THE SCIENTIFIC AND TECHNOLOGICAL LITERACY OF FIRST YEAR PHYSICS STUDENTS: THE EFFECTS OF A TRADITIONAL SCHOOL CURRICULUM

by

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Abstract (491 words)

This study examined the scientific and technological literacy levels of a cohort of first year physics students at the University of Pretoria who experienced a traditional science school curriculum. Inspired by the concept of innovation as advocated in the White Paper on Science and Technology (Department of Arts, Culture, Science and Technology 1997), this study was informed by two innovations. The first innovation was to develop insights and methods to evaluate science and technology literacy levels of learners in South Africa that were consistent with the Outcomes–Based Education (OBE) paradigm. The second innovation was the use of the Strategic Objectives Learning Outcomes (SOLO) taxonomy to evaluate qualitative responses to questions pertaining to technological literacy as a model for addressing the lack of grade-based benchmarks against which to assess learner performance in Curriculum 2005. The study also examined the nature of the traditional science syllabi and teaching practices that the students experienced at school, and how it differed from transformational OBE in science and technology.

The literature search analyzed and traced the evolution of the concepts of scientific and technological literacy against the backdrop of an examination of the underlying concepts of science and technology. The course of this study was shaped by the Mixed Methodology Design Model of combining qualitative and quantitative research methods. The principal research instrument in this study was a questionnaire on science and technology literacy related issues. The qualitative focus of the research was evident in the use of open-ended questions in parts of the questionnaire and their subsequent analysis using the SOLO taxonomy. The quantitative focus of this research manifested itself in the statistical analyses that were administered.

A principal finding related to the nature of the traditional science curriculum was a striking disconnect between the most frequent teaching and learning experiences of the students. By and large, the most frequent teaching methods were traditional in nature. However, the most frequent learning methods were generally more progressive. The impact of the traditional curriculum was defied once again when the impressive scientific literacy levels of the students were revealed. However, the same kind of relationship did not hold true for technological literacy levels of the students which were acceptable but not as impressive as the scientific literacy scores. This differential was defended by the literature, as technology education does not have a structured body of knowledge, concepts, principles, and ideas that define an academic discipline. Therefore, it follows that there is no valid way of determining curriculum content. Hence, the researcher concluded that what was measured may be more accurately described as intuitive technological literacy.

The success of the innovations used in this study has two main implications. First, we can measure scientific and technological literacy levels of the nation and use the results to develop a strategy for scientific and technological advancement. Second, in terms of curriculum transformation, the SOLO taxonomy is a viable and simple method of facilitating learner performance reviews and learner progression.

10 key words:

Science, Technology, Scientific Literacy, Technological Literacy, Outcomes-Based Education, Curriculum 2005, SOLO taxonomy, Mixed Methodology Design Model, Traditional, Transformational.

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