
Managing Science Teachers' Productivity Challenges for Quality Science Education

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Abstract

Teachers are individuals trained to possess the technical know-how and the elements of what it takes to inculcate the expected national education goals through various curriculum subjects at various levels of education. The ability of these teachers to produce graduates with the expected goals indicates teacher's productivity or effectiveness. Majority of secondary education graduates in Nigeria and other third world-nations do not adequately manifest the expected goals of secondary education and national education goals at large. This ugly situation negates the current emphasis on achieving quality science and technology driven economy in the nation. The study therefore examined issues in managing Science Teachers' productivity challenges for quality science education in Anambra State of Nigeria. Descriptive survey design was adopted for the study. Three research questions guided the study. A sample size of 708 science teachers (i.e. 342 Biology, 218 Chemistry, 113 Physics and 35 Basic science teachers), were selected through proportionate stratified sampling. A thirty-item-researchers-made questionnaire built on a 4 point scale was used for data collection. Mean and grand mean were used to answer the research questions. Findings revealed a low extent provision of supportive services for enhancement of teachers productivity in implementing science education reforms. Eight strategies for enhancing science teachers productivity were identified. Based on the findings, sponsoring science teachers to conferences on education reforms and challenges to teachers productivity by ministry of education and corporate organizations were recommended.

Keywords: *Managing, productivity, science teachers, science education, quality and challenges.*

1. Introduction

Nigerian education system recognizes the vital role of science, technology and mathematics in effecting quality national sustainable development. The Nigerian system of education places strong emphasis on achieving quality science education. This appear to be response to the rapid advancement in science and technology to enable Nigerian nation surge ahead in moving with trends and keeping pace with the process of modernization and globalization in line with the globe. Teaching and learning of science has become crucial not only for the well-being of the citizens but also for the advancement of socio-political, economic, technological and knowledge-based development of the society as a whole (Masheng, 2004). New reforms in science education have led to increased students' enrolment in the sciences. Some of such reforms are: renewed used of practical and hand-on-activities in science classes. The issue is that the reforms tend to promote management of classroom interactions that foster environment of friendly teaching and learning. Bajah (2006) observes that emphasis in the classroom is usually placed on the application of

student-centered approach which requires innovations in the development of schemes of work, using new teaching and learning strategies, employment of assessment methods for classroom activities that develop critical skepticism, open mindedness, thoroughness in rational inquiry and desire to learn science.

Science teaching in line with the reforms should be based on the integration of knowledge of systematic study of nature, (Science), learning, pedagogy and creative inquiry originality, innovativeness and hand-on-learning (Bello, 2008 & Onwuachu, 2010). One of the implications is that meaningful teaching of science is partly dependent on the clear understanding of the meaning and nature of science which the teacher holds. The foundation of scientifically oriented career cannot effectively be laid in the classroom without the teacher. The teacher remains the major factor in students learning of science. Science teachers cannot miraculously produce students that are of higher quality than the teachers. This agrees with Ukeje (1992) that no one teach what he knows not. He also observes that education system can rise above its teachers. The importance of science education and its reforms in achieving the role of science, technology and mathematics (STM) in effective quality national sustainable development cannot be over-emphasized. Quality science education in Nigerian secondary schools has been a proposed response to achieving rapid advancement in STM to enable Nigerian nation surge ahead in moving with trends as well as keeping pace with the process of modernization and globalization. Teaching and learning of science become crucial not only for the well-being of the citizens but also for the advancement of the socio-political technological and knowledge-based development of the society as a whole (Mansheng, 2004). The overall essence of science education to stimulate development has called for various reforms emphasis on science, technology and mathematics education (STME).

A reform effort designed to enhance access to science education in secondary school has invariably led to astronomical increase in students involvement in the sciences, renewed use of practice of hands-on activities in science classes and encouragement of classroom interactivensness that could normally foster efficiency and effectiveness in science learning. In support of the above, Bajah (2006) and Onwuachu (2007) advocate teachers' application of a student-centered approach. He emphasizes the need for management of innovations in developing schemes of work, utilization of new teaching and learning strategies, employing assessment methods for classroom activities that develop critical skepticism, open-mindedness, thoroughness in rational inquiry and desire to learn science. Science teachers teaching in line with the above expected classroom practices must be based on the following:

- Integration of knowledge of science
- Integration of learning of science
- Integration of pedagogy and
- Integration of creativity inquiry skills.

The implication of these is that unless the meaningful teaching of science is partly based on a clear understanding of the meaning and nature of science that the teacher holds, the foundation of a scientifically oriented career cannot effectively be laid in the classroom. Hence, teachers to a great extent determine students' learning of science. Teacher determine to high extent. Teachers to become effective must be versatile with the goals of science education.

2. Goals of science education in Nigeria

There are six major goals of science education in Nigeria. They represent the actual as well as the expected behavior of products as science education. These goals are:

1. Having a deep understanding of natural forces, being aware of their environment and acquiring the necessary science concepts and skills for every day life.

2. Inculcating the habit of ethical observation and drawing conclusions only on available data.
3. Developing scientific attitudes and values including open-mindedness, honesty and curiosity.
4. Developing the necessary process skills for the acquisition and application of scientific concepts, principles. Laws and theories.
5. Making effective use of a variety of scientific resources and tools (ICT tools) in the learning and application of science.
6. Produce imaginative and creative work arising from scientific ideas and develop the abilities to reason logically, communicate in a more reasonable and scientifically correct manner for cooperatively and independently learning (Chibuogwu, 2010).

Possession of these goals as characteristics by the secondary school products is an indication of teachers high productivity or effectiveness.

3. Science Teachers Productivity for Quality Science Education

Science teachers are individuals trained to possess a worthwhile knowledge needed to inculcate right science values, attitudes, knowledge and skills into the science students at secondary school for individual integration into the society and stimulation of science and technology (Modebelu, 2007). No wonder Bajah (2006) maintains that the teacher is the most crucial single element in education process. Science teachers are therefore the key factors in the achievement of education reforms for quality science education. Science teachers are organizers of learning experiences, for students, the selectors of instructional units, methods designers, directors of activities and evaluator of students' performances and achievement productivity. The major role of science teachers in achieving quality science education requires teachers display of a high level productivity in the job of teaching. This teacher productivity could be described in terms of compliance with reform initiatives. Onwuachu (2007) sees productivity as a dedicated conduct of staff in the performance of their teaching roles. A productive teacher is a researcher, receiver, disseminator of knowledge, a helper, facilitator, guide, counselor, motivator, leader, a model, manager, a humanist, catalyst etc. A productive teacher is also judicious in preparing lesson notes, maintaining orderly classroom, using cooperative learning techniques, participating in team work in improving materials, managing students, evaluating pupils leaning outcomes, attending and contributing to staff meetings including PTA's. Such productive teacher would not lose sight of co-curricular activities as well as school administration.

Base on the expectation of a productive teacher, Odeli (2010) identifies ten categories of support needed by teachers for effective implementation of educational reforms to include:

- System information
- Use of internet connectivity
- Instructional strategies
- Emotional support
- Classroom management support
- Discipline management support

Chibuogwu (2010) recognizes constructive criticism and guidance as very important support to development of proficiency and enhanced productivity in assuring quality science education reforms.

The problem of the study indicates poor performance of students in science subjects. Science teachers in Anambra State as well as other states in Nigeria have not been able to manifest the above enumerated characteristics of a productive teacher due to various manifold challenges facing

them, (Ezeliora, 2003). Science educators have shown that students perform poorly in science subjects due to the following challenges:

Poor quality science teachers whose methods of teaching are mainly teacher, copying of notes, rote learning of textbooks materials, etc.

Prevalent expository method of instruction as against inquiry, with minimal students involvement in the experiments

Inability of students to understand adequately teachers explanations, lesson notes, practical instructions and materials in science textbooks (Onwuachu, 2007 and Chibuogwu, 2010).

Other challenges include:

- increasing poor instructional delivery,
- incompetence in classroom management,
- inadequate teaching skills, inadequate application of innovative teaching methods,
- lateness to classes and near absence of practical lesson, poor teacher motivation and rewards for excellence (Modebelu & Durie, 2012).

The problem of the study is that students in secondary schools in of Nigeria have continue to record poor performance in science subjects. It also appear that science teachers in these schools are handicapped in terms of quantity and quality. These inadequacy seem to have increased these teachers low productivity or effectiveness. In what ways could science teachers productivity be enhanced?

The study examined managing science teachers productivity challenges for quality science in school in Anambra State of Nigeria

4. Research Questions/Hypothesis

What is the extent of productivity of science teacher in secondary schools in Anambra State?

To what extent have supportive service provided enhanced science teachers productivity in secondary schools.

To what extent would the designated strategies been used to enhance science teachers productivity for improved students' performance.

There is no significance between the extent of science teachers' productivity and extent supportive services provided could enhance the productivity of these teachers.

5. Methodology

The study adopted a descriptive survey design. A sample size of 736 science teachers (307 Biology, 224 Chemistry and 205 Physics) where selected through simple random sampling from a population of 1,840 (768 Biology, 560 Chemistry and 512 Physics) teachers. This was done by selecting 40% of the teachers from the population strata. Three research questions and a null hypothesis guided the study. A four-point-Likert-type scale researchers-self-made questionnaire was used for data collection. The reliability coefficient value of 0.88 was obtained using test-test method with two week interval for 30 science teachers from secondary schools in Delta State using Pearson Product Movement Correlation Coefficient technique. The data obtained were analysed using mean and t-test statistic tool at 0.05 level of significance.

6. Results

6.1 Research Question 1: What is the extent of productivity of science teachers in Anambra State?

Table 1: Mean score responses of science teachers on the science teachers' extent of productivity

S/n	Science teachers	X	Remarks
1.	are committed to the planning of science innovations in their schools	2.21	Low extent
2.	give students assignments that require the use of internet	2.02	Low extent
3.	are committed to the use of instructional aids	2.24	Low extent
4.	improvise materials and specimens	2.15	Low extent
5.	engage their students in co-operative	2.21	Low extent
6.	organize extra classes for coverage of science scheme of work	3.22	High extent
7.	give students projects regularly	3.03	High extent
8.	engage students in hands-on-experience (e.g. hitting iron against a stone to produce fire)	1.80	Low extent
9.	encourage students to ask questions for inquiry and creativity	3.75	High extent
10.	discuss children's progress and problems with their parents	2.14	Low extent

Table 1 shows that the mean scores of science teachers on ten items indicating extent of productivity in their work. It shows that 3 out of the 10 items scored above the weighted mean of 2.50. This indicates that science teachers in the secondary schools in Anambra state are generally productive to a low extent. The only three areas of high productivity are in organizing extra time to cover scheme, in involving students in project works and in the good use of questions to evoke inquiry and creativity.

6.2 Research Question 2: To what extent to which have supportive services provided for enhancement of productivity?

Table 2: Mean scores of science teachers on the extent supportive services provided enhances productivity.

S/n	Items	X	Remarks
11	Seminars are often organized	2.76	High extent
12	Teachers often reinforced for effective classroom interaction	2.00	Low extent
13	Principals often observed classroom instruction and give feedback on appropriate classroom interaction	1.71	Low extent
14	Supervisors often counsel and guide	1.73	Low extent
15	Principal often provide teachers with clear and detailed updates	2.22	Low extent
16	Principals/Supervisors employ appropriate supervisory behavior to improve self-concept of teachers.	1.89	Low extent
17	Principals often employ inquiry approach to solicit teacher's advice	2.48	Low extent
18	PTA contribute towards sponsoring teachers STAN conference	2.32	Low extent
19	Principal encourage teachers to test new materials/strategies for managing classroom of mixed ability	2.47	Low extent
20	Supervisory behaviors teachers received are democratic	2.41	Low extent

Result in table 2 reveals that only item 1 scored above 2.50. The indication is that only seminars that are often organized to assist these teachers as a means of acquiring needed skill for enhancing their productivity. The other nine expected supportive services are provided to a low extent because they scored below 2.50.

6.3 Research 3: To what extent would the designated strategies be used to enhance science teachers productivity?

Table 3: Mean score responses of science teachers on science teachers' productivity.

S/n	Item	X	Remarks
21	A good representation of science teachers should participate in the planning of science education reforms and policies	3.52	High extent
22	Ministry of education and other interested bodies should furnish schools with adequate reference books, journals on new trends in science	3.58	High extent
23	Regular workshops should organize for science teachers in line with any reform introduction.	3.25	High extent
24	Science teachers should be sponsored to exchange programmes in other countries to learn global trends in science education	3.61	High extent
25	Computers with internet facilities should be provided in science laboratories for teachers' use in online learning	3.88	High extent
26	Special hazard allowances should be approved for science teachers for science teachers	3.95	High extent
30	Science teachers should be encouraged to write proposals on science education for reforms and innovation and submit same to MDE for consideration	3.49	High extent

Results in table 3 shows that all the ten items scored above 2.50. The conclusion drawn from these mean ratings is that the entire ten itemized strategies should be utilize to enhance science teachers' productivity for enhanced students' performance and learning.

7. Discussion of results

The findings of the study indicate that science teachers in secondary schools in Anambra state of Nigeria manifest low extent level of productivity in implementation of science reform as a means achieving quality science education. Science teachers rarely use innovative teaching methods such as cooperative learning, science reform books, hand-on-experiences, internet/online learning etc. In confirmation of the above, Bello (2008 and Bajah, 2006) reports of low level of productivity among secondary school staff in Lagos State. Onwuachu (2007) also observe that teachers in secondary schools in Enugu State show low productivity. This, Onwuachu believes results in poor students' performance, learning hence low standard of science education in Nigeria at large.

Findings that supportive services are provided of low extent to science teachers may be attributed to principals' inadequate knowledge and creativity skills in varying supervisory processes as observed in Bajah (2006). Onwuachu (2007) in support of the findings, discovers that PTA rarely sponsor science teachers to conference/workshop because they are not well educated on the importance of teachers attendance to workshops on the academic performance and learning of their children/wards. One of the major challenges in achieving quality science education in Nigeria is the issue of science education reform implementation. The finding indicates that teachers are not usually made aware of new reforms policies. They need training on a new reforms or innovation in terms of technical proficiency and utilization skills. Modebelu and Okeke (2009) report that one of the major aim of science education reforms is to enhance teachers' ability to manage learners, their needs and interests and also their difficulties. The implication is that if teachers in any way lacked supportive services, such teachers will continue to manifest or display low extent productivity.

This also implies low quality education. This is so because no teacher can give what he does not have. Teachers are not well supported implies that students would not be adequately supported by their teachers. Great deal of support services is therefore recommended. This should be at the joint effort of the MOE and other stakeholders.

Ten items on strategies of enhancing science teachers productivity were identified and accepted by science teachers in secondary schools in Anambra State. The strategies include provision of adequately equipped laboratories and learning resources, exchange of programmes for teachers, payment of hazard allowances etc. This in line with Modebelu and Okeke (2009) that identify five items for enhancing teacher commitment and good work behavior to include: Incentives to teachers, adequate teaching and learning facilities well equipped laboratories, seminars and conferences free sponsorship. Onwuachu (2007) and Mansheng (2004) are of the opinion that teachers adequate participation in affairs of education reforms and transformation will go a long way to improve curriculum and its implementation.

8. Conclusion

The study examined issues in managing challenges to science teachers' productivity for quality science education. The status-quo in science teachers' productivity supportive services needed to manage their challenges as a means of reducing impediment to quality science education were studied. Extent of teachers productivity was determined, the extent the supportive services provided have enhanced their productivity was examined and the ten strategies for managing their challenges for enhanced productivity were identified.

9. Recommendations

The following recommendations are made

1. Science teachers' preparation institutions should be adequately equipped to ensure adequate teacher development in terms of skills creativity, originality and improvisation.
2. Since we are on age of computer, secondary schools should be adequately connected to internet facilities. This will provide easy and free access to new trends on pedagogy, content reform policies and implementation strategies
3. Science teachers should adequately be represented in decisions that concern science education quality assurance.

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