

WAYS OF BRIDGING THE GAP BETWEEN TEACHING AND RESEARCH IN SCIENCE EDUCATION IN A REFLECTIVE SOCIETY IN NIGERIA

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Abstract

This study attempts to highlight the gap in teaching and research in science education in a reflective society in Nigeria, synergies between teaching and research, meaning of teaching and research, and some of the gaps that affect the teaching and research in science education. The Gap in teaching science education include, quality of teaching, quality science teaching, academic/professional qualification, In-service refresher courses and trainings, teacher experience, teacher salary, quality teaching-learning resources and the ways of bridging the gap in teaching science education are improving of teachers quality, training and retraining of teachers, provision of resources for teaching and learning etc. The Gap in carrying out research in science education includes lack of utility of research outcomes and feedback, Non-involvement of research-finding consumers, lack of centres for research findings dissemination, lack of adequate funds for research activities, obsolete library and laboratory/workshop facilities and lack of adequate remuneration. All these factors affect the closing of gap in teaching and research in science education and ways of bridging the gap. Regrettably the teaching and research in science education cannot be said to be effective because of the poor performance of students and lack of recent findings on research resulting from out dated information. For the policy recommendations, this paper recommends among others that there should be quality teacher to researcher development, Good practices for effective implementation of inquiry based science education must be identified and properly implemented, Libraries and laboratories should be provided and well equipped, Adequate funds for research activities etc.

Keywords: Gap, Synergy, Teaching, Research, Quality

For any nation including Nigeria to attain sustainable development, there is need to recognize science education as a priority area of education for her citizens (Ogunmade, 2006). Science is derived from Latin word “scientia” which means what is to be known, what is a fact, truth or certain. Science according to Onah (2003) is the bedrock upon which any nation can be built. This means that no country can be globally recognized without talking about its scientific advancements. Mbajiorgu (2003) views science as an act of doing and is more concerned with various investigative processes and activities with regards to developing, acquiring and controlling knowledge, skills, capacity and attitude about the natural factors of the environment. This implies that science is a way of knowing the facts, theories among others. Science education is described by Pember and Humbe (2009) as a process of teaching or training especially, in school to improve one’s knowledge about environment and to develop one’s skill of systematic inquiry as well as natural attitudinal characteristics. Science education has been recognized worldwide as a pre-requisite in technological development. No country can be globally recognized without talking about its scientific advancements. Science education also equips teachers, learners and the society with knowledge, skills, equipment and freedom to perform noble task useful for improving socioeconomic standard. In addition he added that science education courses are designed to produce capable scientists who contribute meaningfully to academic excellence of the society to raise the economic level of nations. Despite the importance of science education to national development, Nigeria lacked sustainable science education since its independence and as a result, science education has not been able to move the country into industrialization and above poverty level. According to Momeke (2007), science education has failed to produce skilled human resources needed for transformation into

national prosperity. This implies that most of Nigeria's development in the direction of modernization has been haphazard leading to acquisition of obsolete technology.

The Synergy/Relationship Between Teaching and Research

The word "synergy" comes from the Greek "συνήργια (sunergiā)", which means cooperation, derived from "{συνήρετέω} συνήρχος (sunergos)" – working together. A sector of the society, which involves two different types of activity, is the Higher Education and the society in general. The two principal activities are *teaching* and research. There are two contrasting perspectives – Positive and Negative on the synergy/relationship. The arguments supporting each position are described as follows (Jekens *et al.*, 2003):

Positive Relationship

There are several different arguments hypothesizing a positive relationship between research and teaching. They are highlighted below;

Research to Teaching

- (i). Research helps in expert and contemporary knowledge being passed onto the student. This is a relationship where the excitement of engaging with the development of the knowledge base of the discipline itself contributes to student learning.
- (ii) Textbooks may not be current in many rapidly developing areas. Additionally, results from one's research can be used to clarify, update, and amend the teaching of a topic.
- (iii) Research leads to credibility enhancement. Students have the desire to learn from people respected in their fields.
- (iv) Successful research can increase lecturer confidence, leading to better classroom performance.

Teaching to Research

- (i) Teaching can be particularly good for young researchers because it can reinforce their ability to expound and clarify their thinking.

According to Adeyeye (2004), the main advantages of integrating research into teaching are:

- (a) The teacher is able to give accurate and up-to-date information to students with relevant examples rather than second-hand knowledge from textbooks.
- (b) The teacher's research is also beneficial when presented and opened to challenges from students. This could in turn stimulate new research directions.
- (c) Teaching could be a recruitment platform for attracting students with a passion for research.

Negative Relationship

A review of the study also provides a list of arguments supporting a negative relationship between quality in research and teaching.

- (i) There is limited time, energy, and commitment, for faculty to do both teaching and research with academics usually prioritizing research over teaching.
- (ii) According to the divergent rewards model, different obligations and rewards are allocated to each activity. Teaching does not contribute significantly towards overall salary, and therefore suffers in comparison to research, which does bring monetary gain.

Meaning of Teaching

Teaching refers to ways that involves imparting of knowledge or skill on an individual. In education, teachers facilitate learning, often in a school or academy or perhaps in another environment such as outdoors. A teacher who teaches on an individual basis may be described as a tutor. The

objective is typically accomplished through either an informal or formal approach to learning, including a course of study and lesson plan that teaches skills, knowledge and/or thinking skills. Different ways to teach are often referred to as pedagogy. When deciding what teaching method to use, teachers consider students' background knowledge, environment, and their learning goals as well as standardized curricula as determined by the relevant authority. Teaching using pedagogy also involve assessing the educational levels of the students on particular skills. Understanding the pedagogy of the students in a classroom involves using differentiated instruction as well as supervision to meet the needs of all students in the classroom (Gregory, 2004).

Meaning of Research

Research is a systematic investigation towards increasing the sum of human knowledge. Osuala (2005) defines research as a process of arriving at dependable solutions to problems through the planned and systematic collection, analysis and interpretation of data. He further explained that research is the most important tool for advancing knowledge, for promoting progress, and for enabling man to relate more effectively to his environment, to accomplish his purposes, and to resolve his conflicts. Arising from this definitions therefore, research in science education is aimed at increasing knowledge in the discipline and providing solutions to problems relating to curriculum, evaluation, students and teachers, the society, all aimed at improving the quality of teaching and learning process. High quality research is useful as it influences development in the field of education since education is central to creating and sustaining any modern society. The use of qualitative and quantitative research is necessary and complimentary in improving the quality of research results. Qualitative method is useful in providing material for hypothesis, and defining complex concepts rigorously and realistically. On the other hand, quantitative research in science education is valuable for hypothesis testing, logical argument, generalization and objectivity. If the researcher is competent in all aspects of research handling, then it is expected that high quality research would result which, in turn, will transform the society and bring about improved standard in the education sector generally and in science education discipline in particular.

The Gap in Teaching Science Education in a Reflective Society in Nigeria

1. Quality of Teaching

Inadequate teaching has been advanced as one of the problems of science education in Nigerian Public schools. Effective teaching occurs when students learn and achieve many scientific goals and not just being able to repeat scientific knowledge (Omoifo, 2012). According to Abdulalu (2007), quality teaching lies at the teacher's capacity to transform written knowledge into forms that are pedagogically powerful and yet adaptive to the student abilities and backgrounds. Ayodele (2006) identified the use of inappropriate non-effective teaching methodology as a major factor hindering students understanding and achievement in science. The teaching and learning of science do not require theoretical and lecture approaches. Onose,(2009) posited that many inexperience teachers teach science in abstraction, thereby making science lessons boring and the students finding it difficult to grasp some scientific concepts, skills and principles.

2. Quality of Science Teachers

Poor quality of science teachers in terms of adequate knowledge base and pedagogic skills is another factor identified to influence students performance. The teacher's academic qualifications and knowledge of subject matter, competencies and skills, and the commitment of teacher have a great impact on the teaching learning process.

3. Academic/Professional Qualification

Academic qualification is a very important quality of a teacher. Academically qualified teacher has more authentic knowledge about the relevant subject than the academically less qualified teacher. Recent studies have shown that students taught by certified teachers consistently outscored those taught by uncertified teachers. Professional qualification can be termed as the preparation for life long journey

into the teaching profession. The basic skills and abilities of the teaching learning process are developed in a teacher through professional qualification. Professional qualification can be categorized into pre-service and in-service professional qualification. Omayuli and Omayuli, (2009) posited that most of the science teachers are also not professionally trained.

4. Teaching Experience

Teaching experience is the time spent by a teacher in the teaching profession, hence the more the years in teaching, the more the experience gained. A teacher without the requisite experience as regards the numbers of years in the teaching profession cannot be said to be experienced in teaching, therefore with the passage of time teachers get command of their subjects and become competent in the art of teaching through experience. In other words, teaching experience improves the teaching skills and methodologies adopted.

5. Teacher Salary

Teacher salary is very important as a predictor of students achievement because it has a capacity to uplift the other aspects of teacher quality. If a teacher gets a suitable salary that covers the basic living costs, he may be able to live comfortably and thus be more effective as he is motivated to use his abilities, competencies and skills. Poor remuneration affects the morale of teachers, distracts and hinders their commitment and effectiveness.

6. In-service Refresher Courses and Training

Over the years, the interplay of politics and economics on teacher training policies led to some degree of compromise in admission requirements. Consequently, a large proportion of what we have today as trained science teachers are professionally incompetent. Odiya and Omonfonmwan (2007) opined that the teacher training institutions have tended to produce teachers that are inadequate in terms of knowledge of subject matter and pedagogic skills. As noted by Okhiku (2005), teachers are not finished products even after the completion of a preparation or pre-service program.

7. Quality Teaching Learning Resource

Lack of ideal resources for science teaching and learning in Nigerian schools has been a major issue of concern. It is a well-known fact that the quality of education a student receives largely depends on the quality of teaching/learning resources provided which include modern textbooks, equipments, consumables like chemicals and reagents, models, charts e.t.c. and the physical learning environments which include the science classrooms and laboratories. To worsen the problem of lack of or inadequate resources, the few available ones are not properly maintained, protected and cared for. Ogunmade (2006) stated that "Majority of students do not have textbooks and most of the schools do not have libraries and where they have one, the textbooks in the libraries are outdated.

Ways of Bridging The Gap of Teaching Science Education in a Reflective Society In Nigeria for Effectiveness

1. Science Education can be Improved if the Teacher Quality is Improved: Concerted efforts should be made by authorities in our higher institutions of learning to establish and sustain non compromised high admission standard (Odiya and Omofonwman 2007). Also, the right caliber of teachers should be recruited and making of the teaching profession a dumping ground for those who cannot get employment elsewhere must be discouraged.

2. Teachers' Training and Retraining Issues: Regrettably today in Nigeria, Science teaching cannot be said to be effective due to observed low performance of science students. The competence, effectiveness and efficiency of a teacher is a function of his training. Therefore training and retraining of science teachers should be given greater emphasis and implementation. Proper training of teacher may strengthen

the causal relationship between the various qualities of teachers and academic achievement. (Dahor, 2011).

3. Quality of Teaching Issues: Central to the calls for a new approach to science education, educators have suggested that special attention be given to teaching about science, i.e developing an understanding of the nature and methods of science. Akinyemi (2006) posited that “if we want performance of students in science to improve, they should be encouraged to use appropriate thinking strategies through innovative intervention by teachers.

4. Resources for Science Teaching and Learning Issue: Since effective teaching and learning of science requires adequate resources such as classrooms, laboratories, textbooks, charts, models and consumables like chemicals and reagents for the teachers to engage students in practical and activity work, the stakeholders in science education should provide enough funds to build more classrooms, laboratories and provide the equipments and resources for the teaching and learning of science. Libraries should be provided with modern quality science textbooks for teachers and students.

The Gap In Carrying Out Research In Science Education In A Reflective Society In Nigeria.

The findings of this study clearly show the likely sources of the problems/crises of research in Science Education.

1. Lack of Utility of Research Outcomes and Feedback

The end product of research is deposited at the appropriate department to gather dust. Sadly enough, it does not find its way into the knowledge economy to be perused, criticized or useful suggestions made to improve it. Such research lack feedback and value as to improve the system.

2. Non-Involvement of Research-finding Consumers

It is common knowledge today that most researches are carried out in complete isolation of the practitioners who are expected to utilize the findings for the overall improvement of the system. For the academics, their research effort is no longer on long term collaborative effort or integrated in concept as to impart positively on educational practices.

3. Lack of Centres for Research Findings Dissemination

Lack of centres for the dissemination of research findings for the benefit of policy makers, practitioners or the commercial-industrial managers etc. Publishing research findings in journals and proceedings of conferences is not enough. They should instead, be fed into the information highway, to be accessible to one and all inclusive of the universities which ought to be on-line. This is in consonance with Birdsall (2004) who believes that research findings should be adequately disseminated for the benefit of all.

4. Lack of Adequate Funds for Research Activities.

Lack of funds/research grants is another major lubricant of the problems in research in Nigeria. For example, Okebukola (2004) regrettably remarked that since 1999, there has not been any research grant allocation to any of the federal universities, thus leading to a hell in research activities.

5. Obsolete Library and Laboratory/Workshop Facilities

It is no longer news that most Nigerian tertiary institutions have merely big buildings housing out-dated books/journals and laboratories/workshops which have been stripped of common chemicals and those that had foreign exchange implications were completely non-available, thus making research activities almost nil.

6. Lack of Adequate Remuneration

There is also the issue of lack of adequate remuneration. Most researchers are not given the required incentives to encourage them. They are left to operate in pitiable conditions with unreliable infrastructure of transport, power, energy etc.

Ways of Bridging The Gap In Carrying out Research In Science Education in a Reflective Society In Nigeria For Effectiveness.

To promote meaningful research culture in science education in Nigeria, the researcher highlights the Way forward below.

- (i) The proprietors of tertiary institutions particularly the Federal and State Governments should devote substantial amount of their national and state budget to research that will add value to the National economy.
- (ii) In fact, the enabling environment should be created in the universities through the provision of up-to-date teaching and research facilities.
- (iii) In more settled economies, industrial research and development, which is the power house of new innovations, depend on close collaboration between the organized private sector or the industry and the university system. Many universities in the developed/developing world that appreciate the value of research, now carry research efforts to development companies that translate such results into consumer goods and services. This is strongly recommended for Nigerian academic researchers. In addition, Nigerian industries should be encouraged to patronize the university research output and at the same time, provide research grants to university scholars.
- (iv) There is serious need for improved infrastructural facilities, libraries and laboratories which are necessary for a conducive research environment.

Conclusions

This paper focused on ways of bridging the gap in teaching and research in science education in a reflective society in Nigeria, synergies between teaching and research, meaning of teaching and research, gaps in teaching and research in science education in a reflective society in Nigeria. The gaps in teaching science education include, quality of teaching, quality science teaching, academic/professional qualification, In-service refresher courses and trainings, teacher experience and teacher salary and quality teaching-learning resources and the ways of bridging the gap in teaching science education are improving of teachers quality, training and retraining of teachers, provision of resources for teaching and learning etc. The gaps in carrying out research in science education includes lack of utility of research outcomes and feedback, Non-involvement of research-finding consumers, lack of centres for research findings dissemination, lack of adequate funds for research activities, obsolete library and laboratory/workshop facilities and lack of adequate remuneration and the Ways of bridging the gap of research in science education include provision of grants to teachers from government, provision of up-to-date teaching and research facilities, encouragement of Nigerian industries in patronizing research outputs, need for improved infrastructural facilities, libraries and laboratories which are necessary for a conducive research environment.

Recommendations

The attainment of the goals of science education is largely dependent on the quality of teachers and researchers. In the light of this study the researchers made the following recommendations.

- There should be quality teacher to researcher development.
- Opportunities to enrich teachers, researchers practices and competencies through in-service training, conferences, seminars and workshops should be provided on a regular basis to help them keep abreast with recent developments in the field of science and broaden their knowledge of subject matter.
- There should be proper staffing of schools in terms of quality and quantity.

- Good practices for effective implementation of inquiry based science education must be identified and properly implemented.
- There should also be provision of modern teaching –learning resources in terms of quality and quantity as students need a variety of science materials to engage in inquiry-centered science learning.
- Libraries and laboratories should be provided and well equipped.
- There should also be adequate utility of research outcomes and feedback.
- There should also be involvement of research-finding consumers.
- Provision of Centres for research findings dissemination.
- Adequate funds for research activities.
- Adequateremuneration for researchers which will enhance their willingness in carrying out research in Nigeria.
- The school administrators, managers, teachers, laboratory assistants, and students should develop good maintenance culture. If science is properly taught from the lower level, this will lay a sound foundation for science at higher level.

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