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At Issue: The Three "Faces" of Technology Education

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Abstract

There are three "faces" of Technology Education. What is meant by this? It means that more emphasis should be given to the students who take industrial technology education (ITE) classes at the high school level with less emphasis given to standards, objectives, or outcomes developed by national organizations. Viewed in this light, three different faces, or types of students, can be envisioned as being served by ITE programs. The first face seen is that of a young person wearing safety glasses, a hard hat, and with a pencil behind one ear. The second face is that of a young person wearing safety glasses who is holding an iPod listening to music. The third face is that of a young person wearing safety glasses who is operating a graphing calculator. The purpose of this paper is to identify the three "faces" of ITE, to show how current curriculums address the first and third "faces", and to suggest how the second "face" should be supported.

Identifying the Three "Faces" of Technology Education

The first student type is made up of students who see high school as the end of their professional education. These students want to work when they complete high school. Making money is a key motivation. These students will become our carpenters, machinists, CAD designers, printers, and auto mechanics, just to name a few. Most people recognize these professions as career and technical occupations. The type of high school instruction that provides this type of education typically consists of learning entry level skills and is known as Career & Technical Education. At some point these students may pursue further training at technical centers or colleges.

The second student type is made up of students who see high school as a passage to the next level. These students make up a large proportion of students in high school. These could be called the "typical" student. These college bound students will become teachers, health care professionals, lawyers, industry professionals, and business people. These students take technology classes just because they want to. They want hands-on activities that produce something of value. These students are most satisfied with what would be considered a shop or drafting class. The knowledge that they gain will stay with them all of their lives. They are not necessarily interested in an industrial career or becoming technologically literate related to the huge content base represented by "technology". These students are already typically more technologically literate than most teachers by the time they get to high school.

The last student type is made up of those gifted in academic skills. They see high school as a stepping stone to more intense education. This student type represents the smallest proportion of students in high school. University education is a given for these students and they will not have much difficulty at either the high school or higher education levels due to their abilities. These students excel in challenging concepts and they will become engineers, physicists, researchers, and mathematicians. These students are most satisfied with courses that base their content in Science, Technology, Engineering, and Mathematics, known as STEM content areas. STEM will be further examined within this paper.

The student types listed above represent students that are served by ITE. Unfortunately the second student type, or "typical" student, is not being well served with the curriculums being emphasized within our current organizations. It is evident that ITE programs are set up either to be Career and Technical Education or STEM based Technological Literacy Education. What about the needs of those students who have no intentions of becoming engineers or carpenters, but want to be able to use their hands with their minds to accomplish something "real" for the purpose of expanding their educational experience? What curriculums are being supported by our national organizations that provide good practical applied technology? Can this type of education be found in what is being supported now? No, because it does not fit well with the purposes of either Career and Technical Education or ITEEA's (International Technology & Engineering Educators Association) version of Technology Education. Following is an overview of the purposes of Career & Technical Education and Technological Literacy as proposed by ITEEA and explanations of how the outcomes of these two content areas do not fit the needs of the "typical" student.

Career & Technical Education

The main goal of Career & Technical Education is to provide leadership in developing an educated, prepared, adaptable and competitive workforce (Association for Career and Technical Education, 2011). This type of education at the high school level is about learning entry level skills. Many technology education programs follow this concept and acquire funding for career and technical education.

The State of Kansas Department of Education, with which the author is most familiar, has developed a model with six clusters. These clusters include: Arts, Communication, and Information; Business, Marketing, and Management; Environmental and Agricultural Systems; Health Science; Human Resources and Services; and Industrial, Manufacturing, and Engineering Systems. Within these clusters can be found numerous knowledge and skills areas. This model contains eleven academic and technical skills including; employability; ethics; systems; teamwork; career development; problem solving; critical thinking; information technology application; legal responsibilities; communication; and health, safety, and environment. The Kansas model even breaks career and technical education into five school levels. These levels include; Career Awareness (Elementary School), Career Exploration (Middle School), Career Preparation & Applications (Secondary), Career Preparation & Applications (Postsecondary), and Career (Lifelong Learning) (Kansas State Department of Education, 2008).

Many of the components found in this model would work well for the "typical" student who just wants to work with his or her hands. The main drawback with these types of classes is that at the high school level they should be designed to prepare a student for entry level skills and employment after high school. The typical student, or second type of student, is really not interested in starting a career after high school. This student will attend a college or university right after high school. Of course that does not mean that this student will not eventually end up in a technical occupation.

ITEEA's Technology Education

The current approach to Technology Education is based on Technological Literacy which is "the ability to use, manage, assess, and understand technology" (Technology – Education, 2010). So, what is technology? Technology is "the cumulative sum of human means developed in response to society's needs or desires to systematically solve problems" (Markert & Backer, 2010, p13). The problem with the study of all technology is the sheer mass of information that could be studied with this concept. ITEEA has developed twenty standards organized into five categories for the study of technology. Here are the five categories:

* The Nature of Technology--characteristics and scope of technology; core concepts of technology; the relationships among technologies and connections between technology and other fields
* Technology and Society--cultural, social, economic, and political effects of technology; effects of technology on the environment; role of society in the development and use of technology; influence of technology on history
* Design--attributes of design; engineering design; role of troubleshooting, research and development, invention and innovation, experimentation in problem solving
* Abilities for a Technological World--apply the design process; use and maintain technological products and systems; assess the impact of products and systems
* The Designed World--medical technologies; agricultural and related biotechnologies; energy and power technologies; information and communication technologies; transportation technologies;

manufacturing technologies; construction technologies (Eric Digests, 2001)

These are very good concepts for a general education curriculum especially at the elementary and junior high school levels to give students a good overview of what technology is in its many forms; however, technology as a whole is so large that a person could study his or her whole life and still only get a superficial understanding of some of the concepts.

Recently ITEEA has moved toward an academic discipline by becoming more and more involved with STEM, which is an approach to education that is designed to revolutionize the teaching of subject areas such as mathematics and science by incorporating technology and engineering into regular curriculums by creating a meta-discipline (Fioriello, 2010). Offshoots from STEM include curriculums that are designed more for the academic student such as the two similar programs *Project Lead the Way* and *Engineering by Design*. *Project Lead the Way* is a program designed to serve middle school and high school students of diverse backgrounds from those already interested in STEM-related fields to those who are more inspired by the application of STEM than they are by traditional math and science courses. Students will have the opportunity to create, design and build things like robots and cars, applying what they are learning in math and science to the world's grand challenges (Project Lead the Way, 2011). *Engineering by Design* is a program committed to providing technological study that challenges students and facilitates creativity, enabling all students to meet local, state, and national technological literacy standards. Students are prepared to engage in STEM related activities in the high school years and beyond (Idaho Engineering Technology Education, 2011).

ITEEA's version of technology education is valid but it still ignores the needs of the "typical" student who desires hands-on activities for the sheer pleasure of it.

Three Equal Fields

This paper is not a proposal for getting rid of anything currently being taught that is considered technology education. What is being proposed is that our national organizations should show support for general hands-on, applied technology classes at the junior high school and high school levels, and if there is no support from these organizations then there should be a separate organization developed that is dedicated to applied technology classes that are student centered rather than content or career centered.

Three distinct curriculums or fields can be envisioned with names such as Career Technology, Applied Technology, and Academic Technology. Career Technology and Academic Technology have been explained above, and would remain as they are, but Applied Technology would be developed to serve the second student type which was described previously.

Applied Technology could be developed using the best aspects of Industrial Arts curriculums. This concept may be disconcerting to some since a great deal of time and money has been spent trying to throw away industrial arts concepts. But before putting this article down in disgust, please read on. As stated at the beginning of the paper the "students" who are served by technology education curriculums should be considered rather than highly held standards or models. There are many very good objectives that were developed for Industrial Arts programs that provide a valid content area for students who want hands-on, real, activities. Here are nine objectives that would suit the needs of the typical student seeking practical applied technology experiences:

1. Student Centered - provides a ready avenue of self-expression for large numbers of persons who find many other avenues for such experiences closed.
2. Appreciation & Use – to develop in each pupil an appreciation of good design, materials, and workmanship.
3. Self-Realization & Use – to develop in each pupil the habits of self-reliance and resourcefulness in meeting practical situations.
4. Cooperative Attitudes - to develop in each pupil a readiness to assist others and to join in socially accepted group undertakings.
5. Health & Safety - to develop in each pupil desirable attitudes and practices with respect to health and safety in the use of materials, tools, and machines.
6. Interest in Achievement - to develop in each pupil a feeling of pride to do useful things and to develop certain worthy free-time interests.
7. Habit of Orderly Performance - to develop in each pupil the habit of an orderly and efficient performance of any task
8. Drawing & Design - to develop in each pupil an understanding of all kinds of common graphic representations and the ability to express ideas by means of drawings and sketches.
9. Practical Skills & Knowledge - to develop in each pupil skill in the use of common tools and machines, and an understanding of the problems involved in building products. (Giachino & Gallington, 1977)

These are very simple, student centered, objectives. This applied technology concept should be considered as “foundational education”. Achieving the goals listed above “is” the justification for providing it. There is no underlying intent to be tied to academic subjects, nor does it imply that it is for career skills. Could students take the skills that they learn in these classes and actually go to work using those skills? Most certainly, they have in the past. Would students use engineering design techniques to build things? Of course, well developed Industrial Arts courses did, and still do in many school districts. They also use the components of engineering such as, mathematics, drafting, design, and the scientific method.

Applied Technology courses should not compete with the other two fields, they should complement them. Students should be free to move among the three fields using skill and knowledge to enhance advanced courses. Here are a few examples of how this could work. A student taking an Applied course in Welding would be better prepared to take an Academic Technology course in Robotics Design or Electric Car Design because that student would have the skill to correctly weld components together. A student who takes an Applied Furniture course may be interested in getting into a Career Cabinetmaking program. A student in a Career Drafting program may wish to take an Applied Advanced CAD course because it would fit into his schedule and give him more experience.

Conclusion

If, in fact, there are "three faces of industrial technology education" then there should be three avenues for students to choose from. Each one of these fields have distinct purposes and should complement instead of compete against each other. Students should be free to move easily among the three fields. All three fields should be equally respected.

It is past time for teachers to be allowed to say "shop class" without having to put a quarter in a jar. With our country's economy, the citizens of the country may need to have more practical skills because they may not have the money for a repairman to come in and replace a switch plate. There may not be as great a demand for engineers as there will be for people with basic Industrial Arts skills.

Author

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