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At Issue: Towards an Authentic Technological Literacy

Charles W. Gagel
University of Idaho

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Charles W. Gagel
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How would you respond if asked to define technology? What first comes to mind? If you are like most people today, your immediate response would likely mention computers, cell phones, or the Internet. While most people, when questioned further, may acknowledge a broader reach of technology, it is the commonness of that first response which suggests that a one-dimensional understanding of technology pervades our social consciousness.

Background

According to Ihde (1990), in our modern world, living through a typical day involves us with technology from the moment we open our eyes. The day begins as we wake to the sound of the morning alarm clock. We rise from the material coverings and structure of the bed and proceed to the bathroom with its water systems, fixtures, and accessories. In the kitchen we start the coffee maker, open the refrigerator, turn on the stove, or perhaps slip a slice of bread into the toaster. We then commute to work in our automobiles or some other form of transportation, bolstered all the while by their technological systems. In the workplace we rely on a vast assortment of tools and equipment. After work, we might stop at a store filled with arrays of products, displays, and advertising. Nor does Ihde limit technology to the material world; he also includes social, political, and economic processes. Even our intimate relationships, Ihde points out, include the use of technologies. Thus Ihde places technology in a context well beyond the confines of the material artifacts that many perceive as its boundary.

Gagel is Associate Professor in the Department of Adult, Career and Technology Education at the University of Idaho, Boise, Idaho. Gagel can be reached at cgagel@uidaho.edu.

Could it be that a limited understanding of the scope of technology is due, in part, to a marginal and narrowing treatment of technology in the school curriculum? This may indeed be the case. In this age of authentic assessment, where context and application are considered essential, the overall general curriculum frequently does not offer an authentic treatment of technology and, consequently, may not be engendering a truly authentic technological literacy. In the broad perspective of technology provided by Ihde, the teaching of technological literacy merits a more authentic treatment in the curriculum and requires a focus directed firmly towards its context in everyday life.

Ihde's multidimensional concept of technology is widely supported in the literature. For instance, Feenberg (1999) emphasizes the social implications of technology in the form of power, control, and politics. Feenberg does not, however, dismiss the more physical aspects of technology. He argues that the study of "technology as a total phenomenon…must include an experiential dimension since experience with devices influences the evolution of their design" (p. xii). In a discussion of vocation, Feenberg maintains that "the technical subject appears autonomous only insofar as its actions are considered in isolation from its life process. Taken as a whole, the succession of its acts adds up to a craft, a vocation, a way of life.…These human attributes of the technical subject define it at the deepest levels, physically, as a person, and as a member of a community of people engaged in similar activities" (p. 206). Here, the carpenter is a carpenter because of the tools, materials, and processes used in the practice of carpentry.

Feenberg's essential theme is that "technological design is central to the social and political structures of modern societies….Every major technical change reverberates at countless levels: economic, political, religious, and cultural. If we continue to see the social and technical domains as being separate, then we are essentially denying an integral part of our existence…" (p. i). Changes in a vocation over time are, therefore, directly shaped by the evolution of its artifacts and techniques. It is the rarity of this historical and sociopolitical perspective within the general curriculum that creates weakness in the teaching of technological literacy.

There are several philosophers and historians of technology that argue for including a historical perspective in the study of technology. Their claim is that too much of today's understanding of technology fails to take into account the mixed blessings that technology provides humanity. Segal (1994), Tenner (1996), and Wenk (1999) hold that unintended consequences are one of the perils of technology. They and many others maintain that all technologies harbor both positive and negative effects. To ignore the risks of technology, Wenk suggests, would be tantamount to "technological sin" (p. 111). Wenk acknowledges the ethical dimensions of technology by stating: "To be sure, technological sin seems an oxymoron because when technology is colloquially defined it is considered value-neutral. When the human ingredients of technology are recognized as vital [to a full understanding of technology], the linkage is obvious" (p. 111). Yet, aside from an occasional elective course on technology and society—usually limited to the university level—there is little treatment of these consequential and ethical issues in the curriculum as it is delivered in the classroom.

Another overlooked aspect of technology is its linkage with science. When mentioned along with science, technology almost invariably is mentioned second. Some maintain that technology is a secondary form of science (i.e, applied science), which therefore justifies its subordinate stature. Tiles and Oberdiek (1995) describe this debate as being rooted in a "conflict between utility and intellectual status" (p. 74). The authors explain that "the use of the 'scientific method' for problem solving, both in science for answering theoretically posed questions and outside science for answering practically posed questions, is one of the reasons why, in the public mind, 'science' has come to cover engineering and technology as well as theoretical science" (p. 87). With science and technology so intertwined and interdependent in today's world, Tiles and Oberdiek suggest that it makes more sense to speak of "techno-science" rather than "applied science." They conceptualize science and technology as two functionally distinct forms of knowledge and reason; the former seeking to explain the natural world, the latter seeking to modify it.

Given even this brief appraisal of technology, it seems reasonable to conclude that technology constitutes more than mere artifacts and technique, and that because of technology's innate relationship with humanity, it possesses intellectual, social, and cultural dimensions. Yet narrow definitions of technology, ones which have ignored its broader ramifications, have limited the teaching of technological literacy.

Technological Literacy

There have been innumerable attempts to define technological literacy over the past two decades. Many fields of study have engaged in this discourse and have invariably tended to emphasize their own disciplinary values. In the field of technology education, the tightening embrace of engineering further constrains the field's perception and treatment of technology. Such differing and self-absorbed viewpoints have resulted in a conflicting variety of interpretations and a curriculum still confused as to what it truly means to be literate in technology.

In direct contrast to definitions which promote one field or another, a holistic concept of technological literacy has entered the curricular literature. For instance, Seemann (2003) argues for a set of holistic principles to guide the teaching and learning of technology. He remarks, "Increasingly, more is asked of technology educators to be holistic in the understanding conveyed to learners of technology itself itself in order to make better informed technical and design decisions in a wider range of applied settings" (p. 28). Seemann states that a case has been "made for technology to not merely be a 'know how' learning experience, but necessarily also a holistic 'know why' learning experience…" (p. 28). The intent of a holistic approach is to develop in the learner an ability to consider a technological problem and/or solution in a full context. The basic principles that Seemann advocates are intended to develop a habit of mind that naturally considers the technical not only in the applied setting, but in the greater social, environmental, and time context as well.

Technological literacy, as described here, requires a multi-disciplinary, coordinated treatment within the broader school curriculum. The inclusion of a historical, sociopolitical, environmental, as well as instrumental appreciation of technology would create technological literacy that prepared the average citizen for everyday life and living.

One of the most succinct definitions of technological literacy is published by the International Technology Education Association (ITEA). It states that technological literacy is “the ability to use, manage, understand, and assess technology” (ITEA, 2000, p. 242). In an analysis of technology education curricula of six countries, Rasinen (2003) found that the ITEA themes (ability, usage, management, etc.) are common in the curricula of the nations reviewed. Across the various curricula, goals consistently required students to develop an understanding of the effects of technology on society and culture; to know the history of technology; to recognize its relationship with the environment; to master the necessary skills to plan, produce, and evaluate; to tolerate uncertainty and adapt to new technologies; and to recognize the interconnections between technology, the workplace, and everyday life. An interdisciplinary delivery, which often included science, social studies, mathematics, and occasionally, history, was also common.

The Case for an Authentic Technological Literacy

The notion of authentic technological literacy came about through efforts to create an authentic assessment instrument for technological literacy. The practice of authentic assessment requires that a topic be presented through a naturalistic context. It also requires that the learner demonstrate an appropriate level of application. The authenticity of the curriculum, therefore, can be judged in terms of how, and to what degree, a particular aspect of technology is experienced and assessed in the learning process.

As test designers attempted to develop test items, it became apparent that everyday encounters with technology were only incidentally treated in the curriculum. The majority of available tests for technological literacy were composed of items that were void of context or application. Moreover, the existing tests did not seem to recognize that the general population can function very well technologically in everyday life without being able to recall technical nomenclature, exacting specifications, algorithmic procedures, or specific historical events. In the existing tests, assessment that required application, analysis, synthesis, and/or evaluation of everyday technological encounters were extremely rare.

In designing authentic assessment instruments, test designers reasoned that technological literacy exists at varying levels of mastery and across an assortment of technological domains. Exactly what domains and what level of mastery is required for a standard of technological literacy that meets the needs of the general population was (and still is) unclear. For test design purposes, technological domains were defined within areas of life where one commonly encounters technology; namely, food, shelter, clothing, communication, wellness, transportation, and entertainment. Highly specialized technology, such as that found in specific workplace environments, was not included because it was not considered applicable to the needs of the general population. It is the effort to meet the needs of the general population that draws into question the growing popularity of an engineering focus in technology education. Rather than encourage a more holistic approach, such a focus could potentially narrow the field's treatment of technology and therefore further marginalize technology's presence in the overall curriculum.

Conclusion

The tendency of the general population to view technology as a narrow, restricted field confined to computers, cell phones, and the Internet suggests that the present treatment of technology in the school curriculum may be too fragmented and too abstract. In order to create a greater understanding of the pervasive reach of technology in today's world, the teaching of technological literacy should broaden its context to include the uses of technology in the common everyday experiences of our daily lives and to consider its influences on our culture, politics, economics, and social interactions. Rather than move towards an engineering design focus, which would only serve to pigeonhole it further, technological literacy needs to expand its scope to integrate it with the goals of general education; that is, to provide an education that generalizes to everyday life in society. By providing a holistic representation of technology, technological literacy would realize the goals of general education, fulfill the provisions of authentic assessment, and meet the needs of the typical citizen.

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