

The Roles of Science Teachers in Promoting Science Education for Sustainable Development in the North Eastern Nigeria

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ABSTRACT

Teachers are educators. Education is the area of focus for science teachers and science is essentially one learning vehicle for this. Great teachers not only educate, but also equip their students with the tools to rethink strategies to tackle problems in the real world. They develop in students personal skills related to creativity, initiative, safe working, develop positive attitudes towards science and scientists, develop positive attitudes towards science as a major factor in the development of society and scientific endeavours which can be tackled with a toolkit of practical knowledge and commonsensical application. This paper looked at the role of science teacher in promoting science education for sustainable development. It examined the concept science education, sustainable development and science teacher. It highlighted some techniques used in teaching science education for sustainable development. The paper recommends among other that Science teachers should have access to innovative classrooms, materials, opportunities to practice new ways of teaching, practical experiences, possibilities to discuss developmental elements with students by proving the value of these natural practical solutions and government and private sectors should put in more effort and resources towards the development of science education.

Keyword: Science education, sustainable development, science teacher.

INTRODUCTION

Nigeria have made important strides in the field of education, we must acknowledge the fact that profound equity gaps still affect the regional education systems. In many instances, educational proposals have not only failed to reverse this trend, but in actual practice, have deepened it. Overcoming this state of affairs requires reflecting on the meaning, purpose, content and practice of the type of education being currently imparted to children, youths and adults. Only thus, may education become a tool that will lead to change and the construction of a sustainable future. Within this framework, United Nations proclaimed the "Decade of Education for Sustainable Development (2005 – 2014, DESD)" and designated UNESCO as its lead agency. The goal of the Decade is to integrate the values of sustainable development into all aspects of education and learning and into every modality of education, whether formal, non-formal, or informal, with a view to encouraging changes in attitude and behaviour that will create more sustainable and fairer societies through national, regional and global efforts. In order to meet the Decade objectives, all children and youth in the region need to be acquainted with scientific knowledge, skills and abilities required for a full and active citizenship for them to be part of sustainable development stride. Education is central to sustainable development as it empower people and strengthens nations. It is a powerful equalizer to reduce the distinctions made by class, race

and culture, and opens door to all to fit themselves out of poverty. As noted by the international council for science (ICSA), one of the biggest challenge facing governments today is how to build capacity in science and technology to achieve the goal of sustainable development (Malcolm et al, 2002). Sustainable development is a prior task for societies in the 21st century in order to attain the needs and aspiration of their people. It is really a great societal demand transformation process which seems to serve as a prior vehicle to reach the ambitious goals for sustainability. In a rapidly changing world it is prominent to allow students to participate in the societal process geared towards sustainable development. It is therefore, very essential that students be given the opportunity to develop competences, skill for reflecting and cooperating with each other. This could be achieved effectively through science education. There is inseparable link between national development and education as no nation will develop beyond the level of efficiency of the education provided for the citizens. Education help define life, values, political, culture and economic power of a nation. It is through education that the human resources capital of a nation is harnessed and deployed for development (Ozioko & Nwabueze, 2010). Science Education for sustainability must embody a commitment to values, principles, attitudes and behaviours and, more specifically, to a clearly understood notion of justice and equity. Naturally, teachers and learning communities are key components in the dissemination of those sustainability principles that will lead to the necessary changes in attitude. It provides information to enable formulation and selection of environment and development policies in the decision-making process. In order to fulfill this requirement, it will be essential to enhance scientific understanding, improve long-term scientific assessments, strengthen scientific capacities in all countries and ensure that the sciences are responsive to emerging needs (Kajikawa, 2008). Teachers play a key role in the appropriate socialization of young people for sustainable development. It is important that, irrespective of the academic subject matter for which a primary or secondary school teacher is responsible, the teacher's major overall responsibility be seen as the moulding of socially and emotionally well-adjusted individuals. The teacher needs to assist the young students to feel good about themselves; to be emotionally secure and self confident, to respect themselves and others, and to take full responsibility for their actions (Offorma, 2010).

CLARIFICATION OF CONCEPTS

Science Education

Science education in recent history also generally concentrates on the teaching of science concepts and addressing misconceptions that learners may hold regarding science concepts or other content. Science education has been strongly influenced by constructivist thinking. Constructivism in science education has been informed by an extensive research programme into student thinking and learning in science, and in particular exploring how teachers can facilitate conceptual change towards canonical scientific thinking. Constructivism emphasizes the active role of the learner, and the significance of current knowledge and understanding in mediating learning, and the importance of teaching that provides an optimal level of guidance to learners (McKeown, 2002).

Sustainable Development

According to Tilbury and Wortman (2004), sustainable development is an organizing principle for human life on a finite planet. It posits a desirable future state for human societies in which living conditions and resource-use meet human needs without undermining the sustainability of natural systems and the environment, so that future generations may also have their needs met. It contains within it two key concepts:

- The concept of needs, in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs."

Education for Sustainable Development is an approach to teaching and learning "that seeks to empower people of all ages to assume responsibility for creating and enjoying a sustainable future." It "prepares people of all walks of life to plan for, cope with, and find solutions for issues that threaten the sustainability of our planet," and encourages "changes in behaviour that will create a more sustainable future."

Science Teacher

A Science teacher is an individual equip with the necessary scientific and technological skills, knowledge, abilities and environmental conditions necessary for achieving his full potentialities (Menyeh, 2009). According to Ameh (1987), a good science teacher has to be someone who is fully-prepared to teach science, having adequate science training and to have a grasp of science discipline. The science teachers should have a sufficient understanding of science concepts in the science they claim to teach. One of the most rewarding things about teaching science is doing it in ways that combine effective communication and confidence with a willingness to try anything to make a fact or principle memorable. Science teachers educate future generations. They teach a wide variety of topics such as earth sciences, basic sciences, biological science, environmental sciences, chemistry and physics (Falk, 2001).

Role of Science Education in Promoting Sustainable Development

Sustainable development is probably the most daunting challenge that humanity has ever faced, and achieving it requires that the fundamental issues be addressed immediately at local, regional and global levels. At all scales, the role of science education is crucial; scientific knowledge and appropriate technologies are central to resolving the economic, social and environmental problems that make current development paths unsustainable. Bridging the development gap between the North and the South, and alleviating poverty to provide a more equitable and sustainable future for all, requires novel integrated approaches that fully incorporate existing and new scientific knowledge (Ogunleye, 2007). Rapid advances in science education has played extremely important role in promoting the implementation of sustainable development strategy, particularly in the areas of information technology, biotechnology, new materials technology, new energy and renewable energy technology, advanced manufacturing technology, aerospace technology, oceanic technology and environmental technology, have provided effective means to ease resource shortages, curb environmental degradation, improve the human health condition, and, above all, achieve

coordinated development of society, economy and environment (Cash et al, 2003). Ready availability of sound scientific information and advice is essential for developing country decision-makers to make informed science-based choices that shape national development strategies. Expanding access to science and technology information and capacity into developing regions will similarly accelerate their paths to development and prosperity in an environmentally sustainable manner (Hurd, 1991). Science and technology are fundamental to the intelligent management and use of natural resources, environmental stewardship and economic development -- in short -- they are essential to sustainability. An "Initiative for Future Agriculture and Food Systems," for a research, extension and education competitive grants program to address critical emerging agricultural issues, including future food production, food safety, environmental quality, natural resource management, and farm income. Key program areas are underway in agricultural genome research, food safety, and agro-biotechnology, for example. Priority funding is made to proposals that engage numerous States, academic and research institutions and that integrate research, extension and education (Clark, 2007). Science education has been used in wide ranging activities from promoting high and basic research and development to cutting edge technology on one hand, to serve the technological requirement of the common man through development of appropriate skills and technology. However, the benefit of science and technology has not reached the socially excluded and marginalized population groups, who are on the flings and margins of science and technology development benefits (Clark, 2003).

Science Teacher's Action in Sustainable Development

Science teachers have the knowledge base to understand sustainable development and the communication skills to explain it. They can be an important factor in increasing the community understanding of this most crucial issue. Good teachers educate about Recycle as a best practice, advocate Reduce in energy consumption and talk about Reuse for conversation. But, Great teachers not only educate, but also equip their students with the tools to rethink strategies to tackle problems in the real world. Problems like sustainable development which can be tackled with a toolkit of practical knowledge and commonsensical application. Let's start small, at the campus for starters. We have Environmental Sciences as a course offered to students. Why not pepper that course with environmental sustainability studies which will help students discover and better understand scientific research, its methods and its results as it relates to sustainable development (Taber & Keith, 2009). Teachers are powerful agents of change in the lives of young people. Focusing on the moulding of well-adjusted young people whatever the subject matter being taught not only benefits the students, it also makes the job of the teacher easier. Earlier we talked about factors within and outside of one's control. One factor totally within the sphere of control of teachers is their attitude towards each student, even to the ones who give problems. Teachers who function in a nurturing validating way will reap great rewards in terms of class behaviour and student receptivity. Teachers are the builders of the nation. Science teachers create various opportunities for students to engage in doing activities that will enable them make sense of the world around them, make new discoveries, solve interesting problems and develop skills that are sustainability driven. Omoifo (2012) emphasized that

science teachers therefore, need to recognize the nature of scientific endeavours and how it relates to science teaching if they are to help their students completely understand the content and underlying principles of science. Effective and consistent Implementation of the science and technology curriculum will lead to poverty alleviation, increase in productivity and rapid economic growth. This will surely reduce the capital flight incurred on importation of goods. Science teachers are increasingly realizing the necessity to become agent of change in order to better meet the needs of students, families and communities they serve and thus fulfill society's expectations about science educators' civil responsibility. Science teachers play crucial role in shaping the students' mind towards sustainability as they impart the knowledge of science. Science teachers help to develop sustainability skills for students such as;

- Mastery of subject matter in science'
- Motivating students to learn science
- Psychomotor skills
- Facilitating team work
- Becoming skilled personnel

Some Desirable Techniques science teachers need to use in teaching science that promote sustainable development

The following are descriptions of and sample activities for four teaching techniques: simulations, class discussions, issue analysis, and storytelling. Each technique stimulates different learning processes.

1. Simulations

Simulations are teaching/learning scenarios in which the teacher defines the context in which the pupils interact. The pupils participate in the scenarios and gather meaning from them. For example, pupils imagine they live in a small fishing village and have to learn how to manage the fishing stocks sustainably (i.e. without depleting the fishing stocks or starving the people). Often, simulations are simplifications of complex abstract concepts. At the same time, because they are distillations of real-world situations, simulations give a sense of reality and thus engage and motivate learners of all ages. Concepts associated with sustainability are often abstract and complex. Simulations reduce complexity and highlight salient aspects. Simulations give concrete ways to teach abstract concepts. Providing concrete examples for abstract concepts is especially important for children and adolescents, many of whom are still in the concrete stages of cognitive development (UNESCO 2006).

2. Class Discussions

Class discussions allow for the transfer of information amongst pupils and from the pupils to the teacher, in addition to the traditional route from teacher to pupils. Pupils come to the classroom with a wide variety of life experiences that can enrich the teaching of the mandated curriculum. Pupils can therefore contribute a great deal to discussions of sustainability with observations from their neighborhoods about what is sustainable and what is not. Teachers can then incorporate these experiences into their lessons through class

discussions that provide pupils with real life applications of concepts. One of the skills that ESD develops is the ability to communicate orally and in writing. Discussions give pupils opportunities to develop oral communication skills (e.g. developing focus and purpose before speaking, active listening, building on the ideas of others, summarizing, and questioning). Pupils with strong auditory learning modalities learn well from discussions, both from listening and expressing their own ideas (McKeown-Ice & Dendinger, 2008).

3. Issue Analysis Technique

Issue analysis is a structured technique for exploring the environmental, social, economic, and political roots of problems that face communities. Issue analysis helps pupils identify major arguments related to a community problem as well as key stakeholders and their perspectives, goals, and assumptions related to that problem. Issue analysis also looks critically at the proposed solutions and the costs—financial and otherwise—and at who will bear those costs. Issue analysis can be done briefly or in depth. Issue analysis is interdisciplinary, bridging the natural and social sciences.

Sustainability is an over-arching paradigm that encompasses environmental, social, economic, and political problems and issues that face communities around the world. When the pupils of today assume positions of leadership and become voters, they will have to deal with complex issues that have no simple answers. While in school, they should develop the tools and frameworks for thinking in a way that will help them untangle the complexities of sustainability issues that face their communities. They will also need to learn to create solutions that are locally appropriate and at the same time keep in mind global consequences (e.g. cleaning up local pollution without shipping toxic and hazardous waste to another country). Issue analysis guides pupils through a process that can be used with any issue. It is a generic process that can be applied to a wide range of environmental, social, and economic problems. Issue analysis also gives pupils a way to come to grips with the feeling that something is not quite right in their own community and in communities around the world, but that they do not yet have the skills to explore. Pupils today come to school with broad exposure to the media. These media put them in contact with people outside their neighbourhoods and around the world. Additionally media expose them to excessive wealth and grinding poverty as well as many other inequities in the world. Pupils hear seemingly contradictory facts, for example, that people have never been wealthier and yet more than a billion people around the world live on less than one US dollar per day (Clark, 2000).

4. Story telling

Telling stories to convey and illustrate sustainability ideas is an engaging form of teaching. Stories can be taken from current events, history, television programmes, literature, drama, and personal experience. Storytelling also draws on the oral traditions of indigenous societies and folk art. Storytelling has been practiced for generations as a means of entertainment, education or cultural preservation and to instill moral values among younger generations. Storytelling is an effective ESD pedagogy as the values reflected in traditional stories often contain the wisdom of the elders or stem from creation stories, which helps to impart respect for cultural heritage as well as the environment.

Storytelling makes ideas, theories, and concepts learned from textbooks come alive. Storytelling adds a human element to otherwise dry information. This enables teachers to better transmit sustainable development information, principles and values to pupils. Storytelling is especially good for pupils whose preferred learning modality is auditory. Remembering a list of isolated concepts and definitions is difficult, but recalling the flow of a story related to these concepts may be easier for pupils. A story may also provide a non-threatening way to ease pupils into learning. Stories engage people of all ages and abilities (UNESCO 2006).

CONCLUSION

Based on the fore going, this paper concludes that science education if properly thought at all level of our educational system it can really lead to sustainable development, particularly in the North-Easter Nigeria which was ravaged by insurgency. The science teacher is central to averting this situation through effective teaching of science which could be achieved through the use of relevant techniques that equipped students with knowledge, skills and competences. These will help the students to contribute immensely towards economic recovery in the North-Eastern.

RECOMMENDATIONS

Based on the fore going, and conclusion drawn the paper recommends thus;

- Science teachers should have access to innovative classrooms, materials, opportunities to practice new ways of teaching, practical experiences, possibilities to discuss developmental elements with students and supervisors. By proving the value of these natural, practical solutions.
- Science teacher therefore, can play an important role in promoting awareness and understanding among his students. This could be through;
- Science teacher should set up healthy examples before his students, imparting information regarding sustainable development through science education by acquainting the students with techniques of creating and invention and educational excursions could be arranged for arousing love for nature.
- Government and private sectors should put in more effort and resources towards the development of science education.
- More modern learning aids such as computers, internet, web sites facilities, over head projectors, internet web sites facilities, overhead projectors, firms etc. should be provided in schools.
- Science teachers should be well paid so that they can put in their best in teaching the students.
- Qualitative and affordable science education should be made available for all.

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