Clarifying Misconceptions between Technology Education and Educational Technology

Only you will assume the responsibility to educate others about the importance of technology education in schools today.

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There is much confusion today when attempting to understand the differences between technology education and educational technology. Both are important components of education; however, the confusion harms both fields of study. This article will provide clarification about the purpose and direction of technology education and educational technology as well as the standards used in both educational areas.

Technology, Technology Education, and Technological Literacy

First let's familiarize ourselves with some fundamental definitions related to technology, technology education, and technological literacy. According to the International Technology Education Association's *Standards for Technological Literacy: Content for the Study of Technology (STL)*, "**Technology** is the modification of the natural environment to satisfy perceived human wants and needs" (ITEA, 2000, p. 9). This modification of the natural environment (nature) may be characterized as "human innovation in action." **Technology education** (sometimes referred to as technological studies) is "a study of technology which provides an opportunity for students to learn about the processes and knowledge related to technology that are needed to solve problems and extend human potential" (ITEA, 2000, p. 242). As a result of studying technology in grades K-12, students gain a level of **technological literacy**, which may be described as one's ability "to use, manage, assess, and understand technology" (ITEA, 2000, p. 9).

Technology education is concerned with the broad spectrum of technology, which encompasses, but is not limited to, such areas as: design, making, problem solving,

technological systems, resources and materials, criteria and constraints, processes, controls, optimization and trade-offs, invention, and many other human topics dealing with human innovation. Technology has both positive and negative effects on society, and conversely, society impacts technology in many ways. A good example is the cessation of building new nuclear power plants in the U.S. over the past few years, which are now being reconsidered because of power shortages in certain sections of the country. The technologically designed world includes major areas that have characteristics that define it and distinguish it from others. Some examples of major areas that could be included in a taxonomy of the designed world are medical technologies, agricultural and related biotechnologies, energy and power technologies, information and communication technologies, transportation technologies, manufacturing technologies, and construction technologies. These areas are not totally inclusive or mutually exclusive since there is obviously some overlap and interplay between them. However, they represent the dynamic and the broad spectrum of technology that permeates our world today. We can be assured that technology in the future will play a more demanding role as it affects us as individuals as well as our society and our environment. We know that our world will be very different 10 or 20 years from now. We have no choice about that. We do, however, have a choice whether we march into that world with our eyes open, deciding for ourselves how we want it to be, or whether we let it propel us, ignorant and helpless to understand where we're going or why. The study of technology that provides technological literacy through technology education will make a difference.

Educational Technology

Educational technology is sometimes referred to as instructional technology or informational technology. A very careful analysis of words and terms related to educational technology gives one a better understanding of the differences between it and technology education. **Educational technology** is concerned with technology in education. It is involved in the use of technology as a "tool" to enhance the teaching and learning process across all subject areas. Educational technology is concerned about teaching and learning with technology. In the International Society for Technology in Education's (ISTE) *National Educational Technology Standards for Students* (NETS•S), the document states that these standards describe, "…what students should know about technology and be able to do with technology" (ISTE, 2000, p. XI). Also the *NETS•S* provide "…curriculum examples of effective use of technology in teaching and learning" (ISTE, 2000, p. XI). (Underline added by author.)

Educational technology is involved with a more narrowed spectrum of technology, dealing primarily with information and communication technology centered around the didactic practice of using technology to improve the teaching and learning process. Key words and phrases found in *National Educational Technology Standards for Students* related to educational technology include: use of technology; media; multimedia; hardware and software; information; telecommunications; web environments; communicate; process data; use technological resources for solving problems; locate, evaluate, and collect information; and other instructional technology terms. In the 14 standards listed in *National Educational Technology Standards for Students*, all have terms that encompass the words of "use(s)," "demonstrate," "select," or "employ" with respect to technology.

Comparison of *Standards for Technological Literacy: Content for the Study of Technology (STL)* (ITEA) and the *National Educational Technology Standards for Students* (ISTE)

Standards for Technological Literacy

The document *Standards for Technological Literacy (STL)* specifies what every student should know and be able to do in order to be technologically literate and offers criteria by which to judge progress toward a vision of technological literacy for all students. There are a total of 20 individual standards in this document. (For a list of all 20 standards, see Figure 1.)

Benchmarks

The benchmarks in *STL* provide the fundamental content elements that

exist as part of the broadly stated standards. Benchmarks are statements that describe the specific knowledge and abilities that enable students to meet a given standard, and they are provided for each of the 20 standards at the K-2, 3-5, 6-8, and 9-12 grade levels. The benchmarks are followed by supporting statements that provide further detail, clarity, and examples. An example of a standard and its enabling benchmarks for grades 6-8 is shown in Figure 2.

National Educational Technology Standards for Students

In the *National Educational Technology Standards for Students (NETS•S),* the technology foundation standards are divided into six broad categories. Standards within each category are to be introduced, reinforced, and mastered by students (ISTE, 2000, p. 14). These technology foundation standards for students are:

1. **Basic operations and concepts**
   - *Students demonstrate a sound understanding of the nature and operation of technology systems.*
   - *Students are proficient in the use of technology.*
2. **Social, ethical, and human issues**
   - *Students understand the ethical, cultural, and societal issues related to technology.*
   - *Students practice responsible use of technology systems, information, and software.*
   - *Students develop positive attitudes toward technology uses that*

Figure 1 – The Standards for Technological Literacy

The Nature of Technology (Chapter 3)

Standard 1. Students will develop an understanding of the characteristics and scope of technology.
Standard 2. Students will develop an understanding of the core concepts of technology.
Standard 3. Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.

Technology and Society (Chapter 4)

Standard 4. Students will develop an understanding of the cultural, social, economic, and political effects of technology.
Standard 5. Students will develop an understanding of the effects of technology on the environment.
Standard 6. Students will develop an understanding of the role of society in the development and use of technology.
Standard 7. Students will develop an understanding of the influence of technology on history.

Design (Chapter 5)

Standard 8. Students will develop an understanding of the attributes of design.
Standard 9. Students will develop an understanding of engineering design.
Standard 10. Students will develop an understanding of the role of trouble-shooting, research and development, invention and innovation, and experimentation in problem solving.

Abilities for a Technological World (Chapter 6)

Standard 11. Students will develop the abilities to apply the design process.
Standard 12. Students will develop the abilities to use and maintain technological products and systems.
Standard 13. Students will develop the abilities to assess the impact of products and systems.

The Designed World (Chapter 7)

Standard 14. Students will develop an understanding of and be able to select and use medical technologies.
Standard 15. Students will develop an understanding of and be able to select and use agricultural and related biotechnologies.
Standard 16. Students will develop an understanding of and be able to select and use energy and power technologies.
Standard 17. Students will develop an understanding of and be able to select and use information and communication technologies.
Standard 18. Students will develop an understanding of and be able to select and use transportation technologies.
Standard 19. Students will develop an understanding of and be able to select and use manufacturing technologies.
Standard 20. Students will develop an understanding of and be able to select and use construction technologies.

Figure 2 – A Representative Standard and its Benchmarks from *Standards for Technological Literacy*

Standard 8. Students will develop an understanding of the attributes of design.

In order to realize the attributes of design, students in grades 6-8 should learn that

- *design is a creative planning process that leads to useful products and systems.* The design process typically occurs in teams whose members contribute different kinds of ideas and expertise. Sometimes a design is for a physical object such as a house, bridge, or appliance and sometimes it is for a non-physical thing, such as software.
- *there is no perfect design.* All designs can be improved. The best designs optimize the desired qualities — safety, reliability, economy, and efficiency — within the given constraints. All designs build on the creative ideas of others.
- *requirements for a design are made up of criteria and constraints.* Criteria identify the desired elements and features of a product or system and usually relate to their purpose or function. Constraints, such as size and cost, establish the limits on a design.

support lifelong learning, collaboration, personal pursuits, and productivity.

3. **Technology productivity tools**
   - *Students use technology tools to enhance learning, increase productivity, and promote creativity.*
   - *Students use productivity tools to collaborate in constructing technology-enhanced models, prepare publications, and produce other creative works.*
4. **Technology communications tools**
   - *Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.*
   - *Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.*
5. **Technology research tools**
   - *Students use technology to locate, evaluate, and collect information from a variety of sources.*
   - *Students use technology tools to process data and report results.*
   - *Students evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.*
6. **Technology problem-solving and decision-making tools**
   - *Students use technology resources for solving problems and making informed decisions.*
   - *Students employ technology in the development of strategies for solving problems in the real world.*

(ISTE, 2000, p. 14-15)

The technology foundation standards for students provide performance indicators, which describe the technology competence students should exhibit upon completion by the grade ranges of Pre-K-2, 3-5, 6-8, and 9-12. As an example, the performance indicators for students in grades 6-8 are as follows:

Prior to completion of Grade 8 students will:

1. Apply strategies for identifying and solving routine hardware and software problems that occur during everyday use. (This is related to category 1.)
2. Demonstrate knowledge of current changes in information technologies and the effect those changes have on the workplace and society. (This is related to category 2.)
3. Exhibit legal and ethical behaviors when using information and technology, and discuss consequences of misuse. (This is related to category 3.)
4. Use content-specific tools, software, and simulations (e.g., environmental probes, graphing calculators, exploratory environments, Web tools) to support learning and research. (This is related to categories 3 and 5.)
5. Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum. (This is related to categories 3 and 6.)
6. Design, develop, publish, and present products (e.g., Web

pages, videotapes) using technology resources that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom. (This is related to categories 4, 5, and 6.)
7. Collaborate with peers, experts, and others using telecommunications and collaborative tools to investigate curriculum-related problems, issues, and information, and to develop solutions or products for audiences inside and outside the classroom. (This is related to categories 4 and 5.)
8. Select and use appropriate tools and technology resources to accomplish a variety of tasks and solve problems. (This is related to categories 5 and 6.)
9. Demonstrate an understanding of concepts underlying hardware, software, and connectivity, and of practical applications to learning and problem solving. (This is related to categories 1 and 6.)
10. Research and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources concerning real-world problems. (This is related to categories 2, 5, and 6.) (ISTE, 2000, p. 22)

Standards for Technological Literacy and *National Educational Standards for Students: Connecting Curriculum and Technology* are quite different documents. The first deals with the content for the study of technology to provide technological literacy for all students. The *NETS•S* deals with how technology can be used as a tool in better teaching the existing core subjects in the school. In fact, the bulk of the ISTE *NETS•S* standards document (Section 3-over 175 pages) is devoted to curriculum integration of using technology in the English language arts learning activities, foreign language learning activities, mathematics learning activities, science learning activities, and social studies learning activities. Section 4 of the *NETS•S* deals with multidisciplinary resource units that can be used by teachers in these core areas of education using educational technology.

Informing Others About the Differences Between Technology Education and Educational Technology

In our technological world today, it becomes the responsibility of everyone to have an in-depth knowledge about all areas of education. This responsibility is particularly important for those in technology education as well as educational technology to educate others about the importance of their field in education. These are some suggestions for educating others about these areas of education:

1. First, gain a good philosophical understanding about the differences between technology education and educational technology yourself. It is recommended also that those directly involved gain a clear understanding of ITEA's *Standards for Technological Literacy* and the ISTE's *National Educational Technology Standards for Students.*
2. Set up formal meetings with the school district administration (superintendent and his or her staff) to educate them about the differences between educational technology and technology education.
3. Likewise, establish meetings with school-level principals, assistant principals, guidance coordinators, and other teachers within the school to inform them about the differences between these two areas of education.
4. Develop informational articles in state and local media (newspapers and local television and radio) to inform others about the importance of technology education and educational technology.
5. In technology education classes, make sure that the students understand the difference between technology education and educational technology.
6. Inform key decision-makers within your state or community about the importance of these two areas of education, as well as their similarities and differences.

Only you will assume the responsibility to educate others about the importance of technology education in schools today. The educational technology community already has a good start gaining support nationally and in states and localities on the use of technology to improve teaching and learning. All educators should become informed about technology education and educational technology in schools today and for the future.

Summary

Unfortunately, there is major confusion between technology education and educational technology. Many times superintendents, principals, curriculum development specialists, and others simply do not know the differences between technology education and educational technology. This is unfortunate since those responsible for administering education in the states and localities around the country are ignorant about two major areas of education. It is unfortunate that they confuse how to use technology with technology education. Without proper knowledge about important areas in education, confusion will cause even more misconceptions and lack of understanding in the future.

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