

Chapter 26

Africanizing Science Education: Engaging Students in Context- Based Science Instruction

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ABSTRACT

The development of Science and Technology has been positively associated with every nation's economic well-being and quality of life. Even though the importance of science in people's daily lives may not be readily noticeable, people engage in many science related activities and experiences, most of which enable them to make science-related decisions and choices every day. This implies that science education will continue to shape humanity, the environment, quality of life, sustainability of the planet, and peaceful coexistence. Effective participation in the scientifically and technologically driven world of the 21st Century implies a science education that produces scientifically literate citizens. This chapter provides justification for rethinking the way science education should be done in Africa generally, and Nigeria, in specific. Recommendations were made for the use of context-based science instruction as an effective way to Africanize science instruction.

INTRODUCTION

We live in a world where functionality is significantly shaped by science and technology. Issues ranging from environmental preservation, poverty reduction, health preservation, economic development, and world peace are increasingly dependent on how well we educate our citizenry in the field of science. Science, its development, and the way it is enacted in our schools will continue to influence humanity and the environment with regards to quality of life, sustainability of the planet, and peaceful coexistence. A preponderance of the evidence suggests that not all students have access to the necessary science education. Science needs to be taught in such a way that every student develops a deep conceptual understanding of science, allowing them to productively use the results to solve real life problems. Fortunately, science education has received renewed global attention. This renewed emphasis provides the impetus

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for which this chapter is being conceived and proposed. Using Nigeria as an example, this chapter will focus on issues related to the Africanization of science education. An overview of the African education culture from the pre-colonial era to the present day is given. Furthermore, the chapter will espouse research on effective instruction and efficient science teaching. The Nigerian educational system and culture are reviewed and used as examples of the current state of science education and reform efforts. The chapter will provide suggestions on how science education should be Africanized to make science a reality in Africa.

SCIENCE EDUCATION AND THE NATURE OF SCIENCE

Humans are born with an innate curiosity to explore and conquer the natural world. As an enterprise, science is a process of discovery that helps satisfy this natural curiosity. Conventional wisdom would have required that science be taught in ways that align with the innate abilities associated with curiosity and exploration. Unfortunately, traditional instruction misrepresents science as a body of facts. It uses strategies that encourage rote memorization of science content with a rigid five-step procedure. For decades, this traditional way of teaching science left students with a lack of deep understanding of science content or an inaccurate understanding of the process of scientific inquiry. Students should come away from science classrooms with an appreciation of the natural world—fascinated by its intricacies and excited to learn. They should view and value science as a multi-faceted, flexible process for gaining a better understanding of the world. This view of science should encourage lifelong learning and foster critical thinking and the ability for students to solve their real life problems as they arise. This way of thinking about science should be reflected in science instruction. It should accurately and enthusiastically communicate the real nature of science in order to encourage students to question “how we know what we know.”

Research into science instruction supports the use of teaching strategies implicit in the nature of science. Science education should help students acquire lifelong skills for engaging in scientific inquiry. Science teachers should make explicit key concepts regarding the nature and processes of science. Engaging students in hands-on inquiry enables students to approach scientific enterprise through the metacognitive approach in order to solve problems in the natural world. The metacognitive approach allows students to think critically and creatively as they test, examine, and reorder their ideas about what science is and how science works. To give students practice in situating science within the context of the natural world, teachers should intentionally revisit key concepts about the nature and process of science in ways that help students see the multiple contexts in which science applies to real-life situations. This is particularly needed given the redefinition of the 21st century skills the students are expected to have in order to be adequately prepared to participate in and contribute to modern society (Levy & Murnane, 2005; Stewart, 2010; Wilmarth, 2010).

Extensive empirical evidence supports the notion that students learn more meaningfully when they are engaged in the process of learning, interacting with their peers and real-life materials. This context-based approach has been reported to be effective in improving science teaching and learning (Bennett, Lubben, & Hogarth, 2007; Fensham, 2009; Millar, Leach, & Osborne, 2000; Roth, 1995; Tobin & McRobbie, 1997). It also has the potential to improve student interest in science (Osborne & Dillon, 2008; Sjoberg & Schreiner, 2005). Context-based science teaching and learning are broadly defined as an approach that takes into account the cultural and social environment in which the student, teacher, and institution are

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