

Problems and Prospects of Teaching Integrated Science in Secondary Schools in Warri, Delta State, Nigeria

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Abstract

The purpose of the work is to find out reasons for poor teaching and learning of integrated science in secondary schools in Warri, Delta State, Nigeria. The instrument used was a structured questionnaire. Data for the study were obtained by administering 360 questionnaires to 360 students. Five public secondary schools and five private secondary schools were selected. 36 students were sampled randomly from each secondary school making a total of 360. 300 questionnaires were fully answered and returned. The data were analyzed using frequency counts, percentages and stanine test. The study recommended that government should employ specialist Integrated science teachers, and schools should endeavor to see that only qualified teachers are allowed to handle integrated science subject in secondary schools. Moreover, curriculum developers should review and reduce the syllabus to a manageable size (without reducing the quality at that level) for both teachers *and students*.

Keywords: Teaching and learning, integrated science, secondary schools

Introduction

Teachers, especially in developing countries, have long demanded to be given professional status. Before now it was like a dumping ground, where anyone who cannot get a desired job takes teaching as the last resort or means of income (Nemine, 2008). Personal experience shows that even secondary school graduates at a time entered into the teaching field just to utilize time while waiting for admission into tertiary institutions. These classes of people have not had any form of teacher training education and do not have prior knowledge of learning theories and principles or acquisition of teaching skills and methods. This made the teaching field a place for all, which does not reflect or portray teaching as a profession. According to Okeke (2004), trend analysis of the educational development in Nigeria points to the fact that there had been dearth of teachers with requisite aptitude, sufficient education, and specialized skills for the effective performance of the crucial role of teaching in the classroom.

However, in recent time teaching has gone beyond what ordinary person along the street can enter into, because it has to do with professionalism and specialization.

This is in line with the guideline of National Policy on Education (FRN, 2004) section 8; sub-section 70B which outlined that the minimum teaching qualification into the teaching profession shall be Nigeria Certificate in Education (NCE). This is a proof that teaching is professionalized in Nigeria. The National Policy on Education (FRN, 2004) section 8, sub-section 74 and 75 outlined that:

Teacher education shall continue to take cognizance of changes in methodology and in the curriculum. Teachers shall be regularly exposed to innovations in their profession; in-service training shall be developed as an integral part of continuing teacher education.

Laudable as these provisions may seem, experience shows that there have been aberrations to this rule.

Purpose of the study

This paper aims at finding out the problems of teaching integrated science in public and private secondary schools in Warri, Delta state, Nigeria. The paper will especially examine the basic reasons that could cause poor performance of students at the junior secondary schools in Delta state of Nigeria.

Research questions

The paper attempts to provide answers to the following research questions.

1. What are the causes of students' poor performance in sciences at senior secondary schools in Delta state?
2. What is the impact of specialist teachers in the area of integrated science?
3. What can be done to increase students' interest and performance in integrated science as well as the sciences generally?

Methodology

The study employed the survey type of descriptive research. The population consisted of five public secondary schools and five private secondary schools in Warri, Delta state. The multi stage sampling technique was used to select the subjects for the study. The tool used was a structured questionnaire. Of the 360 copies of the questionnaire that were administered, 300 copies were answered in full and these were analyzed using percentage and stanine test.

Features of Teaching as a Profession

Teachers are the major factors in implementing the educational objectives and policies and, as such, should be respected and recognized in any country, because when something goes wrong within the educational system, the teachers are first to be blamed (Koko & Nwiyi, 2007). Teaching as a profession has the following features according to Nemine (2008):

- Period of specialized training: Teachers go through formal school e.g. Colleges of Education, universities and other institutions running educational courses.
- Code of conduct: Teaching has its recognized code of professional ethics and conduct.
- Professional organization: Teaching has a body of professional colleagues who share the same ethical codes for instance ASUU in Universities and COEASU in Colleges of Education and the Nigerian Union of Teachers (NUT).
- Control of entry: Teaching, like every other profession, has control of entry. The Nigeria Certificate in Education is the least qualification for entry into the teaching profession in Nigeria.

- Teaching has autonomy and independence as a profession: It has the ability to exercise its own leadership and pursue goals for the general welfare of its members and the development of the body.
- Professional qualification and teaching competencies: Banjo in Ololube(2009), opined that mediocrity in education is unacceptable and it is not in the best interest of both students and the larger world. Teachers have to be academically qualified as well as professionally competent to be able to perform their prescribed roles.

Again, the establishment of Teachers Registration Council is a contributing factor that, professionalized teaching for effective teaching and learning.

What is integrated science?

Integrated Science treats scientific concepts in a manner free of the restrictions imposed by the arbitrary subject boundaries of the separate sciences. It has a dynamic process approach to the teaching and learning of science.

One can see a clear definition of integrated science as one study the ways different authors describe the discipline. Brown (1977) describes integrated science under four broad characteristics:

- i) The unity of all knowledge... that integrated science has a holistic view of knowledge as essentially one and undivided;
- ii) The conceptual unity of the sciences... the various conceptual units that make up the framework are identified;
- iii) A unified process of scientific enquiry... this characteristic place emphasis on the methodological distinctions and similarities among the sciences;
- iv) An interdisciplinary study... that the discipline is a collaborative venture between subjects and viewing of topics or themes from logically different viewpoints with the learner left to synthesize in any way he chooses.

Problems of Teaching Integrated Science in secondary schools, Warri, Delta State, Nigeria.

In his presidential address at the 24th Annual Conference of the Science Teachers Association of Nigeria (STAN) in Jos, 1984, Dr. S.T. Bajah gave a contextual appraisal of integrated science in Nigeria and referred to the situation as a crisis in our classrooms. According to him, the science teacher who in the first lesson on integrated science wrote boldly on the chalkboard "INTERGRATED SCIENCE" began the crisis in the classroom. Superficially, one would think that this is crisis of words. The question is why many teachers would call the course 'Intergrated Science' instead of 'Integrated Science?' The fact of the matter is that most teachers do not just know what exactly this 'Integrated Science' is all about.

I would like to add that most of the problems arise as a result of the inappropriate training background of our science teachers which is not quite adequate for teaching integrated science. A curriculum programme may have the right objectives and appropriate suggestions for practical work. But if the teacher does not apply the required methods to teach the course, then such malpractice soon defeats the objectives and skill, innovation, open-ended experimentation and individual ingenuity of students. Integrated science is 'Science come alive.' It is meant to unite all of us who have specialized disciplines in science. This means that any method applied in teaching integrated science must strive to instill in the students the practical utility and application of the knowledge in everyday life.

Admittedly, any child-centred activity-oriented curriculum requires adequate financial expenditure in terms of purchases of working material and provision of adequately trained personnel. Obviously, one of the problems of teaching integrated science in our schools stem from the inadequacy of laboratory facilities. There is no doubt, that there would be some devoted integrated science teachers in some schools, but in the midst of inadequate working material, they would have been frustrated in their efforts to do it. The problems of inadequate or complete absence of physical facilities are even compounded by the phenomenal increase in school enrolments resulting to the problem of large class-size. Some students on the evaluation of integrated science projects, Jegede's (1982) for example, have reported that new curricular materials developed in Africa have low levels of readability.

The 'teacher factor' is also an indispensable determinant in the successful implementation of any curriculum innovation. As succinctly stated by Stake et al (1978, p.19) what integrated science will be for any one child for any one year, is most dependent on what that child's teacher believes, knows and does-or does not believe, does not know and does not do. For, essentially all of the science learned in school, the teacher is the enabler, the inspiration and the constraint. Integrated science teaching in Nigeria is entrusted into the hands of those teachers majority of who are not qualified to teach the course. Perhaps one main reason why some people look at the future of integrated science as being blurred is the fact that the major focus of secondary school education in general is the West African School Certificate Examination and G.C.E. It appears to the people as if integrated science is inadequate for preparation for the terminal examination.

But this is not so, because integrated science has many prospects as far as education and job prospect is concerned.

Prospects for Integrated Science in Nigeria. Nigeria has been noted for being in the fore-front in the whole-sale adoption of integrated science at junior secondary school level.

The magnitude of prospects for integrated science in Nigeria and the world over cannot be overemphasized. There is a universal rush to integrated science at the junior secondary school level, and reportedly many developed countries have included integrated science in the syllabus at the upper secondary school level and at the tertiary level. There is a universal pressure for nations to develop scientific knowledge in the societies. In this vein, the need for many professional people to be knowledgeable in several areas, the occurrence of problems that can be solved only by co-ordination of research in several specialties and the demands of students, particularly non-science students, for an understanding of the role of science in modern society, have provided strong pressure for less specialization and the presentation of wider views of science which integrated science can provide.

Because of this pressure, many African countries today are exploring the feasibility of implementing integrated science at all levels of the education system. Critics might say that the course is not suitable for advanced work. But the truth is that the junior course could be revised to suit any advanced study as several developed countries have done. The important thing is to make science unified and break the subject boundaries. This move has been achieved in many advanced countries such as the United States of America, Britain, the Caribbean, Australia, and other places. The Caribbean Integrated Science Curriculum (CISC), The United States' BSCS Biology, PSSC Physics, Harvard Project Physics, CHEM Study, and Britain's "O" and "A" level courses in the various individual sciences have made a significant contribution towards the possibility of meaningful integrated science at the upper secondary and tertiary levels. These courses share an increased emphasis on the laboratory approach, a concern for the learner, and a carefully thought-out consideration of the modern nature and scope of the discipline and its relation to science as a whole. Thus, they provide the most useful source of activities, ideas, and approaches for those planning the development of truly integrated science courses at the upper-secondary level (Richmond 1973).

The West African Examination Council has already had several dialogues with Science Teachers Association of Nigeria (STAN) on the feasibility of extending integrated science to the senior secondary school level. Other West African countries too, for example, Sierra Leone and Ghana are making similar moves. Gbamaja (1982) compared the Sierra Leone integrated science programme (core course Integrated Science) for the junior secondary level with some aspects of WAEC Science Syllabus and found that the difference is minimal in terms of content and he suggested ways of extending integrated science to the senior secondary level. Further, Gbamanja (1983) reported that the fact that integrated science ends at the junior secondary school level and does not extend to the senior segment causes a swing away from science. The inquiry/discovery activity skills which they acquired in the integrated science courses are in the senior secondary school as they prepare for the all important school certificate examination and G.C.E. Moreover the Universal Basic Education has coined basic science in place of integrated science to cater for both practical and theoretical aspects of science at primary and junior secondary schools in Nigeria. Other factors which have made it imperative for many countries to start extending integrated science up to advanced levels are:

1. Attention in the modern world is now being paid to science for all citizens.
2. There is a world-wide movement to introduce the interaction of science and society into the classroom.
3. Requirements for further education in fields other than the sciences.
4. Flexibility in the training for the world of work.
5. To make curriculum development easier.
6. To make evaluation easier and more reliable.

The tables below show the responses received on the questionnaires-

Table 1.

	Number	%	Stanine
Integrated science syllabus is too wide	291	97	9
I do not know where to work if I read integrated science	285	97	9
My integrated science teacher lacks methodology of teaching	279	93	9
No excursion, no fields trips, no exposure	262	87	8
Students are not exposed to practical in integrated science	240	80	8
There are not enough physics topics in integrated science	238	79	8
There are too many biology topics in integrated science	225	75	7
There are too many science subjects put together in integrated science.	216	72	7
It is difficult to understand the chemistry aspect of integrated science	213	71	7
Teachers do not use enough instruments, materials to teach integrated science.	210	70	7

Table 2.

Suggestions	Raw Score	%	Stanine
Encourage the use of instructional materials	285	95	9
Reduction of integrated science syllabus	273	91	9
Provision of qualified integrated science teachers	261	87	8
Organize many excursions and fieldtrips for exposure	258	86	8
Provision of guidance counselors on job opportunities	255	85	8
My integrated science teacher should improve on teaching methods	244	81	8
Reduce chemistry topics in integrated science	226	75	7
Reduce physics topics in integrated science	220	73	7

Results and discussion

This section provides answers to the research questions raised. The results are presented below;

(a) Reasons for the poor performance of students in sciences at the senior secondary school.

Table I above indicates that course content, (Syllabus), employment prospects, teacher's methodology and lack of material were major areas of concern. Ninety-seven percent (97%) of the respondents were not sure of where to get employment in case they read the sciences. About 97% also complained about the syllabus which they said was too wide. 70% of the respondents said that there was not enough instructional material to teach integrated science.

(b) What is the impact of specialist teachers in area of integrated science? Ninety-three percent (93%) of the respondents held that their integrated science teacher lacked methodology of teaching which boils down to the lack of specialist teachers in that area. 80% of the respondents said that there were no practical work which is true because the one handling the subject was not trained in that area. This is in agreement with Okeke (2004), who maintained that there had been dearth of teachers with requisite aptitude, sufficient education, and specialized skills for the effective performance of the crucial role of teaching in the classroom. 71% maintained that chemistry topics in integrated science were too difficult. While 79% of them said that Physics topics in integrated science were too few. 87% said that there were too many biology topics in integrated science. 87% of them said that there no field trips, no excursion. While 72% said that too many science subjects were put together in integrated science.

(c) What can be done to increase students' interest and performance in integrated science?

Table 2 above presents some solutions to the problems listed above. Based on the responses from various respondents it was obvious that issues bothering on teachers' qualification, curriculum content and implementation and others were touched. 95% of the respondents suggested the use of appropriate instructional material, while 91% of them opined that the syllabus should be reduced, it should not be over loaded; though the quality should be maintained for both teachers and students. 87% of them suggested that only qualified integrated science teachers should be allowed to handle the subject while 86% were of the opinion that excursion and field trips should be embarked upon to areas where they can see things that relate to what they learn in the classroom. 85% suggested that guidance counselors should be attached to schools who will guide students on the area of specialization hence this will lead to employment opportunities in future.

All these factors allude to the fact that any science taught in the modern world must be interdisciplinary, unified, society-based, and above all, must achieve scientific literacy. These are essentially the characteristics of integrated science in general.

The prospects for integrated science are even obvious at the tertiary level in Nigeria, and elsewhere. Many Colleges of Education and Universities now offer Integrated Science as a course. Even where a student may not specialize in integrated science at the end of his college career, he ought to have at least taken the course, to have some basic knowledge of science. Some Faculties of Education in Nigeria Universities for example, Ahmadu Bello University, University of Port Harcourt, University of Ibadan and others now offer the Bachelor of Education degree (B.Ed.) with Integrated Science. Some other Universities have made integrated science as a general education requisite course for their preliminary venture. "In order to provide for wider background in science, integrated science course have been introduced in many tertiary institutions throughout the world" (Richmond, 1973). Some of the courses are designed for non-science students.

Others are designed for science students at undergraduate and post-graduate levels in England, U.S.A., Australia, and other places. Integrated science has prospects for providing the skills for science literacy.

Nigeria has recently adopted the 6-3-3-4 system of education. The evaluation systems in this new curriculum form a department from the old-timer G.C.E. It appears that other West African countries such as Sierra Leone, Ghana and Liberia will eventually follow Nigeria's foot-steps in adopting the 6-3-3-4 system either in full or in part. One would not be surprised if in the near future the rest of the Africa follow suit. If one examines closely the philosophy and objectives of the 6-3-3-4 education system in Nigeria, one would see that they are very much in line with the philosophy, objectives, and methodology of the integrated science enterprise. The 6-3-3-4 system of education in Nigeria is science-oriented.

Conclusion and Recommendation

Based on the research work above, the following suggestions have been put up by the researcher, which are not mandatory but essential.

1. The teaching of integrated science contributes towards general education, emphasizes the fundamental unity of science and leads towards an understanding of the place of science in contemporary society. Government should therefore encourage young scientists by way of symposium, science competitions, and science clubs and even give scholarships to those who have distinguished themselves in this area.
2. A course in integrated science should emphasize the importance of observation, testing and experimentation which are processes of science for increased understanding of the environment; it should introduce pupil to logical thinking and scientific aptitude.
3. As it may be necessary in an integrated science course to omit some details, it is essential that the content of the course should be judiciously chosen. It must be carefully compiled by collaboration between the different teachers and other specialists.
4. The extent of integration and the balance between integration and co-ordination will depend on the age of the pupils, the type of educational institution and local condition. At the higher stages of secondary education such a course may also be desirable especially for those students who have decided not to specialize in science.
5. Further experiments in the development of new integrated science curricula and the production of teaching material are needed, drawing on those resources that are already available. The results of such experiments would be widely disseminated.

These conclusions and recommendations thus emphasize the fact that integrated science is able to meet the general education needs of each learner and the common needs of the society.

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