

CHALLENGES FACING THE TEACHING AND LEARNING OF INTEGRATED SCIENCE FOR NATIONAL DEVELOPMENT: A CASE STUDY OF GOVERNMENT DAY SECONDARY SCHOOLS IN KARU LGA NASARAWA STATE

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Abstract

The position of Basic Science as the bedrock for all science subjects in the senior secondary school has led to its inclusion in the school curriculum. The researcher reviewed 14 empirical research articles on integrated science published mostly from 1995 to 2015. This paper has discussed the challenges facing its teaching in (GDSS Karu, Nasarawa state. The challenges of teaching the subject are lack of motivation of teachers, lack of interest among students, medium of instruction, and lack of infrastructure among others. Recommendations which if properly effected would enhance effective teaching of basic science are; Teachers should, as prescribed in the curriculum, take students out on field trips and excursions. To facilitate this exercise, teachers should be provided with an impress, to cover the cost of transport and other expenses. Federal and state ministries of education should ensure that every integrated science teacher attends at least one workshop or seminar every year. Moreover, in-service training be approved for many unqualified integrated science teachers in secondary schools.

Keywords: Curriculum, Infrastructure, instruction, Basic science, Integrated Science.

Introduction

Science education plays a vital role in the lives of individuals and the development of a nation scientifically and technologically (Alebiosu and Ifamuyiwa, 2008). It is widely and generally acknowledged that the gateway to the survival of a nation scientifically and technologically is scientific literacy which can only be achieved through science education. To make her citizens show interest in science education, the Nigerian government came up with a policy that 60% of the students seeking admission into the nation's Universities, Polytechnics and Colleges of Education should be admitted to science-oriented courses, while 40% of the students should be considered for Arts and Social Science courses (Ajibola, 2008). This government's effort cannot be said to have yielded much fruits given the dwindling nature of students seeking

admission into science-oriented courses in the Nation's tertiary institutions. More students appear to seek admission into art and social science courses than those of the science-oriented courses on yearly basis. Disturbed by this development, researchers in the field of science education in Nigeria embarked on series of studies to find the logic behind this development. They found that the problem stemmed from the first form of science a child comes across at the JSS (Junior Secondary School) level: that is integrated science.

Integrated science provides students sound basis for further science education study. As a result, a child that is not well grounded in integrated science at this level would not show interest in offering core science subjects (biology, chemistry and physics) at the SSS (Senior Secondary School) level which are the prerequisites for studying science-oriented courses at the Nation's tertiary Institutions. They also found that lack of qualified teachers, lack of equipment and facilities for teaching, lack of practical works, insufficient allotment of time for integrated science teaching and learning on the school time-table and poor methods of teaching are the major factors militating against the successive implementation of the core curriculum in integrated science (Afuwape and Olatoye, 2004).

The aforementioned challenges against teaching integrated science does not include non-sequential arrangement of some of the integrated science concepts in the curriculum. It is believed that if integrated science concepts are not taught from known to unknown and from simple to complex, it is likely that students might find it difficult to understand the concepts taught. This has led to the development of negative attitude towards the subject by the students, which has led to many of them not showing interest in offering core science subjects at the senior secondary school level and science-oriented courses at the Nation's tertiary institutions because of their dismal performance in integrated science examination at the Junior Secondary School Certificate Examination (JSSCE).

The purpose of this study is to look, critically, into the Challenges facing teaching and learning integrated science at the JSS level, and make some recommendations for onward improvement. It is hoped that if integrated science topics are well arranged from known to unknown, simple to complex, students at the JSS level will find integrated science interesting and this will motivate them for further study in higher science education.

The importance of integrated science in everyday life can never be overemphasized. It serves as the bedrock that provides the required training in scientific skills to meet the growing needs of society. It is the fundamental knowledge acquired through integrated science at the upper basic level that leads to the transformation of the world through dramatic advances in almost all fields including medicine, engineering, electronics and aeronautics among others (Guyana Chronicles Online, 2009). The application of scientific knowledge acquired through integrated science, as reported by Guyana Chronicles (2009) that helped many countries like China and India to transform from poor feudal type economies to become economic and industrial power houses and in several ways compete effectively with developed countries. Integrated science is of great importance because early experiences in science help students to develop problem-solving skills that empower students to participate in an increasingly scientific and technological world (Guyana

Chronicle, 2009) Integrated science is the type of science that provides unique training for students in observation, reasoning, and experiment in the different branches of science; it also helps students to develop a logical mind (Prakash, 2012). Integrated science enables students to be systematic and enables them to form an objective judgment. Integrated science, if taught according to its philosophy, equips students with the necessary introductory scientific and technological knowledge and skills necessary to build a progressive society. This forms the bedrock on which scientific and technological studies rest, Adejo and Idachaba in (Ochu & Haruna, 2014)

Perspectives on Integrated Science

Basic science formerly known as Integrated Science is the first form of science a child comes across at the secondary school level. Basic science is a core subject in the National Curriculum at the upper basic level (Kim, 2008). All students from upper basic I-III classes must offer and study the subject. Basic science is considered the bedrock of all science subjects at the senior secondary school (SSS) level. The subject prepares students at the upper basic level for the study of core science subjects (Biology, Chemistry, and physics) at the senior secondary school level (Olaewaju in Oludipe, (2012). That is why Oludipe (2012) further emphasized that for a student to be able to study single science subjects at the senior secondary level successfully; such a student has to be well grounded in Basic Science at the upper basic level. Based on this, it is generally taught as a single science subject, until in the SSS level, and then split into specialized science subjects (biology, chemistry, and physics). It is expected that those students who achieve well in integrated science should be given the opportunity to study separate science subjects at the SSS level. According to Trustees of Princeton University (2013), integrated science is a revolutionary new introductory science curriculum developed at Princeton intended for students considering a career in science. Integrated science emphasizes scientific literacy and research-oriented learning (Eyles, 2009). The subject encourages exploration of student's immediate environment. As a result, integrated science teachers continue to learn along with their students.

Theoretical Frame Work

Research by Bello (2007) has shown that the desires are not being achieved as expected. The learning environment is expected to be democratic, the activities are interactive and student-centred and the teacher facilitates the process of learning in which students are encouraged to be responsible and autonomous. Though the curriculum of integrated science specifies “hands-on” and “minds-on” activities and skill acquisition, most students are not exposed to these real situations in the schools (FRN 2004). Emaikwu (2012), in his research, discovered that integrated science is generally taught using conventional strategy which does not follow the theories put forth by Kolb (1984) and the theory of the learning process. The problem therefore is; what are the challenges that confront the effective teaching of integrated science at the upper basic level? This directly leads to the following questions which form the basis of this discussion.

- a. How did integrated science education evolve?
- b. What is the importance of integrated science in everyday life?

- c. What are the challenges confronting the teaching of integrated science?

Brief History of Integrated Science

In 1968, the West African Examination Council (WAEC) now West African Secondary School Certificate Examination (WASSCE) conducted the Science Teacher's Association of Nigeria (STAN) for the purpose of improving WAEC'S science syllabus. Subject Curriculum Development Committees were therefore set up to consider both the changing needs of Nigerian pupils/students and international trends in their respective subject areas and drawing on their teaching. The committees worked on separate subjects- Biology, Chemistry, and Physics. Later, another Committee was set up consisting of members of the afore-mentioned subjects to work on Integrated Science and the result of their deliberation was documented in STAN'S Curriculum Development Newsletter No. 1 which marked the beginning of Integrated Science teaching and learning in Nigeria.

Integrated Science curriculum materials were designed for the first two years in the secondary schools. These included pupils' text, workbook and Teacher's Guide. These materials were revised to meet the requirements of the National Policy on Education, i.e 6-3-3-4 education system.

The integrated science programme was initiated in 1969 by UNESCO to assist member countries in promoting scientific literacy in a unified way both at the primary and secondary levels. This brought a great awareness of science Curriculum improvement in Nigeria. A study by Chukwuneke and Chinkwenze, (2012) revealed that the scientific, vocational and technological aspects of education are not effectively implemented in the school system. Based on this, integrated science curriculum review became a necessity. This led the Federal Government of Nigeria to take the decision to introduce the 9-year of basic education and the need to attain the Millennium Development Goals (MDGs) by the year 2015 together with the need to meet the critical target for the National Economic Empowerment and Development Strategies (NEEDS), summarized as follows; value reorientation, poverty eradication, job creation, using education to empower the people among others (FRN 2004). As documented by Chukwuneke and Chinkwenze (2012), it became necessary for the existing curriculum for the upper basic level to be reviewed, restructured and realigned to fit into the 9-year basic education programme. With this, the National Council on Education (NCE) therefore in her meeting in 2005 directed the NRDC to ensure the review which also approved the new curriculum. This restructuring and curricular review took effect in September 2007 (Duada & Udofia, 2010). It was during this restructuring and review of curricular that integrated science replaced integrated science. During this time, human rights education, family life, HIV/AIDS education, entrepreneurial skills, globalization, ICT were fused into the 9-year basic education curriculum (FRN 2004) while the following themes were fused into the Integrated Science curriculum to form the integrated science curriculum:

- a) Environmental Education
- b) Drug abuse education

- c) Population and family life education
- d) Sexually transmitted infection (STI) including HIV (FRN 2004)

Integrated science is basic training in scientific skills which are required for human survival, sustainable development, and societal transformation (Chukwuneke & Chinkwenze, 2012). Integrated science is expected to make Nigerians scientifically literate.

Challenges of Teaching Integrated Science in Secondary School

Though, integrated science has been of great value both to individuals and society globally, students have been performing poorly in the subject, especially in GDSS Karu Nasarawa State Benue State. This poor performance might be because of the following challenges;

- i. The teacher as the curriculum user has been identified as the most important factor in curriculum delivery. His/her level of competence and teaching strategies is very important. It is because of this that a lot of blames on the poor performance of students in integrated science has been put on the integrated science teachers;
- ii. Ogunleye (1999) and Balogun (1995) in their research gathered that teachers agreed that students should be actively involved in the teaching-learning processes, but this is not reflecting in their teaching. In most cases lecturing, note-giving, and taking predominate their lessons. Ogunleye in his study found that many science (Integrated science inclusive) teachers are deficient both in academic and professional aspects of their education. As a result, they find it difficult to facilitate integrated science students to construct their knowledge because the use of a constructivist-based strategy is time-consuming; it requires intensive planning and dedication on the part of the teacher;
- iii. Many integrated science teachers cannot guide their students to apply what they learned in the classroom to real life situation. They ignore this aspect completely. It has been observed that some science teachers (integrated science) lack training in instrumentation to enable them detect and repair faulty instruments (Ogunleye, 1999).
- iv. Many integrated science teachers are not yet computer literate, also Many are hardly creative in terms of exploring the environment for the purpose of identifying and using resources for teaching integrated science. Instead, they bombard these students with facts using lecture methods and overload the students with copying notes and assignments;
- v. Most integrated science teachers are not dedicated to their jobs. This could be as a result of the issue of salaries. The issue of salary is a peculiar challenge, where the income is insufficient to live reasonably, teachers are no longer motivated to teach, and some teachers lack interest in the job, which can lead some to leave the profession (Danmole, 2011).
- vi. Teachers do not enjoy regular promotions when due. It is because of this that Hamza and Mohammed (2011) lamented that this situation is not supposed to be the case because of the role and importance of the teachers, especially in integrated science where good teaching should take place in order to produce quality students that could pursue higher education in future.

- vii. Wasagu in Wushishi and Kubo (2011) identified some factors that pose challenges to the teachers of science (integrated science) including inadequate exposure to teaching practice, poor classroom management, and control, poor computer skills, inability to communicate effectively, lack of self-reliance, entrepreneurial skills and poor attitude to work.
- viii. One of the most striking challenges in the teaching of integrated science is lack of interest in integrated science among students. It is well known that learning is an activity which the learner must personally engage (Ivowi, 1999). In order for success to be achieved, the students must develop an interest in the activity.
- ix. Communication is the medium of Instruction in the teaching of integrated science. On this issue, it is observed that many science teachers cannot speak fluently or loud nor express themselves clearly. This makes students to get more confused and lose important information and consequently dislike the subject. Eriba (2004) supports this expression where he said that inexperienced teachers always sound complicated above the comprehension of the students during their lesson delivery;
- x. The issue of non-availability of infrastructure in GDSS Karu is a great challenge to the teaching of integrated science at the upper basic level. The modern system of education (integrated science) in Nigeria today is the one that is to equip students with knowledge and skills to strive well in the present society. It has been reported that the present infrastructure in all levels of the education system, (upper basic level inclusive) is a mockery of Vision 2020 and Millennium Development Goals (MDGs) (Wushishi & Kubo, 2011). The authors in their report further stressed that Nigerian schools lack classrooms, laboratories, and other modern structures necessary for effective teaching and learning of integrated science concepts.
- xi. Inadequate supply of infrastructures jeopardizes the effective teaching of integrated science. Insufficient supply of electricity power generation is the major problem for most of the schools, especially where there is no standby generator. Electricity that would have been used for the equipment in the laboratory or workshop for effective use of electrical equipment is not readily available (Odu, 2011). In the same vein, Aderounmu (2006) also observed that lack of facilities and teachers were some of the factors contributing to the poor performance of students in science (integrated science).
- xii. Due to a lack of materials and infrastructure in Nigerian schools, it has been observed that in most schools candidates who enter for science subjects enter the laboratories only when their schools get instructions from practical examination bodies (Aderounmu, 2006). The author further lamented that even the teachers of these subjects including integrated science did not know the use of most laboratory equipment and chemicals until the practical examination.

Recommendations

This paper as stated earlier discussed some of the fundamental challenges of teaching and learning integrated science in GDSS Karu, based on the findings of this study, the researcher makes the following recommendations;

- i. Time allocated for the teaching of integrated science should be increased say from 35 – 50 minutes so that the pupils will, in the end, develop the power to perceive, understand, experiment, discuss, hypothesize, and draw conclusions.
- ii. Teachers should, as prescribed in the curriculum, take students out on field trips and excursions.
- iii. Federal and state ministries of education should ensure that every integrated science teacher attends at least one workshop or seminar every year.
- iv. Experimentation, inquiry, and functionality are the pillars of modern science education. These cannot be achieved without effective laboratory activities. It is, therefore, schools should be supplied with functional laboratories and other infrastructural facilities.
- v. Integrated Science teachers must be supported by a timely supply of teachers' guides and handbooks for effective teaching of integrated science.
- vi. Integrated science teachers should be highly motivated. To achieve this, prompt and regular payment of salaries and promotions when due must be ensured. This can boost their morale and cause them to produce quality students.
- vii. It is vital that teachers of integrated science should increase the interest of students in science by introducing constructivist-based teaching strategies where students are exposed to construct their own knowledge. With this, students would no longer view science as something abstract but as something that should be connected to real life.
- viii. The use of simple words to explain the most complex concepts during lesson delivery in integrated science should be encouraged.
- ix. For effective teaching of integrated science, the use of instructional materials that are found in the learners' immediate environment should be encouraged; for this would facilitate the student to understand those concepts that seem to be complex to understand.
- x. Experienced integrated science teachers should be delegated to take part during curriculum decision-making process. This would enable integrated science teachers to see their science teaching profession as an enterprise in which they can exercise their creativity.
- xi. For successful teaching of integrated science, the teachers should increase the use of out-of-school/ outdoor activities in the teaching of integrated science. This encourages exploration of the immediate environment for the teaching and learning of the subject.
- xii. The federal and state governments should improve the working conditions of science teachers and upgrade the status of the teaching profession and provide appropriate incentives so as to stem the unfortunate high turnover of experienced and dedicated science teachers.

Conclusion

The position of integrated science as the bedrock for all science subjects in secondary school cannot be over-emphasized. The challenges facing the teaching of integrated science have been identified as lack of motivation of teachers, lack of interest in integrated science among students, medium of instruction and lack of infrastructure among others, the prospects of integrated science will be achieved if the following are implemented such as regular training and retraining of integrated science teachers, timely supply of teachers' guide and handbook for effective teaching of integrated science, provision of well-equipped laboratories and motivation of the integrated science teachers, through regular payment of salaries and science allowances among others.

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