Editorial

Building a Defensible Curriculum Base

Thomas Wright

Educators seem to have a strong desire to relive historical mistakes. During the 1960s, industrial arts innovators divided into three fairly distinct camps. One group could be characterized as the technology camp and was championed by DeVore (1966) and others. Another group was the industry group which was championed by the Ohio State IACP staff (Towers, 1966). A third group was the child-centered group championed by Maley (1973). These people and their followers spent an inordinate amount of time debating the content base for industrial arts and criticizing the other camps' position. However valuable this discourse was, the vast majority of the field was unmoved. Most programs continued to focus their efforts on the skills involved in woodworking, metalworking, and drafting, (Dugger, 1980).

It took the Jacksons Mill Project (Hales and Snyder, n.d.) to cause curriculum innovators to realize that a central focus was necessary if industrial arts programs were to change. For a period of time, the Jackson's Mill curriculum consensus held and significant program improvement occurred.

Today, technology educators are again beginning to divide into camps over curriculum structure issues and to dissipate the focus of the field. There are number of reasons for this split. Some people feel they must make their 'unique' personal contribution to the field. Other leaders are convinced that conditions in their state require a special focus for their state's technology program. Still other people feel that any curriculum structure over five years old is obsolete.

These different positions are dangerous if technology education is to become recognized as a vital area of study for all youth. Instead of everyone going their own way, the leaders of the field must recognize that all subject areas have a fairly stable curriculum structure under which dynamic content fits. For example, science does not change its chemistry, physics, biology, curriculum structure every five years. This action does not cause curriculum stagnation because the content under each of these headings is open for constant review and change.

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The challenge to all technology educators is to apply the same logic as science uses to determine the curriculum focus and structure for the study of technology. This action will require a logical, sequential approach.

First, the arena of the discipline must be established. This action determines the scope of the curriculum. For example, science relies on evidence to develop hypotheses and theories to identify consistent patterns of things and events in the universe (Project 2061, 1989). Its arena, then, is focused on the procedures used to study the natural world and the impacts these findings have on human knowledge.

Technology education also has its focus. Technology is used to create the human-made world. Technologists apply human and physical resources to design, produce, and assess artifacts and systems that control and modify the natural and human-made environments. Also, developing and using technology impacts people, society, and the environment. Therefore the arena of technology is the practices used to develop, produce, and use artifacts and the impacts these actions have on humans and the natural world.

Once the arena of the discipline has been established a second curriculum development step is required. A clear distinction between the 'hows' and 'whys' of technology must be made. For example, the Project 2061 report suggests '...the various scientific disciplines are alike in their reliance on evidence, their use of hypotheses and theories, the kinds of logic used, and much more. Nevertheless, scientists differ greatly from one another in the phenomena they investigate...' This statement suggests there is a fairly common way scientists investigate the universe and that various scientists focus their investigation to specific areas of science.

Technology, likewise, has a way new artifacts are developed. It, also, has an accumulated body of knowledge that explains existing technologies and provides the foundation for new technological advancements. Technology educators need to look at these foci so students can study (1) the processes used by practitioners to develop new technology, (2) the areas of technology which represent the accumulated knowledge of practice, and (3) the impacts of technology. A program that focuses on one of these elements at the exclusion of the others will be incomplete.

However, identifying the primary foci of a program is not enough. The curriculum developer must address each of these foci individually.

Investigating the first focus requires identifying the procedure used to address technological problems and opportunities. This procedure establishes the 'scientific method' of technology. Over time it has been described as the design method (Lindbeck, 1963), problem solving (Waetjen, 1989), and the technological method. A common outline for this process includes (1) defining the problem, (2) developing alternate solutions, (3) selecting a solution, (4) implementing and evaluating the solution, (5) redesigning the solution, and (6) interpreting the solution (Savage and Sterry, 1990).

This procedure describes how technologists approach a problem or opportunity. It describes the way the human-made world is created through discovery, invention, innovation, and development. However, it is only part of a study of technology. The other part becomes clear when the second program focus is describe which will result in developing a system to identify and categorize the accumulate knowledge of technology.

This system must meet the rules for all category systems (Ray and Streichler, 1971):

1. Each entry must be mutually exclusive of other entries.
2. The entries must be totally inclusive of the phenomena being categorized.
3. The system must be functional.

Establishing a way to structure the knowledge of technology causing the profession considerable trauma and is dividing the profession the most. A number of systems have been developed to meet this challenge. Two that seem to have the most promise are the Jackson's Mill (Hales and Snyder, n.d.) human productive activities of communication, construction, manufacturing, and transportation and the Dutch pillars of technology (Wolters, 1989) which allow for studying energy, information and matter (material) processing.

Whichever model the field chooses, one of those listed above or some other, we must resist the product consumption mentality presently being used by some change agents. We need not discard our curriculum structures and philosophical foundations with the frequency we do automobiles and clothing. Chasing fads and personal promotion will do little to develop a credible profession or defensible programs. We urgently need to reach a curriculum compromise in the spirit of Jackson's Mill. Only then can states or local districts address their need for curriculum change with confidence they are not buying into a fad or an incompletely developed curriculum structure.

The third focus of a complete technology education program has received the least attention and may well be the most important. It requires identifying the relationship and interaction among technology, people, society, the environment and other disciplines. Technology is not a natural phenomena. It is the product of human volition.

People saw its development, production, and use as necessary or economically profitable. However, reaching this human vision has positive and negative impacts on people, societies, and the environment.

Likewise, technology is not an isolated body of knowledge. It has strong connections with all other areas of knowledge. Science explains the naturals laws that are applied by technology. Mathematics and mathematical models explain the operation of technological systems. Language and art can be used to describe technology and its impacts. The social studies can describe how technology has, is, and may well impact and be impacted by people and society.

This challenges educators to seek content and course integration. In a recent discussion, an aeronautical engineer (Thompson, 1991) suggested that he didn't see knowledge as discrete subjects like educators do. He said that life's experiences and challenges immediately integrated knowledge. The solutions to the challenges facing society are not the domain of a single discipline.

Clearly defining and describing technological knowledge while seeking its integration with other disciplines will lead the profession, as a whole, to a recognition that (1) technology education is the study of the human-made world, (2) technologists use the technological (problem solving) method to develop new and improved artifacts and systems, (3) technology is used to help people meet their communication, product, and transportation needs and, (4) technology impacts and is impacted by people, society, and the environment.

This four-point philosophy leads us to believe that, like science, there is a generic way to approach a technological problem or opportunity; there are unique practices used to produce, operate, and maintain each device or system; and these actions operated in historical, personal, and societal contexts (see Figure 1). Standing on this solid philosophical ground we can get on with the important task that must be addressed: developing meaningful laboratory-based, action-oriented courses that will introduce students to the exciting field of technology. Only then can we build a case for requiring all students at all grade level to study technology.

Figure 1. A model of the relationship between problem solving, technical actions, and technological contexts.

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