



INTEGRATION OF ENVIRONMENTAL COURSES INTO SECONDARY SCHOOL

PHYSICS CURRICULUM FOR SUSTAINABLE DEVELOPMENT IN NIGERIA

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Abstract

This study discusses Integration of Environmental Courses into Secondary School Physics Curriculum for Sustainable Development in Nigeria using descriptive approach. It highlights how a sustainability curriculum that is

based on the integration of physics education and environmental related courses can impact student learning and career awareness. Challenges and barriers to Integration of

KEYWORDS:

Environmental Education, Sustainability, Integration, Physics

Environmental education in secondary schools are highlighted and suggestions are made.

Introduction

Over the past three decades, particular perspectives regarding the environment have begun to emerge. Mason and Hughes (2001) identified three such perspectives as: (i) realization that human beings not only live on earth and use its resources at an increasingly high rate but also actually belong to the earth and the total ecology of all living systems, (ii) there are strong interactions among different components of the large and complex systems that make up our environment, and (iii) the rising human population and its impact on the environment is a great concern. These perspectives succinctly demonstrate that there is a need to take a great deal of interest in learning a lot more about our environment, how human being interact with the environment and how the

environment interacts with human being. Studies of primary and secondary school children in the world (Nigeria a case study) revealed that although the students did not have a deep understanding of environmental issues and lacked environmental awareness and attitudes necessary for protecting the environment, but the students had great concern for the environment (Chapman & Sharma, 2001; Fien, Yencken, & Sykes, 2002).

For decades, as environmental issues such as global climate change and ozone depletion have been the concerns of environmentalists, much emphasis has been given to teaching these issues in environmental education. Some scholars have suggested that environmental education offers science education a range of perspectives on knowledge and situated learning while at the same time challenging current, orthodox thinking in the subject (Dillon & Scott, 2002). To understand environmental issues and provide rational solutions to these issues, it is necessary to appreciate and understand the science that governs our environment. Mathematics, physics, chemistry, biology, earth and space sciences all play significant roles in understanding our environment meaning that all scientific disciplines can and should address environmental issues. This study specifically considers the benefit that can be derived by integrating environmental issues into secondary school physics curriculum. Integration of environmental issues in physics will not only increase students' interest in physics (Pratt, 2006) but also provide skills that can be used in resolving a range of societal issues as citizens. There is also growing interest in the idea of assessing 21st century competencies such as flexible learning, ability to work with unstructured problems, communication, and teamwork as indicators of achievement in Science, Technology, Engineering and Mathematics (STEM) learning (National Research Council (NRC), 2012a). Incorporating environmental issues in a physics class will help promote these competencies in a fundamental way. Owing to the fact that environmental issues are no longer only reserved for professional scientists and policy makers, there is a need for students to gain basic environmental knowledge and skills that can make students to be active citizens. To be constructive and involved citizens, it is imperative to understand, at least at a basic level, the issues and science behind environmental problems. This study looked into the knowledge to be acquired starting from basic level if environmental topics and issues can be integrated into secondary school physics curriculum and taught in the classroom.

Need for Environmental Education in Schools

Modern world is marked by two major concerns: the impact of globalization and apprehension concerning the sustainability of the environment. In response to progressively more pluralistic societies, schools are taking on an explicit role in

preparing future citizens for diverse societies (David, 2017). Similarly, issues of environmental instability and worldwide environmental degradation have resulted in a call for a greater emphasis on environmental education (David, 2017). The environmental challenges confronting the world today require active participation by all citizens. There is an increasingly urgent need to develop a culture of participation among young people who in turn may become future leaders. Finding ways to engage youth as full participants and leaders in environmental initiatives is critical to ensuring a more sustainable future (Gwekwerere, 2014). -

Communities will only reach the potential as vibrant and healthy places when youth are welcomed as full participating members (Nieto & Bode, 2008), young people must be given the opportunity to fully engage in social and justice issues confronting their communities, and adults need to provide safe and supportive environments where young people can thrive and be creative. An important tenet of social justice education is that students become “empowered” when provided with opportunities to engage in learning that aims to rectify social injustices (Chubbuck & Zembylas, 2008; Upadhyay, 2010). Supportive environments have been found to be instrumental in helping young people gain social skills, build confidence and contribute to the communities. Young people’s involvement in activities and organizations offer the possibilities to borrow examples, alternatives, values and norms from social practices outside the families (Jans, 2004). The goal of environmental education programs in schools is to foster responsible environmental behavior and to provide students with the opportunity to actively participate and work with adults to implement change (Upadhyay, 2010).

In coming decades, governments and individuals will confront the reality that the growing human population and its increasing demands for resources will stress the Earth’s limited supplies of fossil fuels, freshwater, and arable land. Edelson (2007) gives four reasons why environmental science should be a component of the curriculum for all high school students; namely: 1) Environmental education topics provide students with the opportunity to both apply the disciplinary science that was learned previously to understand the world and to extend their understanding of disciplinary science; 2) Environmental education provides an opportunity for students to gain a more rounded understanding of contemporary science because it has two features that are absent from the current high school curriculum; 3) Environmental education is interdisciplinary and presents science

that is unresolved, even at the introductory level; and 4) The study of environmental education provides students with the opportunity to see how fundamental physical, chemical, geological, biological and social processes interact to shape the environments where human beings inhabit.

In order to have citizens who are able to make choices affecting the future there is a need to continue educating students about the environment starting from primary schools as Mitchell (2013) notes: “Life is happening now; choices affecting the future are made now”. We will need to expose students to the knowledge that can help the students make choices while conscious of their future. Many scholars are of the view that environmental education is a model for encouraging students to consider behaviour that affects other people and conditions of the environment (Yambert, Dillon, & Donow, 1985). Therefore education must be transformed from the passive, technical, and apolitical orientation that is reflective of most students’ school-based experiences to an active, critical, and politicized life-long endeavor that transcends the boundaries of classrooms and schools. Environmental science has several characteristics that make it a candidate for the core curriculum (Edelson, 2007). According to Edelson (2007) environmental science is:

- i) Important for students and society;
- ii) Representative of contemporary science;
- iii) An opportunity for students to experience an applied science;
- iv) A particularly engaging context for learning fundamental science.

It should be noted that teachers play a key role in environmental literacy of future generations and are influential in educating children and teenagers to be future leaders in protecting the environment ((McKeown & Hopkins, 2002)).

Integration of Environmental Education and Physics

Since 1970s, physics instructors have turned to real-world examples in order to motivate physics learners in particular, connections to ecological crisis (David, 2017) have been viewed as opportunities to not only make physics relevant, but to motivate students by engaging students in investigating a problem that is impacting both the day-to-day lives and their future. Today, interdisciplinary is more the norm than the exception in universities, and thus the notion of a physics course has broadened somewhat (Moll & Kotlicki 2010). Despite this fact, the number of examples of environmentally relevant physics curricula for science majors in recent literature remains low in Nigerian secondary school. People rarely

associate physics with environmental issues. Traditional physics courses spend a lot of time on topics like motion and forces before focusing on energy with its vast environmental implications (Osowiecki, 2011).

Introducing environmental issues in the physics curriculum can help students understand the relevance of physics topics, such as energy and electricity (Osowiecki, 2011) and provide good basis to make one better understand issues concerning the environment. Integrating environmental issues in physics not only promotes production of active citizens but also improves engagement and interest in physics. For example, Pratte (2006) found out that incorporating environmental modules in physics increased a third of his students' desire to take another science class while another quarter of the students expressed an increased interest to teach science. Thus, there is a need to research into effective ways through which physics subject can be integrated with environmental issues in the curriculum and what challenges can face in the process of integration. The research should be aimed at improving the students' attitudes toward physics and the ability to apply physics concepts to useful real-life situations, by incorporating a theme of energy and environment into most aspect of the courses. For example, the concepts of conservation of energy can be explored using the context of home heating and the Earth's energy balance. Kinematics can be taught in the context of transportation and associated energy consumption and fuel efficiency, drawing connections to ideas of energy and environmental impact. Basic concepts in electricity such as voltage, current, and resistance can be covered with examples like home wiring, transmission lines, and electrical energy consumption.

Emphasis should be based on real-life connections to physics concepts that will changed students' attitudes compared to the previous ways. In addition to changing students' attitudes toward physics, the attitudinal changes should also be felt by the instructors which should reflect that the course changes has created a more positive learning atmosphere. That it is more enjoyable to teach than when the course is being taught in a traditional way. Edelson (2007) who contends that in a system where environmental sciences were integrated fully into the curriculum, the sense of purpose for learning science would become internalized and might carry over to other courses as well.

Challenges and Barriers to Integration of Environmental Education in Schools

In spite of all these calls and arguments implementation of environmental education in schools has been met with challenges and hindrances in Nigeria.

Teachers are more likely to produce students who are more environmentally literate if the students are more knowledgeable, have positive attitudes towards the environment, and show concern for environmental problems (Parlo & Butler, 2007). If teachers lack proficiency in their environmental knowledge, skills and commitment, it is unlikely the teachers will be able to effectively lead environmental change in schools (National Environmental Education Advocacy Council, 2005). The inadequate incorporation of environmental education within teacher education both at University and Nigerian Certificate in Education (NCE) programs is one of the obstacles to successful implementation of environmental education both at primary and secondary schools in Nigeria.

A disconnect between environmental education and science subjects in a traditional school setting is also another barrier to integration of environmental education (Parlo & Butler, 2007). Ham and Sewing (1988) also identified four categories of barriers to environmental education as cited in David (2017)

1. Conceptual barriers: those that stem from a lack of consensus about the scope and content of environmental education.
2. Logistical barriers: those stemming from a perceived lack of time, funding, resources, suitable class size and so forth.
3. Educational barriers: those that stem from teachers' misgivings about their own competence to conduct environmental education programs.
4. Attitudinal barriers: those stemming from teachers' attitudes about environmental education and science instruction.

Conclusion

Environmental education is a new focus for education. It is a way of helping individuals and societies to resolve fundamental issues relating to the current and future use of the world's resources. However, simply raising awareness of these issues is insufficient to bring about change. Environmental education will definitely promote the need for personal initiatives and social participation to achieve sustainability especially in Nigeria where criminality is the order of the day, electric power generation is absurd, little job available cannot go round the young school leavers and so on. Environmental education, together with social legislation, sustainable management, and responsible actions by individuals and communities, is an important component of an effective policy framework for protecting and managing the environment. Sustainable development is the organizing principle for meeting human development goals while at the same

time sustaining the ability of natural systems to provide the natural resources and ecosystem services upon which the economy and society depends. The desirable end result is a state of society where living conditions and resource use continue to meet human needs without undermining the integrity and stability of the natural systems.

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