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Development of Science Education in a Globally Depressed Economy

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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 eventful 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

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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 consumptionexist (Ballas, Lupton, Kavroudalis, Henning, Yiagopoulou, & Dorling, 2012). Wide disparities in participation in science education, in formal, non-formal and informal settings acrossregions, culture and gender are blocking fullinvolvement 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 (Osbone& 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

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knowledge and innovation-intensive societies and economies in which they can be creative and accomplished

5. to empower responsible participation in public science conversations, debates and decision making as active engagement in challenges facing humanity today.Science learning helps us to interpret and understand our world, to manage risk and put uncertainty into perspective, to guide technological development and innovation and to forecast and plan for the future. It improves job prospects, cultural awareness and our ability to act as well-informed citizens in solidarity with citizens around the world. Science and mathematics is the basis for personal accomplishment and responsible citizenship, social and economic development and a benchmark of innovation, entrepreneurship and competitiveness in our global world.
6. science learning contributes to personal well-being and fulfillment, promotes full economic and societal participation, supports creativity and innovation and enables people to be informed and more autonomous and active citizens.

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 toperform 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.

Thestate 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.

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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

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