.11 | 0.58 | 0.75 |
| Standard Deviation | 0.8090 | 0.9280 | 0.6686 | 0.8032 |

Results indicate that this was poor among teachers. Almost half of the teachers (15/32) could not name correctly any of the science process skills (SPS) and none could correctly mention more than 2 process skills. The SPS correctly named are observation (16), Hypothesis (5), question (2), Inferring (2), Measuring (2), measuring (11) and classifying (1).

5. On concepts difficult to teach by teachers major topics mentioned are Genetics (56.3%) of all Ecology (56.3%), Evolution (21.9%). Others were mentioned (eg. Kreb Cycle, Transmission of impulses etc.) by less than 7% of respondents)

## Discussion of Results, Implications and Conclusion

Effective understanding of the content of the biology curriculum by the students is facilitated by an adequate understanding of and commitment to the curriculum objectives, concepts and required teaching strategies by the teachers. Findings in this study indicate that teachers do not try to implement the cardinal objectives of the curriculum. These objectives are based on the national educational objectives and pilot the teaching in the required direction for acquisition of relevant and functional knowledge and attitudes by students. Since these objectives are the means of translating the needs and values of societal and individuals into educational programme, they should be adequately known, understood and implemented by teachers. This knowledge is a pre-requisite for committed and effective teaching.

Finding in this study also showed that teachers responded that they use, to a large extent, the required desirable teaching strategies. This is encouraging especially the use of inquiring and discussion methods. However, teachers lack of knowledge of the concepts taught using these strategies indicate lack of adequate knowledge of the curricular concepts and required strategies. This and the little use of field trip by teachers will militate against adequate understanding of some biology topics, such as poultry, farming, ecosystem (use of pond, etc.). Functional knowledge in such topics will no doubt help in solution of some of our life problems.

Results of the study also indicated that although teachers responded that they use, to an acceptable extent the inquiry method of teaching, some of the practices that favour inquiry teaching were not adequately practised or carried out by both teachers and students. This is inimical to teaching for understanding and functional knowledge. Furthermore, the fact that teachers could not state the science process skills makes one wonder how the teachers now teach for the acquisition of these required skills. These skills are needed for inquiry and developed by inquiry strategies. Their not being known and acquired implies that a contemporary science objective as well as an important content of the curriculum cannot be adequately understood and implemented. Okebukola (1985), Nwosu (1991) found a poor level of acquisition of these process skills. These findings imply that the science process skills which are tools needed for scientific literacy, functional knowledge, creativity, rational decision making are not being adequately emphasized in biology teaching and learning. This also indicates that much of the curricular contents are not being implemented and understood. Worse still is the fact that most teachers