

# FACTORS RESPONSIBLE FOR LOW STUDENTS ENROLLMENT IN SCIENCE IN SENIOR SECONDARY SCHOOLS: CHALLENGES OF THE 21<sup>ST</sup> CENTURY

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## **Abstract**

The paper examined the factors responsible for low students enrolment in science in senior secondary schools. It was shown that the enrolment pattern of students in science in Nigeria has been declining over the years. A number of factors implicated as being responsible include relative difficulty of science, societal value system, poor teaching methods, students attitude, gender stereotyping and poor performance in science. The writer recommended the recruitment of qualified science teachers into the school system, provision of regular opportunities for in - service training for professional development, regular workshops and seminars for science teachers, and production of mathematical free textbook with clear illustrations as solutions to the problem.

## **Introduction**

The broad aims of secondary education within, the overall national objectives as contained in the National Policy on Education of the Federal Republic of Nigeria (FRN, 2004) include:

1. preparation for useful living within the society; and
2. preparation for higher education.

In specific terms, the policy document stated among other things, that secondary schools should equip students to live effectively in our modern age of Science and technology. In view of this, the government and professional bodies like Science Teachers' Association of Nigeria (STAN) have continued to make regular inputs into science education to ensure that science is effectively taught in Nigeria primary and secondary schools. It is pertinent to note, however, that the trend in most secondary schools in Nigeria, reveals that the number of the students who choose to study science subjects at the Senior Secondary School level has been declining (Nworgu, 1990; Maduabum, 1994, Salau, 2002). Despite government's efforts and interest in science. This has had a spillover effect of poor enrollment into science courses in the Universities. Available data indicate low enrollments in science courses in the Universities (Madubum and Madubuike, 1995, Nkpa and Olatunji, 1996; Maduabum, 2000; Maduabum, 2005).

In the contemporary world, science has become a prerequisite for the growth and advancement of most nations in all aspects of human endeavour. Scientific approach to life and work has been utilized by such nations as United States of America (USA) and Britain to achieve positions of eminence. Science and technology, it must be emphasized, have made it possible for improved standard of living of mankind the world over. Science and technology have made tremendous contributions in the field of medicine, in the development of solar and nuclear energy, in improved land and water resources, in instant communication network world wide, and in the emergence of the electronic age generally.

However, my personal experience as a science teacher for many years in both male, female and co-educational senior secondary institutions reveal great imbalance in students choice of science and non-science subjects in favour of non-science subjects. This has always manifested in the number of students actively participating in science subjects in the schools. Also, the West African Examination Council's Yearly validation sheet for students' enrollment in various subjects in the Senior School Certificate Examination (SSCE) reveals less percentage of students' enrollment in the sciences. These observation corroborate research studies carried out on the issue in different parts of the country (Nworgu, 1990; Maduabum, 1994, Akinseide and Ariehe, 2000, salau, 2002, Israel, 2005, Longbap and Nok, 2007J).

More disturbing is that this trend has created a shortfall in the number of qualified candidates required to fill the quota allocated to science and science-related courses in the Universities (Abdulraman, 1992, Maduabum, 2000). The implication is that the nation cannot develop her human and material resources if she does not have a pool of adequately skilled manpower in science and science-related fields at all levels.

In spite of efforts by the Government and its Agencies such as Nigeria Education Research and Development Council (NERDC) including some professional associations like Science Teachers Association

of Nigeria (STAN) to popularized science at all levels of education, students enrollment in the sciences has continued to decline over the years (Nworgu, 1990; Maduabum, 1994, Salau, 2002, Israel, 2005). Among the few that opt for science, a good number of them register only a science subject because it is mandatory (FRN, 2004). No wonder, Yager and Penick (1987), reported that science is not a popular subject in school. Students' low participation in the sciences has hampered the realization of government's University admission policy of 60:40 Science /Arts ratio. This situation is a threat to the nation's scientific and technology aspirations. Studies conducted so far in Nigeria (Maduabum, 1996, Akinseinde and Ariehe, 2000, Salau, 2002, Israel, 2005, Longbap and Nok, 2007) have largely focused on students' enrollment and performance in the science at the secondary school level.

Of relevance also is the gender factor in science participation. It is worthy of note that females are grossly underrepresented in the fields of science, technology and mathematics (STM) in Nigeria (Maduabum, 1994, Nkpa and Olatunji, 1996; Maduabum, 2005). Between 28<sup>th</sup> March and 1<sup>st</sup> April 1993, the United Nations Education Scientific and Cultural Organisation (UNESCO) and the United Nations International Children Education Fund (UNICEF) sponsored a conference on "Education for Girls" at Ouagadougou, Burkina Faso (Imo State Commission For Women and UNICEF, 1994). The conference amongst other issues noted that there is disparity of gender (that is males and females) in the education system and stressed the need to eliminate all practices that will not enhance the opportunity for the education of girls (Imo State Commission for Women and UNICEF, 1994).

Adamu (1992) had contended that development depends not only on a few highly trained science specialists but also on the existence of a well-trained middle level manpower and on a science literate population. The writer wishes to add that when most students' enroll in science subjects, Nigeria will eventually have a large supply of highly qualified manpower in science for economic development.

The study of science subjects will enable the students and the nation to satisfy the nation's demand in conformity with the National Policy on Education (FRN, 2004). The policy document laying emphasis on Science and Technology states in paragraph 38 (1) that the Education of higher professionals will continue within the university system and it will be rooted in a broad based strong scientific background. It went further in paragraph 39 (2) to state that universities and other levels of educational system will be required to pay greater attention to the development of scientific orientation.

It is the considered view of this paper that this attainment will be a mere dream if our students continue to opt out of science subjects in the secondary schools. The Science Teachers Association of

Nigeria (STAN) being aware of the obvious implications of this trend selected the theme of her 28<sup>th</sup> Annual Conference at Bauchi to be "winning more students for Science and Technology".

The realization of the nation's intent for scientific and technology take off would largely depend on the number of students that offer science subject in Senior School Certificate Examination each year.

### **Enrollment Patterns of Students' in Science in Nigeria**

Low students' enrollment in science subjects in Nigeria has remained one major problem facing education in the 21<sup>st</sup> century. Joint Admissions and Matriculation Board (JAMB) has made great efforts to keep to the target ratio of 60:40 Science/Arts, in her university admission in the line with the stipulation of the National Policy on Education. Contrary to expectations, the student university enrollment has remained reversed in favour of Arts over the years. For example, Akpan (1986:3) in his study of admission figures from the universities in the country over a 12-year period 1970/71 to 1981/82, found that despite the general increases in absolute numbers of students admitted into all the university faculties, the number in the sciences had not met the nation's need. On the contrary, Liberal Arts had always admitted more than their fair share of the expected quota.

Yoloye's (1988), study further tends credence to this trend. He's study shows the percentages of science and technology enrollment in the first five years of the 1970s and the first five years of 1980s. Yoloye pointed out that in none of the years has the 60:40 ratio been attained. We were closer, he continued, to the ratio in the early 1970s than in the early 1980s. However, there had been a steady though slow improvement since 1981-82.

Equally disturbing is that the bulk of students who opt for the science select only biology in preference to chemistry and physics (WAEC, 1999). Most of these students simply register for biology, which they consider to be the easiest science subject (Ango and Sila, 1986).

Another related issue borders on gender disparity in science enrollment. Girls and women are grossly underrepresented in the pursuit of science, technology and mathematics (STM) in Nigeria. Maduabum (1994),

reported that available statistics indicate that enrollment figures of girls and women education at the secondary and tertiary levels are comparatively low. This has been confirmed at the secondary school level (Maduabum, 1996, Akinseinde and Ariehe, 2000, Salau, 2002, Israel, 2005, Longbap and Nok, 2007, and at the university level (Abdulraman, 1992; Nkpa, 1993; Maduabum, 1994, Maduabum, 2000, Maduabum, 2005). Maduabum (2005), in a study of total student enrollment by discipline and gender by Federal Universities 1993/94-1997/98 shows that many more males than females were enrolled in Nigerian Federal Universities in STM and STM-related courses in the period under the review. He stated further that, this is largely in contrast to the pattern of enrollment observed in the Arts. It is pertinent to note (Salau, 2002), that female enrollment is usually higher in the areas of English, history, government, religion and social sciences education than in physics, chemistry, mathematics and technology education programmes. The writer wish to add that it is not in doubt that certain factors are responsible for this gender disparity in enrollment.

### **Factors Responsible for Students Low Enrollment in Science**

A number of factors have been implicated as being responsible for low enrollment of students in science. Prominent among these is the relative difficulty of science subjects. According to Bojuwoye (1985:216), science subjects, in particular Physics and Chemistry (also Mathematics) suffer a fall in enrollment among school pupils relative to other subjects. Investigation carried out in schools of Kwara State revealed that science subjects are generally considered by secondary school students as being more than an average level of difficulty and that a high level of intelligence is required for their successful learning.

Opobiyi (1997) echoed same when he reported that one of the reasons in the declining trend of enrollment in chemical education in tertiary institutions in Kwara State is that students perceive chemistry education as being relatively difficult. Okpala and Onocha (1995), have noted that the factors influencing low enrollment in O' level physics examination in Nigeria include bad teaching; lack of mathematical aptitude and difficult nature of physics. Otuka (1983), had earlier noted that in most secondary schools in Nigeria, most students drop physics at the earliest opportunity because they consider it relatively difficult Onwioduokit (1996), investigated the level of difficulty senior secondary physics Students in Akwa Ibom Slate have with concepts in the physics curriculum. A tenderly selected sample of eighty students and twenty teachers responded to the questionnaires used in the study. They results obtained showed that most (77.42%) physics concepts involved in the study were considered difficult by students. It was also found that concepts considered as being either averagely difficult or very difficult by teachers were branded as being as very difficult by students, (Ango and Sila, 1986, Nkpa, 1993, Nkpa and Olalunji, 1996), confirm that pupils particularly girls consider physics and chemistry difficult, but biology less so. Girls in general are more encouraged by good marks, more discouraged by difficulties and so readily see science as difficult and requires considerable effort from even the best students.

In advancing reasons for low enrollment of Nigerian Youths in Science, Maduabum and Madubuike (1995), maintain that the social value system is at root of the problem.

Another major factor is mass or poor performance in Mathematics (Aghenta, 3982). Aghenta maintains that this is one of the major reasons why there are not enough qualified applicants for University education in Nigeria. In a similar vein Okpala and Onocha (1995), found that poor. examination results in physics was a major factor accounting for physics dropouts in Nigerian secondary schools. It is worthy to note that poor results in science subjects have been reported in Joint Admission and Matriculation Board (JAMB) Examinations. Quoting the Register of JAMB, Abdullahi (1990) reported that, "the average score for Mathematics was 38%, for science subjects 44%, and for art subject, 65%. It was also observed that the scores in Mathematics and science had been declining for the last five years.

Another factor is poor science and mathematics background of students (Ohuche, 1983; Otuka, 1983; Maduabum, 1996). Maduabum (1996), had noted that this factor results in cumulative deficiencies amongst students at the secondary level with the attendant difficulty experienced in the learning of science and loss of interest in science.

Girls in many countries still face discrimination due to "inadequate and gender-based teaching and educational materials. Cohen and Cohen (1980), had earlier confirmed that various illustrations in school textbooks and curriculum materials in science subjects often carry passive sexual imagery of women.

In a study of gender stereotyping in Nigerian science textbooks, Ogwo (1991), observes that

illustrations in most textbooks especially science textbooks depicted a world populated and shaped by males. The result of the study revealed that "pictures depicting males constituted 73.5% while pictures depicting females constituted 26.5%. From the 546 sampled pages, male references constituted 88.7% and female references, 11.3%. Also, the number of mention of males constituted 94.8% while female constituted 5.2%. He therefore, affirmed that there are few female role model in instructional material and curriculum. Perhaps this is one of the many factors, for low enrollment in science subjects, especially for female students. UNESCO (1998), also confirmed gender stereotypes in the education system.

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This paper wishes to state that gender roles in society and gender stereotypes in the educational system are likely to influence students selection of science subjects. UNESCO (1997:31) puts it more succinctly "girls who are labeled less able than boys in the highly valued subjects typed as masculine may develop a negative self-concept and become demotivated. This may cause them to avoid the masculine Zone. It follows that only a few girls who want to achieve masculine-fit will enroll in science subjects."

Another factor implicated include poor teaching methods. The teaching styles adopted by science teachers can aid or inhibit effective learning by the students. A good teaching strategy will promote learning while a poor teaching method will inhibit learning, make the lesson boring, uninteresting to the students, and possibly, lead to their dropping out of the subject. The teaching method of our science teachers have been severely criticized (Ajeyalemi, 1987, Ameh, 1990, Onabanjo, 2000).

Onabanjo (2000), investigated the constraints to teaching formal science in Senior Secondary Schools as perceived by teachers and students in Ijebu - Ode Local Government Area of Ogun State. The result revealed such constraints as lack of proper method of teaching (that is separated from students environment), attitude of teachers and students towards science, lack of proper funding by the authorities concerned. These factors are also clear indicators to low students, enrollments in-science subjects. It is pertinent lo note that 'bad teaching is one of the major factors for student's dropout in physics (Okpala and Onocha, 1995).

Teacher personality may enhance or mar a student's chances of enrollment in a subject. Etuk (1987) in a study of social factors that determine career in science and technology found that the teacher's personality and general behaviour is a significant factor. FCanno (2005), found that among students, the teacher's behaviour and attitude towards teaching are sometimes considered to be more-important than his methods in teaching. According to Blunt and Klausmeir (1968), a dictatorial teacher creates an uninteresting classroom climate characterized by absence of students' initiative and' participation. The democratic teacher on the other hand tends to induce senses of involvement in active learning amongst students. In subscribing to these view points, the writer wishes to add that an" undemocratic teacher because of his attitudes can cause student's flight' away from his classroom.

In agreement with the above view, Woolnough (1993), investigated teachers' perception to reasons why students choose for or against science and engineering. He observed that: the most frequently mentioned encouraging factors referred, unsurprisingly, to the quality of teaching. Teachers spoke more of the quality, than the type of science teaching, referring often to enthusiastic' and committed' teaching, and the school having long "traditions'" of good science teaching. He further explained that "the physical sciences were seen as being just too difficult... Not only were the physical sciences seen as too difficult, they were seen also as being too dull".

### **Solutions To The Problem of Students Low Enrollment in Science Subjects**

Low students enrollments in science subjects militates against the objectives of science education in our secondary schools as contained in the National Policy on Education (2004, 4<sup>th</sup> edition). Raising adequate science skilled manpower for the nation will not be achieved if low students enrollment continues unchecked. The nation's intent of having a science literate population will remain a mirage as most students opt out of science. The following suggestions or recommendations will surely reverse the trend.

1. The State Governments in Nigeria should ensure quality and sustain the recruitment of well-qualified science teachers into the school system.
2. The State Governments in Nigeria should also ensure that practising science teachers are provided with regular opportunities for in-service training for professional development to enable them teach the science subjects more confidently.

- 3, The Government in Nigeria through the Secondary Education Management Board (SEMBJ) should organize regular workshops and seminars for science teachers to sensitize them to appropriate behaviour patterns capable of stimulating interest in science.
- 4, Textbook authors in science should endeavour as much as possible, to make their illustrations vivid, understandable and mathematical free for readers.

### Summary

The problem of low enrollment in science subjects has persisted as a major educational problem. This has been attributed to many factors such as difficult nature of science, student's attitude and 'bad' teaching of science.

Recruitment of qualified science teachers and regular workshops for all teachers will help to reduce the problem.

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