Information Appliances: Powerful Ideas Shaping Our Educational System


In my September 1999 editorial (L&L vol. 27 no. 1), I briefly discussed 10 powerful ideas that are helping shape the present and future of information technology (IT) in education. This editorial is about information appliances—number 2 on the list. It also touches on ideas from number 4 (user interface) and number 6 (problem solving). See the whole list at www.iste.org/L&L.

What Is an Information Appliance?

Many years ago, I memorized the statement, “A computer is a machine for the input, storage, processing, and output of information.” In those days, my “model” of a computer was a mainframe housed in an air-conditioned building and supported by a large staff of technicians and computer operators. Eventually minicomputers and then microcomputers were developed. The need for a special air-conditioned building and staff disappeared. The human–machine interface improved to the level that ordinary people could use a computer to accomplish tasks such as writing and e-mail communication.

However, microcomputers are not very user friendly. The human–machine interface favors the machine, not the human.

Contrast this situation with the smart card. A smart card looks like a credit card, but it has embedded electronic circuitry. It can be used for the input, storage, processing, and output of information—that is, it satisfies the definition of being a computer. I recently saw a newspaper article indicating that 1.25 billion smart cards were produced this past year. That is approximately one smart card for every five people on earth. They cost about $4 each to manufacture.

A smart card is an example of an information appliance. It can be thought of as a special-purpose computer designed to accomplish a specific task. For example, the task for a smart card might be fiscal (a credit card and a device that actually stores money) or medical (storage of medical records). The human–machine interface is quite easy to use, and the focus is on the task to be accomplished, not the technology.

How many handheld calculators do you own? My wife and I collectively have a dozen or more. They are scattered around our various work and home offices and at convenient locations around the house. The handheld calculator is an information appliance. A person tends to have more than one of an appliance, like a radio or television, that is particularly useful. Moreover, the brand name tends not to be important. All four-function calculators are pretty much alike. They all can accomplish the task they are intended for, and it is quite easy to transfer one’s calculator knowledge and skills from one of these inexpensive information appliances to another.
Chances are you have used a digital camera or a scanner. Digital cameras are still relatively expensive—they can be thought of as an emerging information appliance. Scanners are now available for less than $100, and some are now quite specialized. For example, one can purchase a scanner for digitizing photographs. Both a digital camera and a scanner are quite easy to use, and each is oriented to accomplishing a specific task. From a user point of view, the focus is on learning to accomplish the task, not on learning to use the technology.

**Disruptive Technologies**

Donald Norman (1998) presents a comprehensive picture of the gradual but accelerating emergence of information appliances. He also analyzes how a new technology can disrupt an industry. You are probably familiar with how IBM failed to adjust to microcomputers (a disruptive technology) and was severely damaged by this failure. Similarly, Microsoft was slow to adjust to the Web (a disruptive technology) but then rapidly made the necessary changes.

From the point of view of our education system, distance learning (especially Web-based distance learning) is a disruptive technology. At the postsecondary education level, distance education has introduced new courses that compete with existing courses and will eventually supplant some of them. Clearly, higher education will be disrupted. Moreover, such distance education is already available to a number of secondary school students. Disruption at the secondary level will also occur.

Information appliances are disruptive technologies. They disrupt businesses, and some of them will disrupt education. We see signs of this with calculators, which have affected math curriculum content and assessment. We see signs of this with handheld messaging devices (which may also be calculators, dictionaries, or word processors) that students may use to exchange information when taking a test. And, of course, students carrying electronic pagers or cell phones can be quite disruptive in class.

A deeper issue is illustrated by the following questions: If an information appliance can accomplish a task that we currently teach students to do by hand or by other means, how should this affect education? Should curriculum content, instructional processes, and assessment change to reflect inexpensive, readily available information appliances?

To stretch your mind a little bit, think of the emerging electronic digital global library. Imagine each student having a library appliance. It contains a huge built-in library, and it automatically accesses the global library as necessary when wireless or wired connectivity is available. Moreover, the user can readily add to this library with a personal database of people and documents and an appointment calendar. This library appliance contains the books and other resource materials that the student is studying now and has studied in the past. How would this affect what we currently teach about library use or about any specific subject matter? Should students use such an information appliance while taking tests?

**Final Remarks**

Information appliances such as the handheld calculator and electronic dictionary have been with us for a long time. The continued rapid progress in chip technology, flat panel display screens, batteries, and connectivity will bring us many more information appliances in the near future. Many of these will be disruptive to our education system.

Think about how you deal with such technologies. Are you taking a proactive approach to acquiring these information appliances and introducing them to your students? Do you work to
make these information appliances a routine part of your curriculum, instruction, and assessment? As an IT-knowledgeable teacher, do you enjoy living at the cutting edge?

Though microcomputers will continue to be very important in education, information appliances are emerging as a new cutting edge of IT in education.

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