

STRATEGIES FOR ENCOURAGING STUDENTS' PARTICIPATION IN SCIENCE IN RURAL AREAS IN NIGERIA

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ABSTRACT

All over the world, rural communities are mostly neglected. Rural setting has certain characteristics such as lack of electricity, portable water and good roads. The teaching of science is peculiar because some of the amenities not provided in rural communities are very important in science teaching. For example, electricity is important in teaching many topics in science. This paper draws experiences from other countries to discuss how science can be effectively taught in the rural communities. There is the need to give special allowances to encourage science teachers to teach in the rural areas. Special budget should be made to provide generators and other infrastructure needed for science teaching in rural schools. Science activities (such as quiz competition) and admission should be done in such a way that science students from rural schools can participate.

Key Words: *Rural schools, science achievement, Students' performance, rural communities.*

INTRODUCTION

It is only when significant percentage of a nation's citizens is scientifically literate that science can be used as the vehicle for development. It is also by strengthening the scientific skills of the citizens that they will be empowered to solve the problems that confront the nation in agriculture, health, environmental management and disease control.

Moreover, it is becoming more evident that for any nation to keep pace with the global technological advances, it must develop a mass of people that understand science and can effectively use the knowledge. Therefore, through scientific enterprise, innovations and inventions would emerge that could translate into practical terms through technological breakthrough for the advancement of humans (Olatoye, 2002; Olatoye & Aderogba, 2012). This is very important to fully realize the objectives of science education, which include production of a scientifically literate society.

One of the goals of science education in Nigeria is the acquisition of appropriate skills and competencies for individual science students to live and contribute to the development of the society. Achievement of this fit can be impaired by non-availability of science equipment (Ogunleye, 2007).

Facts and figures on mass and scientific literacy programmes should give all education stake holders vision to project into the future. United States Government Accountability Office (GAO, 2004) asserted that science understanding and ability will enhance the capacity of science students to have meaningful and productive jobs in the future.

Kerre (1989) asserted that the study of science allows students to experience the richness of and excitement of the natural world. Also, they are faced with complex questions requiring scientific thinking, reasoning and the ability to make informed decisions. Olatoye (2002) also explained that

science helps us to understand our world by interpreting the laws and the principles that govern it. Scientific activities have ethical principles. Ukoli (1985) argues that transforming the Nigerian society into scientific society is likely to be an uphill task, the accomplishment of which is fraught with innumerable and almost insurmountable problems. This problem may as a result of lack of student's participation in science in the rural schools.

In spite of the importance of science in national development, students' performance in science subjects is not encouraging (Ofili, 2012). West Africa Examination Council (WAEC) (2013) observed that achievement of students in Biology, Chemistry and Physics in May/June examinations has been on the decline. The disparity between urban and rural science students in achievement has been on discussion. Olasehinde (2008) asserted that urban Biology students have slightly higher cognitive achievement mean score than the rural students. Ajayi (1975) and Adepoju (2002) were of the opinion that location of secondary schools had high correlation with academic performance of students. The fact is that urban secondary schools are more favoured than rural secondary schools in provision of educational resources and facilities (Ojoawu, 1989; Benjamin, 1998; Adededeji and Olaniyan, 2011).

Since the early 1900s, educational reform movements in the United States of America (USA) have concentrated on improving rural schools by making them more like their urban counterpart in structure (Kennapol and Deyoung, 1999). Historically, educational research has largely ignored the real problems in rural schools (Deyoung, 1987). Over the past four decades, however, a small number of studies have examined differences in students' learning outcome and attitudinal climate provided by urban and rural schools. The results of these studies are mixed,

although early research in this area generally suggested that urban schools offered positive cognitive achievement environments for students than did their rural equivalents (Jenkus, 1963; Rahdlewa and Michayluk 1975).

These differences often were explained in terms of school resources in that rural schools tended to be smaller and therefore, received less tax-based revenue (Khattri, Derley and Kane, 1997). Thus, urban schools at that time often received more funding than did rural schools, as a result of their larger enrolments (Randhawa and Michayluk, 1975). Such difference in funding resulted not only in better physical environments (Khattri, 1997) but also allowed urban schools to recruit more highly qualified teachers and to provide greater curricular variety and educational resources.

UN Food and Agriculture Organisation (FAO) in Adededeji and Olaniyan (2011) classified the characteristics of rural areas into two :(1) rural areas are generally open areas, with low settled population densities; and a high proportion of the unsettled land area used for primary production (agriculture, livestock, forestry, fisheries etc); (2) the residents of rural areas are largely dependent on these primary production activities as their principal, if not their only source of livelihood. This merely defines rural in occupational terms, applying it to less technologically developed communities where the economy is simple, non-industrial and labour intensive. Another approach is to consider rural area in terms of the demographic composition, economic situation, the social structure and cultural background. In this context, rural area is simply defined on the basis of its characteristics which include:

- a. Demographic: This means an objective, numerical, physical attribute of a place or a population, referring only to where people live -

not who they are or what they do. Rural areas have sparse populations, that is, small total number of people who live there or in their low density (i.e., ratio of people to available space),

It is geographically isolated, physically removed from other population areas and from major urban centres or located outside the political boundaries of an urban area. (Weisheit, Well and Falcona, 1995).

- b. Economic: this means how the people in an area make a living. There is a single common industry within the community in which most residents are engaged, resulting in a simple division of labour and a low degree of economic specialization. Rural area's economic classification also may be defined by the functional simplicity of an area. It implies a lack of variety in the ways people make a living and a low degree of functional differentiation in the community's social structure. It does not really mean a place where people tend to "live off the land" that is, inhabitants are close to nature and depend directly on the exploitation of natural resources (Morgan, Alkin,. Adededeji and Sieve, (2006).
- c. Social structure: Another common meaning of rural is derived from its social structure. This consideration reflects the distinctive character of social life and social order in rural communities. It looks at the attributes of rural life in terms of intimacy, informality, and homogeneity. By virtue of the smaller numbers of people in rural settings, social connections are more immediate (face-to-face), more intense or primary (often based on kinship ties),

and more complete (based on knowledge of personal biographies rather than formal role positions). This is because of the greater familiarity in which rural social order is maintained through informal mechanisms of social control based on kinship and personal acquaintance rather than through formal mechanisms and legal institutions (Alkin Adededeji and Sieve, (2006).

- d. Culture: According to Adededeji and Olaniyan (2011) culture in rural area refers to distinctive sets of attitudes, beliefs, values, knowledge systems, and behaviours that characterize the lives of people. This also pictures rural as traditional, slow to change, provincial, and fatalistic. Rural culture has also been characterized as relatively intolerant of diversity and incepting of outsiders. In short, rural is a worldview, a way of thinking that is different from that common among urban dwellers. Rural as a cultural phenomenon that goes beyond geographic or demographic conditions has much intuitive appeal. This is expressed in the common wisdom that "You can take the boy out of the country but you can't take the country out of the boy.

The characteristics of the rural areas are the basic characteristics that affect the rural schools. Despite the characteristics of the rural areas Adeyemi (2009) observed that rural schools form 57% of all secondary schools while the urban schools account for the remaining 43%. The distribution of teachers in to the secondary schools Nigeria has generated mixed feelings among educationists (Alonge, 2004). Common observation is that the work in urban areas rather than in rural areas. This may be due to the presence of

social amenities and infrastructure facilities in the urban area. Adeyemi (2009) asserted that the state governments have not really complied with the National Policy on Education provisions of 40:60 science and non-science teachers ratio (Federal Republic of Nigeria, 2004) in the distribution of amenities and qualified teachers into secondary schools. The demand for qualified teachers seems higher in science subjects than in non-science subjects especially in the rural areas.

Stephens (1998) noted that rural schools districts have students' achievement problem when compared with the urban and sub-urban schools. He argues that common weaknesses in the institutional capacity of rural district unit are their ability to mount and maintain a school improvement process. These include fiscal capacity, tenure management support services, greater per pupil costs, higher number of teachers teaching outside their specialty areas; less competitive salaries and benefits less specialized space and support for science teaching, less availability of placing support service, and fewer evaluation support service.

There have been innovative ways to fund education in Nigeria Community Education

Programme (NCEP) FME (2006) which was directed at the underserved rural communities of Abia, Bauchi and Akwa-Ibom states and the nomadic communities in the north eastern Nigeria. The programme was targeted at increasing the quality and access for women and girls, none of the programme is directed at improving the participation of science students in the rural areas.

The objectives of Universal Basic Education (UBE) UNESCO (2006) include:

- a) Formal basic education encompassing the first nine years of schooling (primary and junior secondary education) for all children;
- b) Nomadic education for school age children, pastoral nomads and fragrant fishermen, and
- c) Literacy and non-formal education for out of school children, youth and adults.

Though Nigerian government continually place emphasis on the study of science and technology (Ofilli, 2012), especially in policy but no practical step has been taken to implement the study of science in schools especially in rural areas.

Table II: Strategies Adopted by some Countries to Improve Science Teaching in Rural Areas

	Mozambique	Lesotho	Malawi	Uganda	South Africa	Ghana	Nigeria***
Rural area incentives	Bonus payments up to 100% of salary. But only to highly qualified teachers. Most teachers do not get any additional payment to move to move rural	A flat bonus of 275 Maloti (USD) per month to locate in a mountain area	No incentives currently for locating teachers in rural areas possibilities being considered EMIS data shows strong correlation between housing and female teachers.	In 2001, introduced a hardship allowance of 20% salary for hard-to-reach areas. Only qualified teachers are eligible. There have been difficulties on decoding which are hard to reach schools.	N/A	N/A	N /A

Housing	NGO and local communities have constructed houses to make rural schools more attractive.	NGO and local communities have constructed houses to make rural schools more attractive.	No general provision of housing for teachers except for females teachers on request.	15% of School Facilities Grant (SFG) is allocated to construction of teacher housing in rural areas	N/A	N/A	N/A
Forced Redeployment of Teachers	N/A	N/A	It is used as punishment for teachers that misbehave.	N/A	The method is used but it damages the morale of the teachers involved.	N/A	It is used as punishment for teachers that misbehave.
Pair posting	N/A	N/A	N/A	N/A	N/A	Pair posting is used to ensure teacher-friend are posted to rural areas to make sure that they are safe.	N/A

Source: Adapted from Mulkeen (2005);

*** Nigeria shows that no serious strategy is put in place to encourage science in rural areas.

The way forward

Evaluation and Monitoring of Students' Achievement

Quality of education has become one of the central issues accorded priority in the recent educational reform worldwide, and quality assurance has become one of the mechanisms used in achieving it. Quality of science in the country depends on the quality of science education. While quality of science education is seen as a product of stakeholders'

investment in science teaching. Whatever the inputs are, without proper monitoring, may become a waste and the desired output may not be achieved. The State Ministry of Education (SME) and the Local Government Education Authority (LGEA) should monitor the Science teachers and the students in rural schools order to ensure that they are doing what they are supposed to do. Furthermore, the Federal and State Education Inspectorate

Services, with the assistance of United Nations Scientific and Cultural Organization (UNESCO), are being restructured and reinforced including the production of guidelines for School Inspection in Nigeria, which highlights the parameters, performance indicators and benchmarks for improved quality control and uniform standard for schools (UNESCO, 2006). The impact of this gesture from UNESCO has not being felt in the rural schools. The use of such material will enable the stake holders to know what more to put in to achieve desired achievement among the science students in rural areas.

Science has been recognized as an instrument for national development and every nation. The Federal Government of Nigeria has placed much emphasis on the study of science. This is because, development in science technology are tangible realities affecting members of the society. Science education which is the dispensation of scientific knowledge to the students in school has become so important that, many consider it necessary to strengthen science teaching in the educational system (Bar-on, 1992). Science is particularly important for developing countries to develop their capacity to import and improve the scientific and technological knowledge that would be suitable and contribute to their autonomous development.

The shortage of qualified science teachers made the offering of science subjects by students unpopular in many schools especially in the rural schools (Adeyemi, 2009). This made rural school students tend to rush to offer non-science subjects at the expense of the science subjects. This situation may undermine government's efforts to develop the field of science and technology (Adeyemi, 2009).

Financial incentive for rural science teachers

Teachers remain underpaid when compared with other profession within the same location. This makes many teachers involve in other businesses which affect their

commitment and quality of teaching. Therefore, apart from increase in rural science teacher salary, the way salaries are organized, how teacher are being paid, teacher promotion and increases in salary over time should be paid attention to.

Many rural science teachers work in difficult conditions. It will thus be imperative to design special and attractive allowances for them. The allowances need to over weigh the social and economic costs of living in rural. The incentive structure must take into consideration the geography of the rural location (Mulkeen, 2005; Adediji and Olaniyan 2011). Adediji and Olaniyan (2011) classified schools into four namely urban, semi-urban, rural and remote schools. The success of incentive strategies for science teachers will dependent not just on adequate targeting but also on amount of the incentives and the opportunity cost of remaining in the rural area (Adediji & Olanyan 2001). Apart from rural allowances being paid to the science teachers, science teachers' allowances should be paid to the science teachers to make them stay on the job.

The payment of incentives will improve the attitude of science teachers to teach students in the rural areas. This will not only motivate the students, it will also help the science teachers to encourage the science students to study science subjects.

Science Teachers' Professional Development

Most newly qualified science teachers posted to the rural settings and the old qualified science teachers lack career development opportunities which could make them effective. Therefore, there is need for effective career package for the rural science teachers.

Career development package for science teachers include scholarship for certified teachers seeking advance training while serving in the rural schools. They should also have access to distant learning, seminars and workshops. Special training opportunities such

as teacher profession development in the use of participatory, laboratory, concept mapping and multigrade teaching strategies should be made available for science teachers in rural area. This will enhance participation in science among the rural school science students.

Purposeful Budgeting for Science Rural Schools

Non-availability of facilities or infrastructural decay characterized the rural schools. Many buildings including the science laboratory are old or not made available by concerned organs. Many schools lack the essential infrastructure to enable them function as safe, efficient and effective schools.

Stake holders should make enough funds available to provide electricity, water, sanitation for the rural schools. The funds to build or repair laboratory and classrooms should be released as at when due. The floors full of holes, roofs broken ceilings, unlock able doors and wide should be attended to in the budget. Rural schools should be fenced and toilets should be provided for males and females for safety and conveniences.

School based management committee (SBMC)

The School Management Committee (SBMC) is a team of members of the community where the school is located that come together to solve the prioritized problems of the school located in their domain. This body can be used by the rural schools to improve the science facilities, encourage the rural science teachers by given moral and financial support to do their work more efficiently. Since the members of the SBMC are drawn from different vocations, religious body, gender etc they should be able to create enabling environment to encourage the community to participate effectively in school development such as provision of science equipments,

infrastructure, supervision, monitoring and evaluation of rural science teachers.

According to Adediji & Olanyan (2011) school community such as (SBMC) can help new science teachers overcome feelings of isolation, acquire a sense of community security and develop professional competence for rural services. This will encourage the rural school science students to participate effectively in the learning of science.

The Use of Colleagues as Motivator among Science Students

If need be use good upper grade students as tutors in science tutorial classes; give both boys and girls equal feedback; let make science relevant and useful to all students especially to the students. This could be done through discussion and exploration rather than traditional lecture method. Students should be motivated to solve problem for the fun of it or satisfaction of getting a right answer. Allow the students to bring their experience into the science learning environment. Suggest to the students the school academic help for the students. Students' efforts and accomplishments should be recognised specially. Their comments on issues should be responded to fully to give them the sense of belonging and respect they deserve.

Science Teachers' Attitude

Science teachers should carefully examine their own behaviour and assumption on gender issues this will include monitoring their use of sex biased languages. By extension the students and the support staff also need to examine their behaviour to create a learning environment that supports and encourages friendliness. Questions should not be designed to favour a gender. The level of the difficulty of the questions should be for both male female students equally.

Participation of science students in out-of school activities in-school activities such as quiz in science should be encouraged. Let

them subscribe to science magazines. Invite resource persons to arouse the interest of rural students in science. Field trips in the immediate and distant community will enable students observe applications of science to living and work setting. Set up science club in and outside the rural schools to motivate and remind the students and their peers of concepts in science.

The importance of role models in science cannot be over emphasised. Students should have access to male and female mentors who can serve as role models. The two parties need to see, hear from and listen to one and other. Heart-to-heart discussions with the mentors will give the students direction on how to go about learning science. This will gear up rural science students to be future scientists. Olasehinde & Olatoye (2014) observed that there is under-representation of female students of female students to be greatest in rural schools. Female teachers should be posted to rural schools to motivate the female science students' retention in rural schools

The Use of Information Communication Technology (ICT) to Improve Rural Students' Participation in Science

Rural schools in Nigeria are not yet taking the advantages of the potentials of the ICT to improve the quality and dissemination of science to students. Though the use of ICT is noted to be growing among the urban school science students, most of the knowledge of computing by the students is not from the formal schools.

The use of ICT should be facilitated by the stake holders to improve the rural students' participation in science. The science teachers and students should be encourage to use computer; e-mail addresses should opened by the them to link the world by saving time, reducing cost and increasing efficiency, the art of browsing for scientific information, participation in science activities etc. Rural science teachers

and students should be trained in the use of various software packages.

CONCLUSION

Rural areas in Nigeria have the highest percentage of human and school population in Nigeria. This paper has shown that there is gross inadequacy of necessary infrastructure needed by the schools in the rural areas for efficiency especially in the teaching of science subject. Also the non availability of science teachers in the rural schools contributed negatively to non participation of rural school students in science subjects.

RECOMMENDATIONS

Therefore, it is recommended that:

1. Needed infrastructure should be provided to the rural schools to promote students' participation in science subjects.
2. Mentors in both genders should be made available to the students, to serve as a source of motivation for the students in rural schools.
3. Stake holders should provide ICT facilities for both the teachers and the students to enable them have access to current scientific developments in the world.
4. Qualified and skilled science teachers should be posted to the rural schools to teach sciences in order to improve the students' enrolment and achievement in science subjects.
5. Teachers should be motivated with incentives such as free and comfortable accommodation, rural allowances and rural science teacher allowances to enable him/her perform efficiently.
6. Science teachers should be monitored to make sure they do the right thing in the rural area where they are posted to work.

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