Development of Science Education in a Globally Depressed Economy

Larai A. Keswet Ph. D, Christine Agbowuro Ph. D and Christiana S. JimwanNaomi AdamuGisilanbe
Department of Science and Technology Education Vocational Education Dept
PMB 2084 JOS, Plateau State Modibo Adamawa State
Nigeria. University of Technology. 
Yola

Abstract — Effective and stimulating science education is fundamental for both the future of science and the ongoing development of our global knowledge society. Yet there is concern in the majority of countries that the overall level of scientific literacy is poor and that children are not being attracted to scientific studies and eventual careers as scientists. Given its mission of strengthening international science for the benefit of society, science education is an area of obvious interest. The need for a scientifically literate populace is increasingly recognized as critical in many countries, as they face the consequences of increasing population pressures, global economic depressions, limited resources and environmental degradation. There is a consensus that in many places around the world, science education is facing serious challenges. As countries face the demands of expanding populations under economic constraints, education as a whole is frequently one of the first areas in which funding is cut to free up resources for other, apparently more pressing demands. This trend is amplified in the area of science, since often those in political decision-making sector have limited appreciation of scientific disciplines and their importance to the vitality of their country’s economy. It is clear that developing countries face greater challenges in science education than economically developed countries due to lack of teaching materials including books, computing communication technologies, community-based science centers, laboratory facilities and equipment, as well as shortage of skilled teachers. Given this world scenario, and the needs of society, there is an urgent need to improve the preparation of scientists of tomorrow, not only through widespread access to quality instruction, facilities and research, opportunities for all students, but also to improve the economies. The paper is an analytical synthesis of the challenges bordering science education in a globally depressed economy, its prospect and indicative actions to revamp science education.

Keywords — Depressed, Development, Economy, Global, Science Education

I. INTRODUCTION

Nations all over the world are striving at reaching an economic equilibrium. The attainment of equal weights on a scale measurement has been the thinking on economic development of nations all over the world. Economic depression is a disequilibrium position which dates back to the 1930 world economic instability. (Sola, Iyiomo & Kaima, 2009). The prevailing depressing economic climate, occasioned largely by paucity of funds is whittling down the chances of meeting standard requirements for quality Science education (Abasi, 2016). In almost half of the countries in Europe (10 out of a total of 21 countries) the education system has been confronted with new cuts as a result of global economic crisis. These countries include: Austria, Finland, Germany, Ireland, Italy, Moldova, Norway, Poland, Spain, and the UK. These cuts are in most cases as a result of reduction in over all government expenditure on education, but in other cases as a consequence of tax reductions (Education international in Abasi, 2016). The economic and financial crisis which started in the united states in September 2008, has rattled markets and economies (developed, developing and underdeveloped) around the globe, and because the world is linked inextricably by globalization. Addressing the global financial crisis would however require knowing the root causes of the crises. Analysis and scholars have noted myriad causes of the global financial crisis including corrupt practices (Oyesola, 2010). Sub-Saharan Africa, which has the furthest to travel to achieve universal primary schooling, faces some of the starkest poverty-related threats to education.

II. CHALLENGES OF SCIENCE EDUCATION: A GLOBAL PERSPECTIVE

The consensus in the world is that scientific literacy should be the main objective of science education. It is a fundamental need for scientific instruction that allows citizens to participate in decision-making about matters related to science and technology. In the Latin American context, the need for scientific literacy is even more urgent. High levels of poverty, degraded quality of life and, above all high level of inequality all contributes to seriousdevelopmental problems. Education including science education gaps needto be bridged. In most countries in the same region such as Argentina, Chile and Colombia there is a large deficit in the number of science and technology professionals who have the education need to perform high-quality research. Science instruction in Latin America is characterized by rote learning in scientific content with decontextualize understanding of science away from everyday life, with little development of scientific skills and critical thinking (Sadler, Gil, Sifredo, Valdes & Vilches, Organization de Estados Americanos as cited in Hernan, 2015)

The education system, in Africa, especially in secondary schools, is characterized by teaching a wide range of subjects which leads to a more theoretical coverage of subject material. The situation is not improved by the low
teacher to student ratio, especially in most of the public schools. A good number of these are ill equipped. All these do not only deny the students the opportunity to acquire scientific practical skills but also kills their interest in science disciplines. University science education is not devoid of problems that hamper the effective imparting of knowledge and practical skills.Institutions do not promote collaborative research, be it interdepartmental or interuniversity within countries, regions or even further. This in effect reduces the quality of research done in these institutions (Arinaitiwe, 2007).

There is diminishing provision of basic teaching and learning facilities for science education in underdeveloped and developing countries, essentially this result in poor quality of academic and professional programs with the consequence of poor rating in underdeveloped and most developing countries. Aging and poorly constructed facilities is visibly evident owing to limited fund available for maintenance purposes. There is heightened pressure on facilities such as furniture for classes, lecture and laboratory equipment. Many tertiary institutions are becoming junkyards of sort. To bring a turn around some approaches from other clime can be adopted for impactful and sustainable funding for science education. There is the need to consider the policy of aligning the levels of government with the respective levels of science education.

III. DEVELOPMENT IN SCIENCE EDUCATION

Science and technology in Europe sits at an important crossroads. Despite public and policy emphasis on the importance of science, important deficits and wide differences in educational outcomes and public understanding exist across Europe, both within and across countries. Unevenness in basic science literacy across Europe which is necessary to ensure a rigorous understanding and use of scientific knowledge in decision-making, particularly in domains such as health, the environment, food, energy and consumption exist (Ballas, Lupton, Kavroudalis, Henning, Yiagopoulou, & Dorling, 2012). Wide disparities in participation in science education, in formal, non-formal and informal settings across regions, culture and gender are blocking full involvement in society of all citizens and scientific talents.

There is declining interest in science studies and related careers that are essential to meet the demand for well-prepared graduates (at all levels) and researchers, especially amongst women. This is detrimental to our knowledge, innovations and economies (Olsen & Lie, 2011). There are concerns about quality arising from a mismatch between demand and supply of qualified science teachers and about the gap between science education research funding and what happens in the classroom (Osborne & Dillon, 2008). There is insufficient understanding of the breadth of competences required of science teachers and science teacher educators for enhancing personal and collaborative achievement, innovation, cultural and economic sustainability (European Commission, 2011). There is inadequate teaching and insufficient family involvement needed to inspire children’s curiosity and the need to shift the emphasis from knowing fact to doing innovative and enjoyable things with knowledge, including being creative with the application of ideas (Blatchford & Kutnick, 2014).

There is short-fall in skills and competences required to identify early-stage global trends necessary to teach EU targets for smart and sustainable growth and high value-added jobs responding to the need to design science-based solutions to the global challenges (Hayden, Ouyan, Scinski, Olszewski, & Bielefeldt, 2011). There are insufficient investments in strategic cooperation and development of ecosystems that would foster effective adoption of latest research findings and emerging technologies in industry and enterprise (Jackson, Brooks Greaves Alexander, 2011)

IV. WHY SCIENCE EDUCATION MATTERS

Knowledge of and about science are integral to preparing our population to be actively engaged and be responsible citizens, creative and innovative, able to work collaboratively and fully aware of and conversant with the complex challenges facing the society. It helps us to explain and understand our world, to guide technological development and innovation and to forecast and plan for the future. This puts science education at the Centre of a broader educational perspective for society as a whole. It is obvious that science educational attainment is linked to better health, personal empowerment and active engagement in public affairs and civil society being more trusting and supportive of other people, as well as feeding and housing our population, healthy living, protecting our environment, generating sufficient energy, supplying enough clean water, urbanization and global climate change. We have a much better chance of tackling these challenges if all societal actors understand the issues and their consequences and are actively involved in helping identify and monitor society’s responses by working together in an inclusive participatory way, we can better align the goals and outcomes of science education and research with the values, needs and expectations.

V. SCIENCE EDUCATION IS VITAL

1. to promote a cultural scientific thinking and inspire citizens to use evident-based reasoning for decision making
2. to ensure citizens have confidence, knowledge and skills to participate actively in an increasingly complex scientific and technological world.
3. to develop the competencies for problem-solving and innovation, as well as analytical and critical thinking that is necessary to empower citizens to lead personally fulfilling, responsible and professionally-engaged lives
4. to inspire children and students of all ages and talent to aspire to careers in science and other occupations and professions that underpin our
science 
b. Strengthening connections and synergies between 
science, creativity, entrepreneurship and innovation.

degree programs have no research component within the 
basic laboratory facilities, many bachelors and master 
exercises to let the students somehow qualify for a degree. 
outdated course contents. Under such conditions much of 
motivated teachers, the lack of laboratory facilities and 
causes are noted primarily in the dearth of competent and 
the world, and especially in developing countries. The 
inspiring mentorship. 

conditions. They can hardly be expected to provide 
being themselves frustrated due to poor working economic 
ill-informed about current developments in science and 
teachers at primary and secondary school levels. It is at 
express a need for the adequate training of their teachers. 
The situation is particularly pressing with respect to 
teachers at primary and secondary school levels. It is at 
stage that the foundations for an enquiring mind and 
of basic concepts are laid. Many teachers at thislevel are 
ill-informed about current developments in science and 
being themselves frustrated due to poor working economic 
conditions. They can hardly be expected to provide 
inspiring mentorship.

The state of science education at the tertiary and post 
school level is also less than satisfactory in many parts of 
the world, and especially in developing countries. The 
causes are noted primarily in the dearth of competent and 
motivated teachers, the lack of laboratory facilities and 
outdated course contents. Under such conditions much of 
the learning of science is reduced to memorization 
exercises to let the students somehow qualify for a degree. 
In the absence of competent and motivating teachers and 
basic laboratory facilities, many bachelors and master 
degree programs have no research component within the 
curriculum.

VI. TEACHER PREPARATION IN SCIENTIFIC DISCIPLINE

Teacher education is policies and procedure designed to 
equip prospective teachers with the knowledge attitude, 
behavior and skills they require to perfom their tasks 
effectively in the classroom.There is need to upgrade 
teachers capabilities in most countries especially with 
regard to content and pedagogy, and in facilitating hands-
on activities for science lessons, as well as on the 
introduction of contemporary technologies to enhance 
students learning in science. While countries vary in there 
process for preparing future teachers, some with 
specialization in science, and some without,they all 
express a need for the adequate training of their teachers. 
The situation is particularly pressing with respect to 
teachers at primary and secondary school levels. It is at 
this stage that the foundations for an enquiring mind and 
of basic concepts are laid. Many teachers at thislevel are 
ill-informed about current developments in science and 
being themselves frustrated due to poor working economic 
conditions. They can hardly be expected to provide 
inspiring mentorship.

The state of science education at the tertiary and post 
school level is also less than satisfactory in many parts of 
the world, and especially in developing countries. The 
causes are noted primarily in the dearth of competent and 
motivated teachers, the lack of laboratory facilities and 
outdated course contents. Under such conditions much of 
the learning of science is reduced to memorization 
exercises to let the students somehow qualify for a degree. 
In the absence of competent and motivating teachers and 
basic laboratory facilities, many bachelors and master 
degree programs have no research component within the 
curriculum.

Teachers at all levels of the educational system are very 
importantin the overall development of any 
nation.Teaching involves the use of wide body of 
knowledge about the subject being taught. Teacher 
education is the process which nurtures prospective 
teachers and updates qualified teachers knowledge and 
skills in the form of professional development. The teacher 
stands out as one of the most important factors 
determining the quality of education and its contributions 
to national development (Nakpodia & Urien, 2011)

VII. CONCLUSION

Education constitutes the foundation of meaningful, 
socio-economic, political growth and development of any 
nation. The financing of education is at the heart of the 
educational crisis in many countries of the world. There 
appears to be perennial crisis of funding and lack of 
definite structures and strategies in the funding of 
education. The challenges in the education in general and 
its funding in particular could be traced to policy and 
strategy instability and consistency, inefficient 
management, wastage and leakages thereby overriding

VIII. INDICATIVE ACTIONS

Education policies and systems should:
1. Ensure that science is an essential component of 
compulsory education for all pupils and students
2. Support schools, teachers, teacher educators and 
students of all ages to adopt an inquiry approach to 
science education as part of the core framework of 
science education for all
3. Address socio-economic, inequalities in order to 
widen access and provide everyone with the 
opportunities to pursue excellence in learning 
outcomes in science
4. Science education should balance requirements of 
breadth and depth of knowledge about science to 
ensure young people and adult learners are both 
motivated to learn and equipped to fully engage in 
scientific discussions and decisions and to facilitate 
further and deeper study
5. Science education should focus on competences 
with an emphasis on learning through science and 
shifting from STEM to STEAM by linking science 
with other subjects and discipline
6. Greater attention should be given to the value of all 
disciplines and how inter-disciplinarily can 
contributes to our understanding and knowledge of 
scientific principles and solve societal challenges
7. Learning institutions, at all levels, should boost 
understanding the importance of science education 
as a means of acquiring key competences to ease 
the transition from education to employability by;
a. Learning about science through other discipline and 
learning about other discipline through science
b. Strengthening connections and synergies between 
science, creativity, entrepreneurship and innovation.
8. Action should be taken to continually improve teaching quality, with greater focus on teacher competences, disciplinary knowledge.
9. Effort should be made to attract more highly qualified and motivated people to become science teachers and to boost the status of the profession.
10. Greater emphasis should be given to closing the research practice gap, by embedding science education research findings into teacher preparation, curriculum development, teaching and learning and assessment for learning.
11. Approach methodologies should be developed for teaching research ethics and raising awareness for research integrity.
12. Continuous professional development should become a requirement and a right for all science teachers throughout their teaching career.
13. Promote partnerships between science teachers, students, researchers, innovators, professionals in enterprise and other stakeholders in science-related fields, in order to work on real-life challenges and innovations, including associated ethical, social and economic issues.
14. Promote partnership that foster networking, sharing and applying science and technology research findings amongst teachers and professionals across different enterprises.
15. Greater attention should be given to promoting responsible research and innovation and enhancing public understanding of scientific findings and the capabilities to discuss their benefits and consequences.
16. Citizens should be actively and directly involved in science research and innovation projects.
17. Emphasis should be placed on connecting innovation and science education strategies, at local, regional, national and international levels, taking into account societal needs and global developments.
18. Collaborate and share knowledge of and about science and science communication, as well as identifying solutions for global societal challenges facing human kind should actively pursued with international partners.
19. Science education should benefit from an agreed set of international guidelines, evidence-based on a grounded on collaborative and inclusive deliberations.
20. Science education should be an essential component of a learning continuum for all, from pre-school to active engaged citizenship.
21. Science education should focus on competences with an emphasis on learning through science and shifting from STEM to STEAM by linking science with other subjects and disciplines.
22. The quality of teaching, teacher induction, pre-service preparation and in-service professional development should be enhanced to improve the depth and quality of learning outcomes.
23. Collaboration between formal, non-formal and informal educational providers, enterprise, industry and civil society, should be enhanced to ensure relevance and meaningful engagement of all societal actors with science and increase uptake of science studies and science-based careers to improve employability and competitiveness.
24. Greater b attention should be given to promoting responsible research and innovation and enhancing public understanding of scientific findings and the capabilities to discuss their benefits and consequences.
25. Emphasis should be placed on connecting innovation and science education strategies, at local, regional, national, European and international levels, taking into account societal needs and global development.
26. Promote research and support actions that emphasize a balance approach to the acquisition of scientific and generic competences.
27. Educational institutions at all levels, should boost understanding of the importance of science education as a means of acquiring key competences to science as a means of acquiring key competences to ease the transition from education to employability.
28. Encourage teaching strategies to enhance students motivation for learning and to develop students self-regulation for science learning, including classroom-based actions.
29. Promote innovations of technology enhanced teaching and learning as well as project-based learning through e.g field studies, laboratory work and various kinds of outdoor activities.
30. Promote the development of innovation Hubs that link formal and informal science education with business and enterprise, SME, and civil society organization at municipal and regional levels, in order to foster, share and apply science and technology research to different genres of enterprises.
31. Support the co-creation of innovative curricula, with defined learning outcomes involving science teachers, science teacher educators, researchers and representatives from enterprise and civil society.
32. Support pilot projects which help develop the capacity for greater school-family and school-enterprise synergies.

REFERENCES


