Chapter V

Creativity and Ingenuity, Design, and Problem-Solving

Introduction

One of the most used and abused approaches to technology studies in the schools is creative design and technological problem-solving. Current research suggests that it is not clear what students learn, if anything, in many creative design and technological problem-solving activities. Recalling the previous chapters, it is not enough to merely involve students in activities and problems. Emotions, knowledge, and skills must be articulated, organized, and demonstrated. Inferences from mistakes and successes must be drawn. Procedures must be practiced. One of the reasons that creative design and technological problem-solving activities are often without adequate results is that technology teachers tend to take creativity, design and problem-solving for granted. We assume that creativity, design, and problem-solving are automatic components of what we practice in technology studies. However, little is automatic in education. There is more to design and problem-solving than learning methods and resolving technical problems. In this chapter, current research is brought to bear on creative design, ingenuity, and technological problem-solving.

In technology studies, one of our missions is to demystify the processes and products of design and technology. It is not enough to merely teach students to express their creativity, design or solve problems. We use the processes of creative design and problem-solving to disclose self-knowledge and feelings as well as the cultural

and material conditions of subsistence, work, and home life. It is relatively easy to say this is the case. What remains is for us to describe *how* technology teachers can derive knowledge and feelings from technologies. *How does doing lead to knowing?* This chapter explains eleven methods of disclosive analysis for teachers to use with their students to demystify the processes and products of design and technology. The chapter concludes with an explanation of design briefs, an essential tool for engaging students in design and problem-solving.

Creativity, Imagination, and Ingenuity

Can creativity and ingenuity be taught? Can the imagination be nourished? If so, how? What is creativity? A typical library catalogue search for the word "creativity" produces over 1,000 titles, and searches of commercial book dealers on the Internet produces 680,000 titles. The entry of creativity as a keyword in the ERIC (Educational Resource Information Center) database produced 25,348 journal articles in 2001. When one enters the phrase "technology and creativity" into the Google Web search engine, 787,000 sites are listed. An ERIC search using the same phrase produces 1,614 possible journal articles (Lamonde, 2001, pp. 56-58). Coming to terms with creativity is overwhelming. On one hand, the volume of references to creativity reveals its significance. On the other hand, due to this popularity, it is difficult to take it seriously.

Early inquiries into creativity isolated four stages in the creative process: preparation, incubation, illumination, and verification (Wallis, 1926). Not coincidentally, the four stages reflected the stages of problem-solving isolated by Dewey in 1916. Many a teacher attempted to provoke creative thought in their students by walking them through these four stages. Other teachers emphasized Guilford's (1950, 1967) criteria for creative products: ideational fluency, flexibility, elaboration, and originality. Definitions of creativity referred to both the process of reaching a novel achievement and the novel achievement itself. Researchers generally defined creativity as the "recombination of known elements into something new" (Ciardi, 1956) or more currently as "bringing something into being that is original (new, unusual, novel, unexpected) and also valuable (useful, good, adaptive, appropriate)" (Ochse, 1990, p. 2). Rossman''s (1964) classic study, *Industrial Creativity*, identified three characteristics common to inventors: originality, perseverance and imagination. After studying the work of 864 successful (male) inventors, he concluded that "inventing is a learned behavior and there is no evidence that it is intrinsic."

Of course, we want students to reach for novel achievements. Of course, we want unique expressions. Teachers want students to be novel within their world of norms and conformity, to think outside the box. But how novel is novelty if everyone is novel? In order to avoid the pitfalls of defining a creative process or identifying

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