Journal of
INDUSTRIAL
TECHNOLOGY

Volume 15, Number 2 - February 1999 to April 1999

An Outline for the Study of Using Technology

By Dr. Jim Flowers

KEYWORD SEARCH

Curriculum

Reviewed Article

The Official Electronic Publication of the National Association of Industrial Technology • www.nait.org
© 1999

An Outline for the Study of Using Technology

By Dr. Jim Flowers

Jim Flowers is an Assistant Professor in the Department of Industry and Technology at Ball State University in Muncie, Indiana. He was named the Department's Outstanding Teacher of 1998. He received a Bachelors Degree in Philosophy and a Bachelors Degree in Industrial Arts in 1980 from SUNY/Buffalo State College. He received a Masters in Tech Ed in 1986 and a Ph.D. in Wood Science 1990, both from West Virginia University.

Arguments offered in support of the study of technology often cite the pervasiveness of technology in our present day. People drive automobiles, use computers and cell phones, watch television, use the Internet, and generally rely on a host of manufactured and constructed products. However, public school curriculum in technology education seems to concentrate on the creation or transfer of technology. Students often design new products and systems to solve technological problems. There is a discrepancy between the "use of technology" that seems ubiquitous, and the "creation of technology" which is studied in school. While creating technology may well be a critical need (although this point is open to dispute), an even greater need for the general populace is an understanding of the wise use of technology.

In the last few decades, a number of movements in technology education, including Appropriate Technology, Technological Literacy, and especially Design and Technology, seemed to allude to a need to better understand how people use Technology. As the emphasis on design in technology education increases, it becomes increasingly important to study how products are used and to use that information as input in designing better products. Chen and Chang (1996) suggested that industrial technology students examine the (internal) design requirements of the manufacturing system, as well as those of the (external) end user. Nielsen (1993) identified product characteristics associated with ease of use: efficiency, error prevention and recovery, memorability, and user satisfaction. Rubin (1994) examined problems associated with hard-to-use products, developing three principles of user centered design: "An early focus on users and tasks . . . . Empirical measurement of product usage . . . . Iterative design whereby a product is designed, modified, and tested repeatedly" (p.12). Others have developed and tested methodologies for examining usability (Sugar and Boling, 1995).

McCade (1990) suggested that teaching design be coupled with teaching troubleshooting, but noted the need to educate technological consumers: "Wise producers and consumers of technology must be capable of the type of critical thinking necessary to see beyond the shallow, short-term considerations and select the most appropriate technologies" (p. 37).

In technology education classes, the problem-solving approach to technology is often reactive, not proactive. Technology teachers supply students with problem statements and ask them to develop their own solutions. While this approach may offer many benefits for students, some teachers go even farther, asking students to develop their own problem statements. This is teaching students how to better react to technology and to their environment. But consider a comparison to the job of a dentist, whose goal is not just to fill our cavities (i.e., solve problems), but to help us use and maintain our teeth and gums in such a way as to minimize the occurrence of such problems. Ideally, there would be no dental problems to solve, because of a wise approach to using and maintaining healthy teeth and gums. Similarly, a technology teacher could encourage students to take a more proactive approach by helping them to analyze the use of technological products and services and then to develop a sound and responsible approach to that use.

In recognition of the need to address the study of the use of technology in curriculum, the Technology For All Americans Project (ITEA, 1996) published a new structure for the study of technology that listed only four processes: designing and developing technological systems, determining and controlling the behavior of technological systems, utilizing technology systems, and assessing the impact and consequences of technological systems. Utilizing technology must be addressed in new technology curriculum, yet it could seem so foreign to typical technology education that many teachers would think it inappropriate, and neither desire to learn about it nor to help their students study it.

In order to address the need to study the use of technology, a new course has been developed for technology education majors at Ball State University in Muncie, Indiana. The course is entitled "Using and Assessing Technology," and as of 1998 it is listed as a required course in the both the technology education curriculum and in an interdepartmental minor called Technology and the Environment. The course includes an introductory unit on technology, a unit on using technology from the approach of the individual user, and a unit on formal and large-scale technology assessment. The following content outline for the course's unit on "using technology" may prove helpful in describing the richness and importance of this study. The unit is designed for the college sophomore and a seven-week time frame. It is situated after an introductory unit, and prior to a unit on "assessing technology."

Using technology:
the individual end user
- A. Variety of uses
- B. Choosing
  1. Availability and access
  2. Education
     a. Learning about options
     b. Sources of information and misinformation
     c. Life-cycle of the technology
  3. Criteria to evaluate the appropriateness of the choices
     a. Utility
     b. Aesthetics
     c. Economics (value)
     d. Human interface (ergonomics)
     e. Social appeal
     f. Environmental soundness
     g. Personal appeal
     h. Appropriate service availability
     i. Timing (seasonality, market, billing, etc.)
     j. Personal resource availability (more than just money)
     k. Other
  4. Logistics of choosing and purchasing
  5. Effects of the choice
- C. Initiation of new technology
  1. Installation and assembly
  2. Training
  3. Self-familiarization
  4. Documentation
- D. Operation
  1. Requisite resources and knowledge
  2. Approach
  3. Assistance
  4. Safety
  5. Efficiency
  6. Feedback
- E. Maintenance
  1. User-maintenance
  2. Specialist-maintenance
  3. Sources of information
- F. Security
- G. Record-keeping
- H. Alterations and upgrades
- I. Evaluation
  1. Evaluating the appropriateness of the existing technology
     a. Usability testing
        (1) Procedure
        (2) Analysis
  2. Options in utilization to improve utility
  3. Establishing criteria to aid in disposition or replacement decisions
- J. Disposal
  1. Social responsibilities
  2. Environmental responsibilities
- K. Effects on the individual
  1. Changes in activities and time allocation
  2. Different options
  3. Different responsibilities
  4. Different resource levels may be available
  5. Altered view of self (empowerment)
  6. Gains and losses
- L. Sound personal philosophies of the responsible use of technology

Although this is not a typical laboratory course, students have numerous hands-on activities with new technologies. However, the primary study is not the technology itself, but instead the technology - user partnership (or lack thereof). Typical activities may include evaluating and writing users manuals or installation guides, performing usability tests with volunteers who are confronted with a new technology, matching product life cycles with human life cycles, developing comprehensive maintenance schedules, and evaluating case studies where the study of technological use (or its lack or shortcomings) has been a critical factor.

Many of the students will eventually be responsible for purchasing, using, and maintaining equipment, either in a school or in industry. An added benefit of this course may be a more closely examined approach to equipment use by the instructor and the students.

Even with this new course, the study of using technology represents only about 1% of the four-year curriculum for technology education majors at Ball State University. Much larger percentages are devoted to technological design, production and control. However, this course represents the initial response by the faculty to address a vital, yet often overlooked area.

References

Chen, J., & Chang, T. (1996). Design for manufacturing: An industrial technology point of view. Journal of Industrial Technology, 12(4), 11-16.

ITEA. (1996). Technology for all Americans. Reston, VA: International Technology Education Association

McCade, J. (1990.) Problem solving: Much more than just design. Journal of Technology Education, 2(1), 28-42.

Nielsen, J. (1993). Usability engineering. Boston, MA: Academic Press.

Rubin, J. (1994). Handbook of usability testing: How to plan, design, and conduct effective tests. New York: Wiley Technical Communication Library.

Sugar, W., & Boling, E. (1995, February). User-centered innovation: A model for "early usability testing". Paper presented at the 1995 Annual National Convention of the Association for Educational Communications and Technology, Anaheim, CA.