

# Chapter 17

## Curriculum Development and Scientific Research

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### ABSTRACT

*As a science, knowledge created during curriculum development should be both generated and placed within a scientific research corpus, peer reviewed, and published. In the context of science, the knowledge generated during the process of developing curriculum should be generated and placed within the public domain in a scientific manner. This chapter will describe a framework for curriculum development, study and evaluation of research based curricula. It will also provide a description of the framework, which will include three categories of activities and 10 phases that are embedded within those categories. It will propose that curriculum research should provide an ideal context for building a scientific knowledge base for education curriculum development.*

### INTRODUCTION

*Curriculum* can be defined differently depending on who is defining it (Beauchamp, 1986; Eisner, 2002; Gaylen, 1981; Jackson, 1992; Marsh & Willis, 2003; Pinar, Reynolds, Slattery, & Taubman, 1995; Pratt, 1980; Slattery, & Taubman, 1995; Walker, 2003; Wiles & Bondi, 2002). The difference among the definition is quite narrow (Jackson, 1992). This chapter focuses on what is called available curriculum or implemented curriculum which compares with the ideal, adopted, implemented, achieved, or tested curriculum (Burkhardt, Fraser, & Ridgway, 1990). Because usage in this material corresponds with historical (Beauchamp, 1981; Dewey, 1902/1976) and common uses as an available “course of study,” reflected in dictionary definitions (Goodlad & Associates, 1979; Jackson, 1992), from this point on, the “available” will not be used. It is therefore important to note that curriculum is an instructional content for giving readers acceptable values in concepts and procedures (Battista & Clements, 2000; Beauchamp, 1981). In this case, designing and evaluation of any specific curriculum is emphasized where an involvement of a section of curriculum is discussed. Specifically, any curriculum sub-theory is established from a well-grounded curriculum theory (Beauchamp, 1981). Connecting this reading gives an explanation of

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what curriculum theory is. The distinction is clear here; one deals with curriculum development and the other with scientific research (Clements & Battista, 2000; Clements, Battista, Sarama, & Swaminathan, 1997a; Lagemann, 1997; Gravemeijer, 1994b). Scientific research deals with creation of knowledge. Curriculum development has to do with material construction.

The scientific knowledge is considered valuable as it provides information that can be trusted and shared in the scientific scenarios (National Research Council, 2002). Curriculum developers consider the process of curriculum designing science (Brown, 1992; Simon, 1969; Wittmann, 1995) clearly showing how the learning process and developing theories are related (Cobb, Confrey, diSessa, Lehrer, & Schauble, 2003).

In the context of science, the knowledge generated during the process of developing curriculum should be generated and placed within the public domain in a scientific manner.

Scientific knowledge is cumulative in nature and the goal of such advances should be to solve problems encountered in the process of curriculum development (Dewey, 1929; Scardamalia & Bereiter, 1994; Tyler, 1949). Curriculum should be based on research. This implies that all research is social and political (Latour, 1987), which has been evidenced by the impulse researchers are globally laying emphasis on diverse research issues spreading from research issues to research values. A word of caution is in order here, that curriculum research should not be limited to research-to-practice strategies and methods. Other related strategies have been included in this chapter. It is of essence that we note that models with limited research-to-practice strategies constitute to one way investigation results, which do not bring value in itself. Relevant and valid scientific curriculum development should create basic issues that address the three domains of practice, policy and theory.

If these goals have to be achieved, curriculum developers should refer from existing research so that the known can be applied to the anticipated curriculum and revision be visible in accordance with existing models of learning and facilitate relevant evaluation processes (Brown, 1992; Dewey, 1929). In this manner, curriculum development and curriculum research interact quite well, thus providing useful information that is considered gap filling in the scientific research.

Literature is present on the methods of various components discussed in the framework described in this chapter; however, there should be no one methodology that can be said to be detailed in its scope. The following designs are used as examples to stress this point. Design experiments (Brown, 1992; Cobb et al., 2003; The Design-Based Research Collective, 2003), are usually used in conducting formative research to confirm and iteratively refine educational designs based on principles borrowed from previous researches (Collins, Joseph, & Bielaczyc, 2004), to provide a theoretical underpinning for several components of development. But design experiments are often limited to pilot or field testing (Fishman, Marx, Blumenfeld, Krajcik, & Soloway, 2004; NRC Committee, 2004, p. 75), as such, they do not put emphasis on the development of curriculum per se, and do not adequately address the full range of questions of the proposed framework. (The emphasis in design experiments on theory and model development is important, but the proposed framework's main goals are the production of an effective curriculum and educational research answering a comprehensive set of questions. NRC report on evaluating curricular effectiveness (NRC Committee, 2004), is in agreement with several components of the proposed framework but falls short on either curriculum development or formative evaluation, which are key focus in scientific research. It would be purposeful that methodologies in teaching experiments, design experiments and curriculum evaluation be analyzed and synthesized into a coherent, complete curriculum frame so that meaning is established by readers wanting to capture meaning in this field. This chapter will now describe a framework for curriculum development, study and evaluation of

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