Curriculum Focus for Technology Education

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Determination of a curriculum development paradigm for technology education was identified as a primary concern for the profession (Wicklein, 1993). The lack of focus for curriculum content has created a somewhat disjointed approach to the study of technology. It has also diminished the impact that technology education could have on education and society. Satchwell & Dugger (1996) described the diversity within technology education to be "ranging from basic programs reflective of early manual arts to state-of-the-art technology education programs" (p. 11). Zuga's (1989) seminal research on relating the goals of technology education with curriculum planning identified major curriculum design categories. Curriculum design and development in technology education has centered around these five categories: *(a) technical performance or processes; (b) academic focus on the specific body of knowledge relating to industry and technology; (c) intellectual processes that concentrate on critical thinking and problem solving; (d) social reconstruction through realistic or real world situations; and (e) personal, learner-centered focus on individual needs and interests* (Zuga, 1989). The strengths and weaknesses of each of these design approaches must be evaluated, possibly coordinated, and eventually implemented into technology education curriculum planning if the field is to ever have a central theme or focus.

First Things First

Before technology education, as a profession, can determine the focus of the curriculum we must understand what technology education is supposed to achieve. Significant debate over the past decade has established a fairly consistent rationale for the study of technology and the need for technology education. A reasonable explanation of technology was postulated by Wright, Israel, & Lauda (1993), when they said: "Technology is the practice used to develop, produce, and use artifacts and the impacts these practices have on humans and the natural world." Therefore, technology education should encourage students to study the (a) processes used by practitioners (technologists) to develop new technology (this may include critical thinking and problem solving), (b) areas of technology which represent the accumulated

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knowledge of practice (specific technological applications), and (c) impacts of technology on society and the environment (Wright, 1992). With this as a basis for the field, curriculum development can begin.

As development of curriculum is considered, disagreement arises. Here is where the curricular friction begins to take place and be noticed. For much of the profession the current curriculum framework is little different from the old vocational models used in years past that concentrate on the technical aspects of selected tools and materials. It is packaged differently, modules are used instead of unit shops, computers and robots are used instead of jack planes and handsaws, but the philosophical basis remains the same. Educators concentrate the majority of their efforts on the technical procedures used to create artifacts and give the processes used by technologists and the impacts of technology on society only cursory attention. Students sometimes gain knowledge about the technological processes and the impacts of technology as a by-product of the curriculum. These outcomes occur in a haphazard way, however, rather than through a coordinated curriculum that shares the stage with the major elements of the technology education curriculum.

The Curriculum vs. Application Gap

There is a schizophrenic approach to curriculum design and student learning. There is a serious duality between what professional educators *say* about curriculum in technology education and what is *done* in the classroom. We say technology education should encourage students to study the processes used by technologists to think critically and solve problems. However, at best we present rigid linear models that relegate students to prescriptive solutions as if there was only one approach to the problem. We say technology education should encourage students to study the impacts of technology on society and the environment, yet we devote the vast majority of classroom time to specific and sometimes obscure technical skill development. The gap between what we say in curriculum designs and what we do in the classroom continues and may even be widening. The content of technology education curricula today is more geared toward learning cognitive processes than what has existed in years past with industrial arts. However, the approach that many teachers take to address this curriculum tends to concentrate on technical skill development which differs little with the industrial arts programs of yesteryear. An analysis of the psychological preferences of teachers within the profession has yielded some light on this issue. Wicklein and Rojewski (1995) compared the psychological type profiles of technology and industrial arts educators. Their analysis found a relationship between professional orientation (technology education vs. industrial arts) and psychological type preference. While the industrial arts teachers preferred an introverted, step-by-step approach to learning and teaching, the technology educators preferences leaned to a more extroverted, intuitive approach. Keeping in mind that a large percentage of current technology teachers are *"retooled"* industrial arts teachers, these differences in psychological types start to explain the reason for the gap in curriculum design and classroom application.

Learning About Learning

Curriculum developers within the field of technology education can learn a lot from an analysis of current learning theory. The building block model for education is fundamentally wrong. That is, learning is not a simple linear addition of placing one concept or skill on top of another. Educators have traditionally assumed that schooling directly enables transfer of one topic to another, yet Berryman (1991) aggressively reports otherwise. She maintains that individuals do not predictably use knowledge learned in school in everyday practice, nor do they use everyday knowledge in school settings. Perhaps most important, learners do not predictably transfer learning across school subjects. Berryman writes that context is critical for understanding and thus learning. "[T]he importance of context lies in the meaning that it gives to learning" (p. 11). Furthermore, if learning is to happen "students must have the opportunity to actively use this information themselves and to experience its effects on their own performance" (Bransford & Vye, 1989, p. 188). If knowledge has no apparent application, it may not be perceived as meaningful or readily transferable to other learning situations (Bransford, Sherwood, Hasselbring, Kinzer, & Williams, 1990).

To the extent that schooling is isolated from the community (real life), too many concepts are learned in abstract ways. Learning theorists such as Berryman (1991), Resnick (1987), and Spiro, Coulson, Feltovich, & Anderson (1988) believe that transfer of knowledge is inhibited by learning environments which do little to address community based reality. Lave (1988) addresses this problem by advancing the concept of "authentic activity" which she defines as the ordinary practices of "just plain folks" within a given culture. Rather than using the educational syntax of the classroom, they propose using everyday activities as a means of providing contextualized or situated learning. This places learners in a free and more relevant classroom shared by a community of active learners.

Much learning takes place through social interaction, although it generally goes unnoticed. Rather than a classroom of individuals learning on their own, learning may be best accomplished through a small community of learners working together. For example, individual views regarding a particular topic are presented to the class, but later (i.e., after discussion and presentation of all the views within the community of learners) students are given the opportunity to revise their views. Any revisions reflect learning (a revision of thought processes). This means that the community of learners should be doing a lot of talking in an atmosphere based upon trust and mutual respect. The teacher's role shifts from the giver of knowledge to that of a facilitator who shares dialogue while challenging students to back up their claims.

All of this applies to the way educators within the field of technology education focus the curriculum. Current modes of delivering technology education curriculum activate certain aspects of learning theory but often come up short from delivering the total package. The modular curriculum which is so pervasive within the field today begins to address collaborative, "authentic" real world learning opportunities; however, it tends to be restrictive (limited in scope, collaboration, and sequence), disconnected (limited in transfer potential and unrealistic), and lacking a reality based learning context (hypothetically abstract). Rather than focusing in on the development of student learning skills, we remain enamored by the gadgetry of the technology itself. Rather than contribute to helping students develop the thinking skills where technology is used to solve problems within our society, we concentrate on the technical application of a few select technologies. Students are often left with minor technical skills and an unreflective assumption that all technology is good. Rather than help students develop a balanced perspective of the impact that technology has on society, we often present it as a power in and of itself that we as citizens have little or no power to control. Technology becomes this great sign of success and progress that is often beyond our ability to understand and therefore, must be accepted and applied simply because it exists rather than because it adds significantly to the society. As teachers of technology we can do more to aid students to become more proactive in the use of technology to solve problems rather than trainers of isolated technical skills.

Practice of Technology

The concern over technical skill development is another critical issue with regards to curriculum design in technology education. The debate over the types and degrees of tool skills associated with technology education continues to draw much concern throughout the profession. Current practices range from serious semi-vocational high-tech skill training to basic orientations with simple hand tools. The consternation that many technology educators experience with this topic has led to a polarization within the profession; the question over the types, quantities, and approaches used in the education about tool skills continues to loom over the technology education curriculum. Regardless of which philosophy is most appropriate in this matter, the need to address the practice of technology will remain as one of the constants within the curriculum, because this is one of the unique features of technology education. Perhaps a suitable solution to this dilemma would be to examine and coordinate tool skill development with *the processes used by technologists to solve problems* (e.g., learning technical design skills to help in the solution of a production problem). By doing this the tool skills would be serving a need rather than standing alone as unconnected activities within the curriculum. Technical skills have unique and historical roots within the field of technology education and industrial arts, classroom activities related to tool use have been an important motivator for many students over the years. It is literally impossible to address the study of technology in any practical terms without considering some application of tool skills. The critical issue is, to what degree should the curriculum be devoted to technical skill training? Historically, educators within technology education have given an exorbitant amount of instructional time to this area while slighting many of the other facets of the curriculum. An appropriate balance of tool skills with other curriculum areas is a key to a healthy curriculum.

Perspective of Technology

A missing link in our new curriculum is ‘perspective’. Perspective, in this case, indicates the need to examine - not just where we are and where we are going with technology - but where we have been. With current curricular approaches in technology education students will emerge with a lopsided view of reality if educators do not address the entire progression of technology: past, present and future.

The question of where to draw the line in the scope of studying the historical, present, and future issues within a given subject is often critical for teachers but according to Neil Postman, author of *Technopoly* (1992), this is of little importance.

> Perhaps the most important contribution schools can make to the education of our youth is to give them a sense of coherence in their studies, a sense of purpose, meaning, and interconnectedness in what they learn (Postman, p. 185-186). Postman continues, Modern secular education is failing not because it doesn’t teach who Ginger Rogers, Norman Mailer, and a thousand other people are but because it has no moral, social, or intellectual center. There is no set of ideas or attitudes that permeates all parts of the curriculum. The curriculum is not, in fact, a “course of study” at all, but a meaningless hodgepodge of subjects. It does not even put forward a clear vision of what constitutes an educated person, unless it is a person who possesses “skills.” In other words, a technocrat’s ideal - a person with no commitment and no point of view but with plenty of marketable skills. (p. 186)

Postman’s perspective of the historical component of education is essential to a complete understanding of present day conditions. The development of modern industrial societies was not possible without the evolution of technology. To truly educate students within our field the concept of technology’s history must be integral in the technology education curriculum. As Cicero put it, “To remain ignorant of things that happened before you were born is to remain a child.” According to Postman (1992) “every teacher must be a history teacher.” (p. 189) Without an understanding of the history of technology we as a society cannot completely understand or appreciate humanity’s confrontation with nature and learn of our limits with regard to nature.

So where do we draw the proverbial line between past and present? Is there, in actuality, a line to be drawn? At what point do we limit our curriculum perspective of technology? Why should our technological past be compartmentalized within our curriculum? These questions lead us to an understanding that technology is relative to time and culture, we can learn important lessons from the many technological developments of our past. This is wonderful food for thought and makes the study of technology thoroughly enthralling to students. Perhaps they will be the ones to answer some of the 'unsolved mysteries of the universe', if given an opportunity. Many educators would deem it obvious that to deny our technology education students a chance, through the curriculum, to delve into contrasting cultures of the past and present is pure tunnel vision. Cultural continuity gives sustenance to the study of technology.

Technology education aside from its more utilitarian, 'hands on' application is a valuable tool for discovering more about ourselves. Incorporating the technological process, in its entirety, into the technology education curriculum is essential for a far-reaching and quality program. It would be an incredible injustice to put limitations on our field of study, we need technology education to be comprehensive and stimulating.

Career Orientation & Awareness

Providing opportunities for students to be exposed to and learn about specific careers related to technology is an essential ingredient of the technology education curriculum. By presenting opportunities to experience technologies influence on solving problems, students are made aware of a variety of careers options. The question over what type of technological experiences to include in the curriculum has continued to be a point of concern for many technology teachers. Choices of technological topics vary drastically from program to program, with little attention given to the underlying needs for the experience (e.g., flight module - students learn basic principles of aerodynamics but seem to concentrate mostly on manipulating the flight simulator). A possible solution may be in an examination and implementation of content identified in the National Critical Technologies Report, a bi-annual report required by law and submitted by The Office of the President. The content of this report would provide an accurate, up-to-date analysis of the critical technologies that are impacting on the national economy and provide a strong basis for the technical and career options of the curriculum. This approach combined with local and regional career opportunities would begin to address some of the occupational needs of students.

Summary

It is difficult to determine the curriculum focus for technology education; the literature comprises a rather eclectic presentation of curriculum paths. Perhaps the most comprehensive plan for developing curriculum in recent times was identified in the *Conceptual Framework for Technology Education* (Savage and Sterry, 1991). However, even this model for technology education has not achieved universal acceptance and implementation within the field. The obstacles preventing the creation of a strong curriculum theory for technology education must be removed if the profession is attain the deep roots that are necessary to become a respected field of study. Current developments with the *Technology for All Americans Project* may help in creating this curriculum base for the field however, technology educators will need to address some very significant philosophical issues before this can happen.

The era of the independent technology teacher determining the content of curriculum based on personal interests is quickly becoming a practice of the past. As a unique field of study it is imperative that we understand the critical elements for our curriculum and then implement a convergent curriculum that addresses technology education comprehensively. To accomplish this we must be committed to confronting the following criteria.

1. Identification of curriculum themes based on what we really know about the study of technology, the processes used by technologists to solve problems, and the impact technology has on society. We must be able to get beyond our infatuation with the technical gadgetry.
2. An understanding of how people learn and discerning the most effective methods for utilizing this learning. Learning theory must be a strong focal point for the curriculum we develop for technology education. This may mean challenging and possibly changing some of our existing instructional approaches to better serve the learners.
3. Commitment on behalf of the entire profession (i.e., teachers, teacher educators, professional associations, administrators, supervisors, textbook publishers, equipment suppliers, etc.) to rethink, reskill, reorganize, and apply a thematically focused curriculum in the classroom.

The need for a curriculum focus will not be solved by select groups of educators working independently but will only succeed when the profession as a whole understands that a united approach to technology education is essential for a viable field of study. Technology education curricula has the potential to be strong and vital for all schools with many options available for teachers and students. However, the important component of curriculum focus is currently not targeted as definitively as needed for the profession to move forward vigorously to take its rightful place within the education community. If we are serious about making technology education a core subject in American schools then we must think about, plan, and implement our curriculum with consistency and focused vision.

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