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The Status of Ethics in Technology Education

Chapter 6

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Ethics is not a new concept within technology education. The inclusion of ethics evolved naturally from the progression of technological activity in the latter part of the twentieth century. During this shift to a postindustrial society, people started to look at technology from a more humanistic view than they previously had. To keep pace with these changes, a "new ethic" was suggested to help advance technological literacy by highlighting the relationship between humans, the environment, and technology (DeVore, 1980, 1991).

How far have we come? This chapter reviews the current state of ethics within technology education. In the first two sections, materials for classroom instruction, including textbooks and modular materials, are examined. The third section discusses and recommends resources and practices that appear in professional literature. A survey of international technology education and ethics constitutes the fourth section. The chapter concludes with a look at professional ethics as they relate to technology teachers, teacher educators, and administrators.

ETHICS MATERIALS IN TEXTBOOKS AND OTHER PRINTED MATTER

This section focuses on the incorporation of ethics in textbooks and other printed materials that are available for use in technology education programs. Five textbook publishers were invited to participate in a survey intended to identify ethics-related materials that are available within various components of technology education. The survey was not designed to critique textbook publisher materials. The companies were asked if they produced curriculum materials that contained instruction in ethics. Two

textbook publishers, Goodheart-Willcox and Pearson Education, chose to participate in the study. Both of these publishers identified that they produced curriculum materials containing instruction in ethics, including textbooks and/or workbooks as well as teacher instructional materials. One of the two vendors also stated that in addition to the textbook and/or workbooks and teacher materials, they also produce student-centered activities and software/multimedia materials. Both vendors provide curriculum materials for grades 6–8, but one also generates instructional materials for high school students that incorporate ethics. In their responses, representatives from Goodheart-Willcox and Pearson Education stated that their curriculum materials are aligned with *Standards for Technological Literacy: Content for the Study of Technology* (International Technology Education Association [ITEA], 2000). In addition, one of the vendor's materials are aligned with the Texas Education Agency.

Topics Covered

The 20 *Standards for Technological Literacy* highlight 17 areas that are important for students to study to become technologically literate. Participants of the survey were asked to identify which of the following categories their curriculum materials teach about ethics:

1. Characteristics and scope of technology
2. Core concepts of technology (systems, resources, requirements, optimization, and trade-offs)
3. Relationships among technologies and connections between technology and other fields
4. Cultural, social, economic, and political effects of technology
5. The effects of technology on the environment
6. The role of society in the development and use of technology
7. The influence of technology on history
8. Design
9. Problem solving
10. The impacts of products and systems
11. Medical
12. Agricultural and biotechnology
13. Energy and transportation

14. Information and communication
15. Transportation
16. Manufacturing
17. Construction

One of the textbook vendor respondents stated that their curriculum materials incorporate ethics with all 17 of the categories identified in the *Standards for Technological Literacy.* The other representative stated that their ethics materials incorporate all of the categories excluding the influence of technology on history and the impacts of products and systems.

Presentation Strategies

Publishing companies were asked to identify the presentation strategies utilized in their textbooks or other printed materials when incorporating ethics. In their surveys, both of the participating providers of textbooks and other printed materials stated that ethics-related instruction was presented in their materials through reading and writing activities as well as through teacher presentations; however, the intensity of the instruction varied between the two. One vendor identified the ethics-related curriculum materials as comprehensive, including several lessons or activities and, in addition to the reading, writing, and teacher activities, also used research, discussion, and debate as presentation strategies. The other vendor indicated that ethics was mentioned in the materials, but no specific lessons or activities for teaching ethics were included.

Expected Outcomes

The textbook publishers were asked to identify the strategies in which students were assessed. Both respondents indicated that assessment was performed through written work (excluding tests or quizzes) and student presentations. One of the companies also identified tests and quizzes as well as class or group discussions as strategies for assessment.

To determine the effectiveness of the curriculum incorporating ethics, both companies' materials were reviewed through instructor surveys prior to publication and after dissemination. One of the companies also utilized student surveys to review the effectiveness of the materials. In addition to being reviewed prior to publication, one of the companies also field-tested their materials. Both companies' instructional materials are standards-based to ensure effectiveness.

ETHICS MATERIALS IN MODULAR ACTIVITIES

The following section focuses on how well ethics has been incorporated into vendor-generated modules. Similar to the preceding textbook section, vendors were invited to participate in a survey to reveal insight on current ethics instruction within technology education. The purpose of the survey was strictly to identify what is available, not critique vendor-developed materials. Twelve vendors were identified from professional publications and participation in professional conferences, primarily the annual conference of the International Technology Education Association (ITEA). Out of the 12 vendors approached, Applied Educational Systems, Inc., DEPCO, Inc., Hearlihy, and Lab Volt Systems chose to participate in the study.

Brief Overview of Modular Technology Education

The evolution of technology education out of industrial arts has encompassed a variety of curriculum approaches. According to Warner (1959), technology education "derived via socioeconomic analysis of technology and not by job or trade analysis of the commoner village trades, such as those of the carpenter, the blacksmith, the cabinet maker . . ." This approach to teaching the curriculum emphasized the organizing of content on human activity rather than on tool skills. Olson (1963) added that the technology curriculum should include the analysis of the function of the personal life. He interpreted this as comprising anything from one's occupational life to one's recreational life. Accordingly, the curriculum was to emphasize not only human activity, but also tool skills. Thus began the struggle for technology education to define the best approach for teaching its curriculum.

The Industrial Arts Curriculum Project (IACP) embarked on this process in 1968 by initiating the inclusion of "practices used to change materials to add to their worth and the problems associated with creating these changes" (Wright, 1995). Again, the curriculum included both tool skills and human activity. However, for the first time, the curriculum incorporated the impact technology was having on our world. Despite these early curriculum advances, the 1980s proved to be the decade with the most influential changes in the technology education curriculum and its approaches (Dugger and Yung, 1995). Even though the term module had been used to describe individualized learning units since the 1970s (Reed, 2001a), it was not until the mid-1980s when Industrial Arts was changed to

Technology Education that the modular approach to technology education (MATE) began to take root in the technology labs (Dean, 1997).

Early instructional modules were developed as general education tools and were influenced by the Gestalt principle of summation and the teaching machines of B. F. Skinner (Reed, 2001a). Skinner's machines incorporated small instructional steps, active student involvement, immediate confirmation or reinforcement, and self-pacing. Similarly, the MATE requires students to assimilate knowledge from reading, watching videos, and working through software to solve problems utilizing technological tools of today through self-paced, hands-on activities. Accordingly, MATE is defined as ". . . completely (or nearly completely) organized such that students rotate among content modules in which all of the instructional materials and equipment are provided, requiring minimal assistance or instruction from the teacher" (Brusic and LaPorte, 2000, p. 8).

Although only about one-sixth of the technology education labs in the United States were identified as modular in a recent national study, about half of the survey respondents incorporated some form of vendor-generated curriculum (Sanders, 2001). Obviously, modular technology education and vendor curriculum have opened a new venue for technology vendors. For a detailed account of one company's development in this area, Dean (1997) provides a history of PITSCO, Inc., which is one of technology education's most prominent module suppliers.

Hence, another caveat in the ongoing struggle for technology education is to define the best approach for teaching. According to Petrina (1993), ". . . corporate MATEs admit only selected views and ideologies on the social and cultural interaction with technology. Shaped by corporate values and market interests, corporate MATEs basically amount to 'company' views of the technological world; and consequently, determine *what* and *whose* knowledge is legitimate" (italics original, p. 77). This same issue is important when considering whose view of ethics should be taught (Hill and Dewey, 2001). Corporate modules are costly, but they are a contemporary approach for a dynamic program that still covers the basics of technology while producing technologically literate students (R. Barker, personal communication, January 23, 1998).

Identifying Included Ethics Topics

According to the vendor surveys for this chapter, all participants stated that they did produce technology education curriculum materials for

grade levels 6–12 that contain instruction on ethics. The types of curriculum materials produced that include ethics were (*a*) textbooks and/or workbooks, (*b*) videos, (*c*) teacher materials, (*d*) student-centered activities (for example, modular materials, kits), and (*e*) software and/or multimedia (for example, CD, DVD, Web-based). Participants indicated a variety of methods in which materials are reviewed to ensure the effectiveness of their curriculum. Each vendor stated that materials were reviewed and field-tested prior to publication and that their materials were standards-based. Two of the respondents indicated that they also received instructor feedback after the materials were implemented, and one vendor also solicited student feedback.

All four companies stated that their materials were based on the *Standards for Technological Literacy: Content for the Study of Technology.* Two of the four stated the materials were also based on the Secretary's Commission on Achieving Necessary Skills (SCANS). Other influencing standards included those published by the International Society for Technology in Education (ISTE), National Science Teachers Association (NSTA), National Council of Teachers of Mathematics, National Coalition for Advanced Manufacturing (NACFAM), AgriScience, in-house (company) standards, and individual state standards.

The same areas from *Standards for Technological Literacy* that were utilized in the textbook survey described previously were also utilized in the module vendor survey. Three of the four companies stated their curriculum moderately (one lesson or activity) covered ethics in the following 15 categories:

1. Characteristics and scope of technology
2. Relationships among technologies and connections between technology and other fields
3. Cultural, social, economic, and political effects of technology
4. The effects of technology on the environment
5. The role of society in the development and use of technology
6. The influence of technology on history
7. Design
8. Problem solving
9. The impacts of products and systems
10. Agricultural and biotechnology

11. Energy and transportation
12. Information and communication
13. Transportation
14. Manufacturing
15. Construction

One of these four companies also stated their materials included ethics instruction as it relates to medical technology. Only one company stated that they comprehensively (several lessons or activities) covered ethics in all 17 categories, including the core concepts of technology (systems, resources, requirements, optimization and trade-offs, processes, and controls).

Measurement Strategies for Ethics-Related Outcomes

John Richardson, a forerunner in vendor-generated technology education curriculum, claimed "kids actually experience why they need to learn and they will retain knowledge by seeing and experiencing concrete applications as opposed to memorizing answers to a test" (Potsky, 1997). This statement sums up the assessment strategy for most modular vendors. All four companies surveyed utilized multiple assessment strategies in their MATE. Written work, tests or quizzes, and portfolios were commonly used by all four companies. Concomitantly, only one of the companies stated that they utilized group or class discussion. This is an interesting finding given the social and affective nature of ethics. Other assessment strategies included student presentations, audio or video, electronic activity (for example, Web page, digital video), and projects.

Survey Influences

During follow-up of the textbook and modular vendor surveys at the 2003 ITEA conference in Nashville, Tennessee, some interesting feedback emerged. First, several vendors admitted that they did not respond to the survey because they did not feel they were incorporating ethics instruction in their materials. When a discussion ensued regarding copyright, building codes, and other similar concepts covered in technology education, however, many vendors realized they do, in fact, touch on ethics. A second issue emerged when one vendor, upon reviewing the survey, realized they were not incorporating ethics. The survey prompted a review of *Standards for*

Technological Literacy and the inclusion of ethics in updates of their materials.

ETHICS IN TECHNOLOGY EDUCATION LITERATURE

A wide range of sources discuss the importance of ethics in technology education. However, unlike texts and modular materials, standards and scholarly literature often make recommendations but leave instructional methods, activities, and assessments up to curriculum designers.

Sources

The previous review of texts and modular materials shows the influence of standards as a primary source for curriculum development. The *Standards for Technological Literacy: Content for the Study of Technology* (ITEA, 2000) also plays a key role for teachers, administrators, and teacher educators.

The *Standards for Technological Literacy* addresses ethics in Standard 4 and benchmarks F and J (see Table 6-1). These cognitive benchmarks are unique in their own right, but are closely related. Benchmark F clearly focuses on the identification of ethical issues to help students develop an understanding of the relationship between societal concerns and technology. Benchmark J encourages opportunities for students to build on these cognitive skills by helping them to understand the importance of ethical decisions as citizens who use, manage, and assess technology.

The *National Standards for Social Studies Teachers* (National Council for the Social Studies, 1997) also highlights the importance of decision making and ethics. Specifically, thematic Standard 8 on science, technol-

Table 6-1. Ethics Addressed in the *Standards for Technological Literacy* (ITEA, 2000)

Standard 4: Students will develop an understanding of the cultural, social, economic, and political effects of technology (p. 57).
Benchmark F (grades 6–8): The development and use of technology poses ethical issues (p. 61).
Benchmark J (grades 9–12): Ethical considerations are important in the development, selection, and use of technologies (p. 63).

ogy, and society emphasizes the need for teachers to help students use ethical standards when analyzing the physical world. Such parallels to the *Standards for Technological Literacy* provide opportunities for teachers to use interdisciplinary, collaborative experiences with their students (Sanders and Binderup, 2000).

Equally important to standards-based curriculum is the scholarly research that supports curriculum and teaching practice. Unfortunately, research on ethics in technology education is limited. A search of over 5,200 technology education theses and dissertations spanning more than 100 years only turned up two graduate studies related to ethics and these focused on the topic of work ethic (Reed, 2001b). Nevertheless, there are notable studies and instructional materials in the professional literature.

Topics Covered

A great deal of the technology education literature regarding ethics stresses the need for teachers to include the social context inherent in science and technology studies (STS). For example, many technology educators have traditionally focused on the impacts of technology as if there are no social influences on these forces. A more holistic instructional approach, however, includes the concept that creators, users, and consumers of technology shape the direction of those impacts as well as the technologies themselves (Pannabecker, 1991).

To teach these STS concepts, less time is spent on technical skills and concepts and more time on social content. Computer-aided design (CAD), traditionally a skill-driven subject, can provide an excellent example of how to balance technical and social content. A sociotechnical CAD class would include many ethical-personal topics, including, among others, the sociology, psychology, history, and economics associated with CAD (Petrina, 2003).

A sociotechnical approach is also helpful for teaching ethics related to biotechnology, which is a relatively new topic in technology education. By looking at the environmental and cultural issues associated with these technologies, in addition to the economic and technical aspects, students would be better prepared to make decisions that are global in scope (Conway, 2000). Topics with strong support for instruction on bioethics include social impacts, principles of ethics, impacts of using biotechnology, regulation (legislation and safety), and potentials of gene therapy (Wells, 1994).

Identifying instructional content based upon research and published sources is important. Some areas, such as appropriate technology, provide an abundance of material on ethics. Appropriate technology topics suitable for instruction include, among others, environmental pollution, labor issues, and nonrenewable energy sources (Hill and Dewey, 2001). Other technology topics with ethical considerations are public response to information technology, access to medical care for the aging population, and technological control of the environment (Hendricks, 1996).

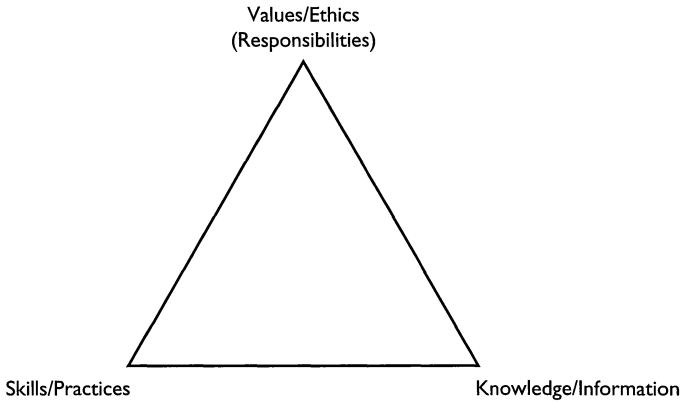
Context and Instructional Activities

The National Academy of Engineering and National Research Council (2002) claims that a technologically literate person should develop ways of thinking and acting along with acquisition of technological knowledge and skills. A significant part of these "ways of thinking" involves the ability to ask questions, seek information, and make decisions. Each of these skills has implications for instruction on ethics. But how can technology educators effectively implement these sociotechnical skills outlined by content standards, STS, and professional organizations?

Obviously, the ideal method is to have a technology education course dedicated to ethics. Although this might not be practical in a secondary school setting, Todd and Karsnitz (1999) demonstrated how this could be accomplished at the university level. The *Society, Ethics, and Technology* course developed at the College of New Jersey was implemented to strengthen the general education requirements. The course was approved based on the rationale that technology had become such an important part of society that a true liberal arts education now required knowledge of this complex relationship.

A second source of strategies for teaching sociotechnical skills can be found by examining other disciplines. Preparation for medical professions, for example, includes instruction in three areas: (*a*) skills/practice, (*b*) knowledge/information, and (*c*) values/ethics. Figure 6-1 illustrates the balance of this triangular association utilized in medicine. Like medical instruction, technological studies could start at any one of these points and progress to the other two (Gradwell, 1999). This trinity is representative of the characteristics of a technologically literate person as outlined by the National Academy of Engineering and National Research Council (2002) and includes knowledge, ways of thinking and acting, and capabilities.

Figure 6-1. Ensuring balance in technology (Gradwell, 1999).



Interdisciplinary activities can incorporate philosophical activities. For example, one interesting exercise is to have students view technology as a prosthesis or extension of the human body. Comparisons relating technology directly to the human body can help issues become more personalized, thus causing students to ask themselves tough questions and become more engaged in their thinking (Huyke, 2001).

The ITEA has provided an additional source for guidance in implementing ethics material and sociotechnical instruction. Monographs on interpreting the *Standards for Technological Literacy* (Meyer, 2000a) and assessment strategies (Meyer, 2000b) have been developed to help teachers create curriculum that is tied to research. The ITEA's Center for the Advancement of Teaching Technology and Science (CATTS) also has created curriculum materials and training to help teachers implement standards-based instruction.

Curriculum materials developed by teachers and teacher educators also have tremendous potential for getting ethics instruction into the technology education classroom. Wells' (2000) *Technology Education Biotechnology Curriculum* is an excellent example that includes a framework for objectives and learning outcomes as well as activities on bioethics. In a second example, Gorman (1998) used case studies, simulation, and learning modules to teach secondary students about the integral role of ethics in discovery and invention.

INTERNATIONAL TECHNOLOGY EDUCATION AND ETHICS

The previous professional literature discussion reflected methods for incorporating ethics instruction into technology education. Many countries, however, already have varying degrees of instruction on ethics. Although a complete survey of international instruction on ethics in technology education is beyond the scope of this chapter, this section highlights some of the more significant examples.

Extent of Ethics Instruction

International instruction on ethics generally comes in three forms: (*a*) courses for students, (*b*) materials for teacher education, and (*c*) teacher resources. Although some countries require students to take ethics courses, these are not necessarily specific to technology education. Korea, for example, requires academic high school students to take a course in ethics (Yi, 1997).

Teacher education materials on ethics generally fall into two categories: (*a*) a reflection of STS practice or (*b*) the standards and curriculum that future teachers will implement after they enter the classroom. Incorporating STS methods requires the teacher educator to incorporate ethics materials and highlight the importance of sociotechnical instruction into their courses. Often, the process is an evolutionary one that requires the teacher educator to continually evaluate the curriculum as well as sociotechnical trends (Petrina, 2003). Incorporating ethics instruction based on local standards and curriculum is a common practice. However, whether the preservice instruction on ethics is carried over to primary, elementary, and secondary classrooms is questionable (K. Volk, personal communication, July 31, 2002).

Resources for the classroom teacher are the primary source of international instruction on ethics. Many countries provide teachers with standards, objectives, and curriculum materials. However, the depth of these materials as they relate specifically to ethics varies widely. The best way to understand the range of resources is to review implementation strategies.

Strategies for Including Ethics in Technology Education

Some countries are working on initiatives to bring technology education courses into the mainstream curriculum. Finland, for example, has a

core curriculum that allows local flexibility for subjects like technology education. Recent developments, however, are creating national interest for consistency in technology education classes (Järvinen and Nykänen, 2002). For now, ethics instruction is left up to the technology teacher. Finnish technology teachers are required to take courses in educational science and ethics as a part of their preservice studies (Alamäki, 2000), so influences are in place to encourage inclusion of ethical issues in instruction.

Countries with more established technology education programs, such as New Zealand, England, Canada, and Australia, have published materials for including ethics in technology education. New Zealand created a document titled *Technology in the New Zealand Curriculum* (Ministry of Education) in 1995 that contains three strands: (*a*) technological knowledge and understanding, (*b*) technological capability, and (*c*) technology and society (Reid, 2000). The third strand contains an achievement objective stating that students "should develop awareness and understanding of the beliefs, values, and ethics of individuals and groups" (Ministry of Education, 10). This comprehensive document explains each achievement objective and provides learning and assessment examples for each level in secondary education.

England has developed a scheme of work that is the overall plan of design and technology. The scheme of work is made up of units that are usually designed to be completed over a term or less. Units set out specific learning objectives that reflect the program of study, as well as possible teaching activities and learning outcomes (Department for Education and Skills 2002). A search of these units indicated that inclusion of ethics is primarily limited to the secondary level, years seven through nine.

Several Canadian provinces also have materials for teachers that incorporate ethics instruction. In British Columbia, one of the primary goals of technology education is to help students "develop the ability to deal ethically with technology" (British Columbia Education, 2002). An Integrated Resource Package is available to help teachers integrate STS concepts, including ethics. Saskatchewan also provides teachers with a handbook that includes models detailing how to discuss social issues (Saskatchewan Education 2002).

In Australia, Williams (2001) conducted a comprehensive study of technology education curriculum as it related to values. Documents from all eight states and territories were reviewed as well as data from interviews and focus groups. The term *values* was broken down into five areas,

including social, cultural, environmental, economic, and ethical. One of the key findings was that all five areas were generally not being addressed effectively (Williams).

Outcomes Identified and Achieved

Many of the international materials highlighted in the preceding section are curriculum guides or units that do not contain specific outcomes for ethics. Materials usually include ethics as one of the objectives or part of a unit. Seven of the eight Australian states and territories, however, did have outcomes for ethics, although Williams (2001) revealed that the inclusion of those particular outcomes was limited and not systematic. For example, several states and territories included ethics in the primary years but the majority of material was found in the senior years. The most comprehensive attention to ethics was found in instructional technology and primarily dealt with privacy, hacking, intellectual property, and security. Broader areas in which ethical issues were addressed included gene technology, agriculture, designing, copyright, design for the disabled, and food technology (Williams).

Availability of Materials for Adoption or Use by Others

Some of the international materials discussed in this chapter are available on the World Wide Web. Uniform Resource Locators (URLs) are listed in the reference section of this chapter for the Canadian provinces of British Columbia (British Columbia Education, 2002) and Saskatchewan (Saskatchewan Education, 2002). England also has a Web site for the design and technology curriculum that contains a teacher's guide and instructional units for the primary and secondary levels (Department for Education and Skills, 2002). New Zealand's document titled *Technology in the New Zealand Curriculum* is available in print from the Ministry of Education (1995).

PROFESSIONAL ETHICS IN TECHNOLOGY EDUCATION

The ethical influence of technology educators at all levels should emanate from their professional knowledge and behavior rather than from the power derived from their role. This section discusses the importance for technology education teachers, administrators, and teacher educators to demonstrate ethical behavior at all times. Technology education litera-

ture on the significance of modeling ethical behavior and aspects for teacher education is limited. However, professional development standards and materials from other disciplines and organizations have laid the foundation for expanding ethics-related resources in technology education.

Ethical Behavior by Technology Education Teachers

The role of technology teachers in encouraging high ethical standards is of utmost importance because they interact directly with students from a wide range of cultural, social, and economic backgrounds. In an age in which the political climate is holding teachers more and more accountable through accreditation, standardized testing, and certification, it is imperative for teachers to display ethical behavior in and out of the classroom. Ethical education should be an integral part of teacher preparation and in-service education.

In a survey by Wiens (1996), technology teacher education coordinators realized the importance of incorporating sociocultural aspects of technology, including ethics. However, many of the respondents realized these aspects were not being addressed despite their inclusion in the National Council for Accreditation of Teacher Education (NCATE) guidelines. Meeting NCATE guidelines by including sociocultural instruction in preservice education serves two important functions. First, such instruction can provide students with methods and materials for incorporating ethics into their future technology education programs. Humanities courses in ethics can also benefit preservice teachers by teaching them how to address technological decisions (Wiens, 1995). Second, preservice teachers can learn the importance of modeling ethical behavior in the classroom. The behavior used in the classroom should be exemplary and consistent with professional standards.

The Technology for All Americans project created assessment standards, professional development standards, and program standards to help teachers after they entered the classroom. The narrative materials for professional development standard PD-6 states "Pre-service and in-service professional development experiences should prepare teachers to engage in comprehensive and sustained personal professional growth" (ITEA, 2003, p. 60). Ethical behavior is exclusively mentioned under PD-6, guideline B: Teacher candidates and educators should "establish a personal commitment to ethical behavior within the educational environment as well as in private life" (p. 60).

Ethical Behavior by Technology Education Administrators

Administrators generally do not have as much contact with students as teachers, but should adhere to the same ethical standards. Also, because administrators deal more directly with other administrators, parents, school boards, and community leaders, they should be cognizant of professional standards. The National Education Association (NEA) highlighted this need in 1975 when it created a code of ethics for education that included two provisions: "Commitment to the Student" and "Commitment to the Profession" (Wagner, 1996).

A more direct example of professional commitment for technology educators is provided by ITEA. The ITEA has adopted standards of conduct for the technology education profession. All members, including students, teachers, administrators, and teacher educators, are expected to adhere to the code of conduct, which includes actively promoting and encouraging "the highest level of ethics within the technology teaching profession" (Devier 1999, 255). The ITEA has also implemented a recognition program for professionals who have demonstrated significant leadership. The guidelines of the Distinguished Technology Educator (DTE) award include several leadership attributes, such as modeling "behaviors and characteristics that include ethical, moral, and legal aspects of being a professional educator" (Wright 1999, 186).

Ethical Behavior by Technology Teacher Educators

Teacher educators have several significant reasons to incorporate instruction related to ethics into their programs. The obvious reason is to portray ethical behavior and provide preservice teachers with instructional methods and materials. A second, more long-range goal is to provide students with the ability to connect classroom experiences with higher-order outcomes. Developing an independent learning ethic helps teachers to see the value of lifelong learning (Hanson 1993). The importance of these concepts has been recognized by the profession through provisions in the CTTE/ITEA/NCATE guidelines for technology teacher preparation programs.

The CTTE/ITEA/NCATE guidelines for technology teacher education stipulate that each of the 10 standards for teacher preparation programs should be explained by outcome statements called indicators. Knowledge, performance, and disposition indicators are included with each standard. Disposition indicators are those that deal with attitudes, values, ethics, beliefs, and affective behaviors in relation to the standard.

> It is important to remember that when writing a folio, it is not necessary to respond to each and every indicator. The folio and supporting documentation should be written to the standards. However, mastery of indicators will lead to more complete achievement of each standard. (Council on Technology Teacher Education [CTTE], 2002, Section III-12)

These guidelines highlight the importance for teacher education programs to document how they are including ethics in their preservice courses.

Aspects of Ethics to be Included in Teacher Education

The majority of materials reviewed to this point have outlined the need for instruction in ethics. But whose view of ethics should we be using in technology teacher education? Sensitivity in the selection of instructional materials is extremely important. Hill and Dewey (2001) presented three possible methods for including ethics: (*a*) selecting topics that represent commonly agreed upon concepts, (*b*) utilizing published work, or (*c*) taking a research-based approach. All three methods should be introduced in teacher education even though the last two are more defensible (Hill and Dewey).

The first approach to ethics instruction, utilizing commonly agreed upon concepts, is a good approach to foster classroom discussion. The corporate scandals in the United States at the beginning of the twenty-first century provide a good example. A wide range of media commentaries from that time could be used to discuss the importance of ethical behavior by professionals. This approach is good for creating awareness on ethics, but care should be taken to help students become aware that actions adopted within an organization are not necessarily ethical. The basis for ethics must extend beyond approval by a particular subset of society.

Organizations such as the Josephson Institute of Ethics have developed materials on ethics that can be included in teacher education. Strategies outlined by the Josephson Institute help students to identify ethical issues as well as to acquire skills on how to take action. The first aspect involves the ability to discern right from wrong, good from evil, and propriety from impropriety. The second involves the commitment to do what is right, good, and proper (Josephson Institute of Ethics, 2002a). To help implement these components into education, the Josephson Institute runs a project known as *Character Counts!* that has several

hundred coalition members. Members include a variety of organizations, school systems, communities, cities, and counties.

The *Character Counts!,* coalition is designed "to fortify the lives of America's young people with consensus ethical values called the 'Six Pillars of Character'" (Character Counts!, 2002). The six values include trustworthiness, respect, responsibility, fairness, caring, and citizenship. Space here does not permit a complete discussion on how to incorporate these six values into technology teacher preparation. However, *Character Counts!* does provide information on its Web site regarding materials, awards, and training (http://www.charactercounts.org/).

Research can also provide materials for inclusion in teacher preparation. For example, a survey conducted by the Josephson Institute in 1998 is helpful to show preservice teachers what secondary students in the United States believe about ethical behavior. Compelling data is also presented on whether these students emulated ethical behavior with family, friends, and the public (Josephson Institute of Ethics, 2002b). In a narrower survey dealing strictly with work ethic, Hill (1995) identified three constructs that are useful for teacher educators: interpersonal skills, initiative, and being dependable. These examples show how teacher educators can use research to emulate ethical behavior, provide instructional methods and materials, and foster a learning ethic that promotes lifelong learning.

Additional examples of incorporating ethics were presented in Chapter 1. The list of attributes provided (integrity, responsibility, fairness, caring, initiative, interpersonal skills, and dependability) are based on research and are universally accepted. The model outlined in Chapter 1 (see Figure 1-1) also ties to the problem-solving model that has traditionally been used in technology education courses.

SUMMARY

How far have we come? This initial question was posed to see how well the technology education profession has incorporated ethics to help advance technological literacy. Five areas were reviewed: (*a*) vendor textbooks and print materials, (*b*) vendor modules, (*c*) professional literature, (*d*) international ethics materials, and (*e*) professional ethics for technology teachers, teacher educators, and administrators.

In the first two sections, a survey was completed with textbook companies and module suppliers to identify commercial materials that

incorporated instruction on ethics. Respondents indicated that ethics was incorporated into a broad range of technology topics using a variety of delivery methods and a mixture of assessment strategies. The *Standards for Technological Literacy* (ITEA, 2000), as well as other standards, has an impact on the development of materials.

The professional literature reviewed on ethics in technology education indicated strong support for its inclusion; however, there was very little substantive research. Much of the literature was in the form of editorials, standards, and curriculum frameworks. A similar trend was found in the international community. Ethics was often one objective or part of a unit or lesson rather than the central focus. Clearly, there is room for more research on the inclusion of ethics in technology education and a need for curriculum development. Materials are available from organizations that focus on ethics; however, these are not specific to technology education. These materials do provide a significant opportunity for interdisciplinary instruction, especially because the importance for instruction on ethics as it relates to technology is highlighted in standards from multiple disciplines.

Professional ethics for technology teachers, teacher educators, and administrators is a third area that needs further development. Much of the literature in technology education has stressed the need for professional educators to emulate ethical behavior at all times, but guidelines or examples are usually not provided. This situation demonstrates the paradox of our initial question, *how far have we come?* Clearly, we have established the baseline for ethics within technology education. However, the horizon changes with each step. Out of all the disciplines in modern education, technology education has traditionally been the leader in experiential learning. We now have an opportunity to also become the leader for sociotechnical instruction by incorporating ethics into our classrooms, laboratories, and through interdisciplinary collaborations.

REFLECTION QUESTIONS

1. To what extent do companies that develop textbooks, modules, and other instructional materials shape the nature of technology education content?
2. This chapter has provided an overview of existing materials that support ethics instruction as a component of technology education. In

a situation in which modular materials are being used to teach technology education, how should ethics instruction be handled if not included in the modular materials?

3. How can technology educators influence companies to include a greater emphasis on ethics in the instructional materials they produce?
4. To what extent was ethics included in the content of industrial arts?
5. How important is it for teacher preparation programs to include a course related to society, ethics, and technology within their programs of study?
6. What can technology educators in the United States learn from their international counterparts about including ethics within the study of technology?
7. How important is professional ethics within the field of technology education? If teachers failed to abide by copyright laws, displayed a poor work ethic, or demonstrated poor judgment in their decisions, what would the impact be on their students?
8. How would you approach preparation of a technology education activity that encourages the development of good character traits?

REFERENCES

Alamäki, A. (2000). Current trends in technology education in Finland. *Journal of Technology Studies, 26*(1), 19-23.

British Columbia Education. (2002). *Technology education kindergarten to grade 12 objectives.* Retrieved December 5, 2002, from http://www.bced.gov.bc.ca/irp/te11_12/intro3.htm

Brusic, S. A., & LaPorte, J. E. (2000). The status of modular technology education in Virginia. *Journal of Industrial Teacher Education, 38*(1), 5-28.

Character Counts! (2002). *Character Counts!* Retrieved December 5, 2002, from http://www.charactercounts.org/

Conway, R. (2000). Ethical judgments in genetic engineering: The implications for technology education. *International Journal of Technology and Design Education, 10*(3), 239-254.

Council on Technology Teacher Education (CTTE). (2002). *Draft ITEA/CTTE/NCATE standards.* Reston, VA: Author.

Dean, H. R. (1997). *Changing education: A success story.* Dallas, TX: Arete.

Department for Education and Skills. (2002). *The Standards Site: Schemes of Work.* Retrieved December 5, 2002, from http://www.standards.dfes.gov.uk/schemes/

Devier, D. H. (1999). Fostering a professional culture in technology education. In A. F. Gilberti & D. L. Rouch (Eds.), *Advancing professionalism in technology education* (pp. 251-270). Peoria, IL: Glencoe/McGraw-Hill.

DeVore, P. W. (1980). *Technology: An introduction.* Worcester, Massachusetts: Davis Publications, Inc.

DeVore, P. W. (1991). Technological literacy: The evolving paradigm. In M. J. Dyrenfurth & M. R. Kozak (Eds.), *Technological Literacy* (pp. 251-279). Peoria, IL: Glencoe/McGraw-Hill.

Dugger, W. E., & Yung, J. E. (1995). *Fastback: Technology education today* (308th ed.). Bloomington, IN: Phi Delta Kappa.

Gorman, M. E. (1998). *Transforming nature: Ethics, invention, and discovery.* Boston: Kluwer Academic.

Gradwell, J. B. (1999). The immensity of technology . . . and the role of the individual. *International Journal of Technology and Design Education, 9*(3), 241-267.

Hanson, R. E. (1993). A technological teacher education program planning model. *Journal of Technology Education, 5*(1), 21-28.

Hendricks, J. L. (1996). Technology—Social and interpersonal interaction. In R. L. Custer & A. E. Wiens (Eds.), *Technology and the quality of life* (pp. 321-344). Peoria, IL: Glencoe/McGraw-Hill.

Hill, R. B. (1995). A new look at selected employability skills: A factor analysis of the Occupational Work Ethic. *Journal of Vocational Education Research, 20*(4), 59-73.

Hill, R. B., & Dewey, G. (2001). Moral and ethical issues related to appropriate technology. In R. C. Wicklein (Ed.), *Appropriate technology for sustainable living* (pp. 78-91). Peoria, IL: Glencoe/McGraw-Hill.

Huyke, G. J. (2001). Toward an ethics of technologies as prostheses. *International Journal of Technology and Design Education, 11*(1), 53-65.

International Technology Education Association (ITEA). (2000). *Standards for technological literacy: Content for the study of technology.* Reston, VA: Author.

International Technology Education Association (ITEA). (2003). *Advancing excellence in technological literacy: Student assessment, professional development, and program standards.* Reston, VA: Author.

Järvinen, E-M., & Nykänen, J. (2002). *Technology education now!* Paper presented at the International Technology Education Association annual conference, Columbus, OH.

Josephson Institute of Ethics. (2002a). *Making ethical decisions—What is ethics anyway?* Retrieved December 5, 2002, from http://www.josephsoninstitute.org/MED/MED-whatisethics.htm

Josephson Institute of Ethics. (2002b). ***1998 report card on the ethics of American youth.*** Retrieved December 5, 2002, from http://www.josephsoninstitute.org/98-Survey/98survey.htm

Meyer, S. (2000a). *Criteria for Interpreting the Standards for Technological Literacy: Content for the Study of Technology.* Reston, VA: International Technology Education Association.

Meyer, S. (2000b). *Assessment Strategies for the Standards for Technological Literacy: Content for the Study of Technology.* Reston, VA: International Technology Education Association.

Ministry of Education. (1995). *Technology in the New Zealand Curriculum.* Wellington, New Zealand: Learning Media Limited.

National Academy of Engineering and National Research Council. (2002). *Technically speaking: Why all Americans need to know more about technology.* In G. Pearson & A. T. Young (Eds.), *Committee on Technological Literacy.* Washington, DC: National Academy Press.

National Council for the Social Studies. (1997). *National Standards for Social Studies Teachers.* Washington, DC: Author.

Olson, D. W. (1963). *Industrial arts and technology.* Englewood Cliffs, NJ: Prentice-Hall.

Pannabecker, J. R. (1991). Technological impacts and determinism in technology education: Alternate metaphors from social constructivism. *Journal of Technology Education, 3*(1).

Petrina, S. (1993). Under the corporate thumb: Troubles with our MATE (Modular Approach to Technology Education). *Journal of Technology Education, 5*(1), 72-80.

Petrina, S. (2003). Two cultures of technical courses and discourses: The case of computer aided design. *International Journal of Technology and Design Education, 13*(1), 47-73.

Potsky, A. (1997, February). Buffet style learning. *Techniques,* 40-43.

Reed, P. A. (2001a). Learning style and laboratory preference: A study of middle school technology education teachers in Virginia. *Journal of Technology Education, 13*(1), 59-71.

Reed, P. A. (Ed.). (2001b). *The technology education graduate research database: 1892–2000.* Retrieved December 5, 2002, from http://www.teched.vt.edu/CTTE/

Reid, M. S. (2000). Towards effective technology education in New Zealand. *Journal of Technology Education, 11*(2), 33-47.

Sanders, M. E. (2001). New paradigm or old wine? The status of technology education in the United States. *Journal of Technology Education, 12*(2), 35-55.

Sanders, M. E., & Binderup, K. (2000). *Integrating technology education across the curriculum.* Reston, VA: International Technology Education Association.

Saskatchewan Education. (2002). *Understanding the common essential learnings: A handbook for teachers.* Retrieved December 5, 2002, from http://www.sasked.bov.sk.ca/docs/policy/cels/

Todd, R. D., & Karsnitz, J. R. (1999). Identifying and solving professional problems. In A. F. Gilberti & D. L. Rouch (Eds.), *Advancing professionalism in technology education* (pp. 139-164). Peoria, IL: Glencoe/McGraw-Hill.

Wagner, P. A. (1996). *Fastback: Understanding professional ethics* (403rd ed.). Bloomington, IN: Phi Delta Kappa.

Warner, W. E. (1959). *The industrial arts curriculum: Development of a program to reflect American technology.* Columbus, OH: Epsilon Pi Tau.

Wells, J. G. (1994). Establishing a taxonometric structure for the study of biotechnology in secondary school technology education. *Journal of Technology Education, 6*(1), 58-75.

Wells, J. G. (2000). *Technology education biotechnology curriculum.* Morgantown, WV: TEBC Project.

Wiens, A. E. (1995). Technology and liberal education. In G. E. Martin (Ed.), *Foundations of Technology Education* (pp. 119-152). Peoria, IL: Glencoe/McGraw-Hill.

Wiens, A. E. (1996). Teaching about socio-cultural dimensions of technology development and use. *The Technology Teacher, 55*(6), 23-26.

Williams, P. J. (2001). *The teaching and learning of technology in Australian primary and secondary schools.* Department of Education, Science and Technology Working Report, Commonwealth of Australia, 299 pp.

Wright, R. T. (1995). Technology education curriculum development efforts. In G. E. Martin (Ed.), *Foundations of Technology Education* (pp. 247-285). Peoria, IL: Glencoe/McGraw-Hill.

Wright, J. R. (1999). Teacher professionalism in higher education. In A. F. Gilberti & D. L. Rouch (Eds.), *Advancing professionalism in technology education* (pp. 181-198). Peoria, IL: Glencoe/McGraw-Hill.

Yi, S. (1997). Technology education in Korea: Curriculum and challenges. *Journal of Technology Studies, 23*(2), 42-49.