

ROLE OF SCIENCE EDUCATION IN INTERNATIONALIZATION OF SCIENTIFIC LITERACY IN NIGERIA

Odo John Ogah and Elom Isaac Ogbaji

Abstract

Scientific literacy has become a way of addressing several challenging issues in Nigeria that has necessitated science teaching in our schools. This paper therefore focused on the meaning and importance of scientific literacy driven by science education. The paper also delved into highlighting the roles of science education as a significant part of human culture that represent the pinnacles of human thinking capacity among others. Poor planning, poor funding and politicization were viewed as the impediments to science education in Nigeria. As a way forward, the paper recommended proper planning of educational programmes, increase budgetary allocation to education programmes, and politician's due interference on admission issue of students as well as staff recruitments as a measure for improved science learning.

The term "internationalization" has been used for centuries in political science and governmental relations, but its popularity in the education sector has really only soared since the early 1980s. In the 1990s, the term international education centered on differentiating it from comparative education, global education and multicultural education, (Knight, 2015). Today, in the 21st century, another set of related terms has emerged which according to knight (2015) include transnational education, borderless education and cross-border education. Internationalization is defined as the process of integrating an international, intercultural, or global dimension into the purpose, functions or delivery of post secondary education (Knight, 2015). From the definition, it implies that scientific literacy which has become a way of presenting a balanced formulation of several legitimate or competing purposes for science teaching in our schools can be made viable driven by science education.

Science education is the field concerned with sharing science content and process with individuals not traditionally part of scientific community. The learners may be children, college students, or adults within the general public. The field of science education include work in science content, science process, (the scientific method), some social sciences, and some teaching pedagogies. The traditional subjects included in the standards are physical, life, earth, space and human science (en.wikipedia). The thrust of this paper is an overview of scientific literacy, and the role of science education in Nigeria.

Scientific Literacy

The term "scientific literacy" has been defined by several authors in various ways since Paul deHard Hurd used the term in 1958 (American Association for the Advancement of Science (AAAS) 1989, Laugksch, 2000 and Bybee, 1997). Norris and Philips (2003) contend that scientific literacy has been used to include various components from knowledge of the substantive contents of science and the ability to distinguish from non-science; understanding science and its applications; knowledge of what counts as science; ability to think scientifically; and ability to use scientific knowledge in

problem solving among others. According to the United States National Centre for Education Statistics, Scientific literacy is the knowledge and understanding of scientific concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity (Adams; Perkins; Podolefsky; Dubson; Finkelstein and Wieman 2006). A scientifically literate person is defined as one who has the capacity to:

- *Understand, experiment, and reason as well as interpret scientific facts and their meaning;*
- *Ask, find, or determine answers to questions derived from curiosity about everyday experiences;*
- *Describe, explain, and predict natural phenomena;*
- *Read articles with understanding of science in a popular press and engage in social conversation about the validity of the conclusions and*
- *Pose and evaluate argument based on evidence and to apply conclusion from such argument appropriately (America Association for the Advancement of Science (AAAS, 1993:14).*

The Organization for Economic Cooperation and Development (OECD) and Programme for International Students Assessment (PISA) Framework (2015) defined scientific literacy as the ability to engage with science-related issues, and with ideas of science, as a reflective citizen. A scientifically literate person, therefore, is one who is willing to engage in a reasoned discourse about science and technology which requires the competence to:

- a. **Explain phenomena scientifically** - Recognize, offer and, evaluate explanations for a range of natural and technological phenomena;
- b. **Evaluate and design scientific inquiry** - Describe and appraise scientific investigations and propose ways of addressing questions scientifically and
- c. **Interpret data and evidence scientifically** - Analyze and evaluate data, claims and arguments in a variety of representations and draw appropriate scientific conclusions.

The implication from the varied definitions of scientific literacy is that scientific literacy may involve particular attitudes towards learning and using science. A scientifically literate citizen therefore, feels concern about environmental and social issues, responsible to act on these issues and empowered to use science as a tool in addressing these issues.

Programmes to promote scientific literacy among students abound. Examples are the quiz bowls and science fair. Other programmes include: the Global Challenge Award; the National Ocean Science Bowls and Action Bioscience (Wikispaces). In Nigerian schools, such programmes are also organized among students of inter-schools and inter-states science quiz competition sponsored by schools, non-governmental agencies and bodies like Mathematics Association of Nigeria (MAN), and Science Teacher's Association of Nigeria (STAN). These are aimed at promoting scientific literacy in the country owing to the numerous benefits of science and technology to the country's all-round development.

Roles of Science Education Programmes in Nigeria

Across the nation the importance of science in life is far reaching, not only because we live in an age where every technological discovery has something to do with science but rather because sciences promote understanding of the planet earth we live in. Abdullahi (1987) argued that science teaching is essential and could be an instrument through which technology, economical and political breakthrough can be achieved. To him, if sciences or technology has helped other western countries

like United Kingdom, America, Japan and Germany to greatness then there is need to examine those factors that can assist in promoting scientific literacy in Nigerian educational institutions. In the area of policy formation, it behooved that democratic government like Nigeria must incorporate the use of research derived evidence into policy formulation.

Many challenges that most societies face required an understanding of the uses and limit of technologies and how science can better inform our choices. This trend calls for recognition that it is important to promote science literacy across all sectors of the populations. This implies that if Nigeria is to have reasonable science policies, public understanding of science is a necessity. This is because according to Olorundare (2007) public misunderstanding of science will work its way through the political, social and economic processes and emerge into detrimental policies.

Succinctly, Poincare (2007:285) revealed that science education is important in the following ways:

- *Science is a significant part of human culture and represents one of the pinnacles of human thinking capacity.*
- *Science provides a laboratory of common experience for development of language, logic and problem-solving skills.*
- *A democracy demands that its citizens make personal and community decisions about issues in which scientific information plays a fundamental role, and they need knowledge of science as well as an understanding of scientific methodology.*
- *For some students science will become a lifelong vacation or avocation.*
- *The nation is dependent on the technical and scientific abilities of its citizens for its economic competitiveness and materials needs.*

Impediments of Science Education in Nigeria

Among the factors affecting science teaching in Nigeria are: Poor planning, poor funding, methodology used in teaching science and Politicization.

1. **Poor planning:** Planning is a very important factor to be considered in any programme. Educational planning has become very important because it makes sure of institution's success, it considers the significant issues, constraints, and conditions and factors of education with focus on potential objectives, goals and vision. This is in line with the view of Ibrahim (2014) that planning makes for effectiveness and efficiency of a programme. Many of the science education programmes introduced in the past failed and did not see the light of the day due to poor planning, therefore, the need for effective planning.

2. **Poor funding:** Lack of fund has been observed to be a serious setback in the proper implementation of science education in Nigeria bearing in mind that the success of any educational programme depends largely on how it is funded. Inadequate funding militates against the provision of basic infrastructures, facilities for research and needed number of qualified teachers to effectively teach sciences. Kola (2013) noted that laboratories, workshops, and libraries that exist in most of our institutions are ill-equipped as a result of inadequate funding. These probably, may spell doom for scientific literacy in Nigeria.

3. **Methodology used in teaching science** – The teaching method the teachers used in the classroom for teaching science posed challenge to science education. Omoifo (2012) affirmed that methodology of teaching is what makes a teacher a professional. Most science teachers are not qualified to effectively teach science. They lack the content knowledge in their fields and as such

adopt a method that often presents the learners as passive recipients of lesson material. These will have great effect on the science achievement of the students.

4. **Politicization:** Politicization of Education generally has a great effect on the development of science education. Today, many educational institutions are opened and run in many states on political ground. Mahmoud (2013) observed that admission into universities, colleges, polytechnics, monotronics, secondary and primary schools are sometimes guided by politicians and not academic performance. He added that parents today used their political office or influences for education of their children. Such children which in most cases are not qualified to be admitted to read the prescribe science courses often perform below standard leading to production of half baked graduates that cannot contribute to the nation's development. In the same manner politician often influence the recruitment exercise of teachers. Many people are after securing job for their children just to have a meal ticket not bordering whether their wards are qualified or not. This has contributed to recruitment of many unqualified teachers in our schools.

Recommendations

Considering the fact that scientific literacy is crucial and should be given prominence for Nigeria to advance scientifically and technologically, the following recommendations are made in this paper:

1. The government of Nigeria through her education ministries at all levels should ensure that education programmes is effectively planned by involving curriculum experts, stake holders in education sectors as well as classroom teachers. These will go a long way to ensuring the workability of our educational programmes.

2. The government should ensure adequate budgetary provision to fund the education sector. Private sectors should be encouraged to put more resources in the development of science education. This will cushion the problem of shortage of infrastructures, and facilities needed to effectively train future scientists.

3. The government and private investors in education should strive to employ only professional and qualified teaching staff and ensure their training and re-training. This is because the achievement of the objectives of science by the learners depends on the teacher's knowledge of content and methods.

4. Admission of students to schools and recruitment of teachers should be based on merit and not on political influence for effective learning and teaching and of sciences and other disciplines.

Conclusion

Enhancing scientific literacy through science education is developing ability to creatively utilize evidence-based scientific knowledge and skills, particularly with relevance for everyday life and career, in solving challenging yet meaningful scientific problems as well as making sound socio-scientific decisions. These will transcend to scientific, technological, economic and social development of Nigeria driven by a sound science education programme that is bedeviled by some problems was highlighted. The paper therefore, submits that for sound science learning, the problems mentioned among others should be addressed.

References

- Abdulahi, A. (1987). *Science Teaching in Nigeria*. Illorin: Atoto Press.
- Adams, W. K; Perkins, K. K; Podolefsky, N. S; Dubson, M; Finkelstein, N. D; Wieman, C. E. (2006). A New instrument for measuring students' beliefs about physics and learning physics: the Colorado Learning Attitudes about science survey. *Physical Review Special Topics: Physical Education Research*. 2: 010101 doi:10:1103.
- American Association for the Advancement of Science (1989). *Science for all Americans: A Project 2001 report on literacy goals in science, mathematics and technology*, Washington, DC: AAAS.
- American Association for the Advancement of Science (1993). *Benchmark for scientific literacy*. Oxford, UK: Oxford University Press.
- Bybee, R. W. (1997). Towards an understanding of scientific literacy. In: W. Graber & C. Bolte (Eds.). *Scientific Literacy: An International Symposium*.
- Hurd, P. D. (1958). Science Literacy: It's meaning for American Schools. *Educational Leadership*, 16(1), 13 – 16.
- Ibrahim, A. I. (2014). Restructuring Science Teaching in Nigeria Tertiary Institution. *American Journal of Educational Research*, 2(11), 1100 – 1103.
- Knight, J. (2015). Updating the Definition of Internationalization. E- learning International Issues. Retrieved 31st August ,2017 from: www.iau.net/content/definition.
- Kola, A. J. (2013). Importance of science education to national development and problem militating against its development. *American Journal of Education Research*, 1(7), 225 – 229
- Laugksch, R. C. (2000). Scientific Literacy: A conceptual overview. *Science Education*, 84, 71 – 94.
- Mahmoud, S. S. M. (2013,September,7). Education: Problems and Challenges in Nigeria, what to be done. *Daily Trust*. p.11.
- Norris, S. P. & Philips, L. M. (2000). How literacy in its fundamental sense is central to scientific literacy. *Science Education*, 87, 224 -240.
- Olorundare, S. A. (2007). Scientific Literacy in Nigeria: The role of Science Education Programme Retrieved 31st August, 2017 from: <http://dx.doi.org>
- Omoifo, C. N. (2012). Dance of limits reversing the trends in science education in Nigeria. *Inaugural lecture series 124*, Benin: University of Benin Press.

- Organization for Economic Cooperation and Development (OECD) (1998). *Instrument design: A framework for assessing scientific literacy. Report of Project Managers Meeting, Arnhem. The Netherlands Programme for International Students Assessment.*
- Organization for Economic Cooperation and Development (2003). *The PISA 2003 assessment framework.* Retrieved August 2017 from: <http://www.pisaoecd.org/dataoecd>.
- Poincare, H. (2007). Goals for Science Education. “National Research Council 2007. *Taking Science to School: Learning and Teaching Science in Grade K – 8.* Washington DC: The National Academic Press. Science Education. Retrieved 31st August, 2017 from: <https://en.wikipedia.org>.