A History of Instructional Design and Technology: Part I: A History of Instructional Media

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This is the first of a two-part article that will discuss the history of the field of instructional design and technology in the United States. A definition of the field is provided and the major features of the definition are identified. A rational for using instructional design and technology as the label for the field is also presented. Events in the history of instructional media, from the early 1900s to the present day, are described. The birth of school museums, the visual and audiovisual instruction movements, the use of media during World War II, and the interest in instructional television, computers, and the Internet are among the topics discussed. The article concludes with a summarization of the effects media have had on instructional practices, and a prediction regarding the effect computers, the Internet, and other digital media will have on such practices over the next decade.

☐ Approximately 15 years ago I wrote a history of the field of *instructional technology* (Reiser, 1987), which appeared as a chapter in a book edited by Robert M. Gagné. Since that time, many innovations and new ideas have affected the nature of the field. For example, recent technological advances, new ideas and theories regarding the learning process, and new views of how to promote learning and performance in classrooms and in the workplace have all had an influence on the field. In light of all the changes that have taken place, it seems appropriate to update the earlier history. This article and another that will appear in the next issue of *Educational Technology Research and Development* serve as an update of my description of the history of the field I now refer to as *instructional design and technology*.

Before I begin to discuss the history of the field of instructional design and technology, and before I provide my reasons for labeling it as such, let me provide a definition of field:

> The field of instructional design and technology encompasses the analysis of learning and performance problems, and the design, development, implementation, evaluation and management of instructional and non-instructional processes and resources intended to improve learning and performance in a variety of settings, particularly educational institutions and the workplace. Professionals in the field of instructional design and technology often use systematic instructional design procedures and employ a variety of instructional media to accomplish their goals. Moreover, in recent years, they have paid increasing attention to non-instructional solutions to some performance problems. Research and theory related to each of the aforementioned areas is also an important part of the field. (Reiser, in press)

What are the major features of this definition? In many ways it is similar to the most recent Association for Educational Communication and Technology (AECT) definition of the field (Seels & Richey, 1994). Like the 1994 AECT definition, the definition presented in this article mentions five categories of activities or practices: (a) *design,* (b) *development,* (c) *utilization* or *implementation,* (d) *management,* and (e) *evaluation,* often associated with the field; and adds a sixth category, (f) *analysis*. Moreover, like the 1994 definition, the current definition relates those activities or practices to *processes and resources for learning*. In addition, the current definition indicates that *research and theory,* as well as practice, play an important role in the field.

In several respects, however, the current definition goes beyond the 1994 AECT definition. For example, the current definition makes specific reference to some of the *performance technology* concepts that have recently expanded the nature of the field (e.g., *analyzing performance problems in the workplace* and employing *noninstructional solutions,* as well as instructional solutions, to solve those problems). Moreover, the current definition highlights two practices that have, over the years, formed the core of the field. These two practices are (a) *the use of media for instructional purposes* and (b) *the use of systematic instructional design procedures* (often simply called *instructional design*). Although many have argued about the value of employing these practices, they remain as the key defining elements of the field of instructional design and technology. Individuals involved in the field are those who spend a significant portion of their time working with media, or with tasks associated with systematic instructional design procedures, or with both.

Why use the term *instructional design and technology,* rather than *instructional technology,* as the label for the field? Because in spite of the many efforts to clearly define the broad meaning of the latter term (Reiser & Ely, 1997), most individuals outside of the profession, as well as many inside it, when asked to define the term *instructional technology* mention computers, videos, CD-ROMs, overhead and slide projectors, and other types of hardware and software typically associated with the term *instructional media.* In other words, most individuals equate the term *instructional technology* with the term *instructional media.* In light of this fact, perhaps it is time to reconsider the label we use for the broad field that encompasses the areas of instructional media, instructional design and performance technology. While any of a number of terms come to mind, I like *instructional design and technology* (IDT). This term, which has been employed by one of the professional organizations in our field (Professors of Instructional Design and Technology), directly refers to the key concepts mentioned earlier—instructional design and instructional technology (i.e., instructional media). Moreover, as my description of the history of instructional design will indicate, in recent years many of the concepts associated with the performance technology movement have been regularly employed by those individuals who call themselves instructional designers.

As stated earlier, this history of the field will appear in two articles in succeeding issues of this journal. This article focuses on the history of instructional media, and the second article will focus on the history of instructional design. This is a natural separation because, from a historical perspective, most of the practices related to instructional media have occurred independent of developments associated with instructional design.

It should also be noted that although many important events in the history of the IDT field have taken place in other countries, the emphasis in this article and the one that will follow will be on events that have taken place in the United States.

HISTORY OF INSTRUCTIONAL MEDIA

The term *instructional media* has been defined as the physical means via which instruction is presented to learners (Reiser & Gagné, 1983). Under this definition, every physical means of instructional delivery, from the live instructor to the textbook to the computer and so on, would be classified as an instructional medium. It may be wise for practitioners in the field to adopt this viewpoint; however, in most discussions of the history of instructional media, the three primary

means of instruction prior to the 20th century (and still the most common means today)—the teacher, the chalkboard, and the textbook—have been categorized separately from other media (cf. Commission on Instructional Technology, 1970). In order to clearly describe the history of media, this viewpoint will be employed in this article. Thus, *instructional media* will be defined as the physical means, other than the teacher, chalkboard, and textbook, via which instruction is presented to learners.

School Museums

In the United States, the use of media for instructional purposes has been traced back to at least as early as the first decade of the 20th century (Saettler, 1990). It was at that time that school museums came into existence. As Saettler (1968) has indicated, these museums "served as the central administrative unit(s) for visual instruction by (their) distribution of portable museum exhibits, stereographs (three-dimensional photographs), slides, films, study prints, charts, and other instructional materials" (p. 89). The first school museum was opened in St. Louis in 1905, and shortly thereafter, school museums were opened in Reading, PA, and Cleveland, OH. Although few such museums have been established since the early 1900s, the district-wide media center may be considered a modern-day equivalent.

Saettler (1990) has also stated that the materials housed in school museums were viewed as supplementary curriculum materials. They were not intended to supplant the teacher or the textbook. Throughout the past 100 years, this early view of the role of instructional media has remained prevalent in the educational community at large. That is, during this time period most educators have viewed instructional media as supplementary means of presenting instruction. In contrast, teachers and textbooks are generally viewed as the primary means of presenting instruction, and teachers are usually given the authority to decide what other instructional media they will employ. Over the years, a number of professionals in the IDT field (e.g., Heinich, 1970) have argued against this notion, indicating that (a) teachers should be viewed on an equal footing with instructional media—as just one of many possible means of presenting instruction; and (b) teachers should not be given sole authority for deciding what instructional media will be employed in classrooms. However, in the broad educational community, these viewpoints have not prevailed.

The Visual Instruction Movement and Instructional Films

As Saettler (1990) has indicated, in the early part of the 20th century, most of the media housed in school museums were visual media, such as films, slides, and photographs. Thus, at the time, the increasing interest in using media in the school was referred to as the "visual instruction" or "visual education" movement. The latter term was used at least as far back as 1908, when the Keystone View Company published *Visual Education*, a teacher's guide to lantern slides and stereographs.

Besides magic lanterns (lantern slide projectors) and stereopticons (stereograph viewers), which were used in some schools during the second half of the 19th century (Anderson, 1962), the motion picture projector was one of the first media devices used in schools. In the United States, the first catalog of instructional films was published in 1910. Later that year, the public school system of Rochester, NY, became the first to adopt films for regular instructional use. In 1913, Thomas Edison proclaimed: "Books will soon be obsolete in the schools . . . . It is possible to teach every branch of human knowledge with the motion picture. Our school system will be completely changed in the next ten years" (cited in Saettler, 1968, p. 98).

Ten years after Edison made his forecast, the changes he had predicted had not come about. However, during this decade (1914–1923), the visual instruction movement did grow. Five national professional organizations for visual instruction were established, five journals focusing on visual instruction began publication, more than 20 teacher-training institutions began offering courses in visual instruction, and at least a dozen large-city school systems devel-

oped bureaus of visual education (Saettler, 1990).

The Audiovisual Instruction Movement and Instructional Radio

During the remainder of the 1920s and through much of the 1930s, technological advances in such areas as radio broadcasting, sound recordings, and sound motion pictures led to increased interest in instructional media. With the advent of media incorporating sound, the expanding visual instruction movement became known as the audiovisual instruction movement (Finn, 1972; McCluskey, 1981). However, McCluskey, who was one of the leaders in the field during this period, indicated that while the field continued to grow, the educational community at large was not greatly affected by that growth. He stated that by 1930, commercial interests in the visual instruction movement had invested and lost more than $50 million, only part of which was due to the Great Depression, which began in 1929.

In spite of the adverse economic effects of the Great Depression, the audiovisual instruction movement continued to evolve. According to Saettler (1990), one of the most significant events in this evolution was the merging, in 1932, of the three existing national professional organizations for visual instruction. As a result of this merger, leadership in the movement was consolidated within one organization, the Department of Visual Instruction (DVI), which at that time was part of the National Education Association. Over the years, this organization, which was created in 1923, and which is now called AECT, has maintained a leadership role in the field of instructional design and technology.

During the 1920s and 1930s, a number of textbooks on the topic of visual instruction were written. Perhaps the most important of these textbooks was *Visualizing the Curriculum* (Hoban, Hoban, & Zissman, 1937). In this book, the authors stated that the value of audiovisual material was a function of their degree of realism. The authors also presented a hierarchy of media, ranging from those that could only present concepts in an abstract fashion to those that allowed for very concrete representations (Heinich, Molenda, Russell, & Smaldino, 1999). Some of these ideas had previously been discussed by others, but had not been dealt with as thoroughly. In 1946, Edgar Dale further elaborated on these ideas when he developed his famous Cone of Experience. Throughout the history of the audiovisual instruction movement, many have indicated that part of the value of audiovisual materials is their ability to present concepts in a concrete manner (Saettler, 1990).

A medium that gained a great deal of attention during this period was radio. By the early 1930s, many audiovisual enthusiasts were hailing radio as the medium that would revolutionize education. For example, in referring to the instructional potential of radio, films, and television, the editor of publications for the National Education Association stated that "tomorrow they will be as common as the book and powerful in their effect on learning and teaching" (Morgan, 1932, p. ix). However, contrary to these sorts of predictions, over the next 20 years radio had very little impact on instructional practices (Cuban, 1986).

World War II

With the onset of World War II, the growth of the audiovisual instruction movement in the schools slowed; however, audiovisual devices were used extensively in the military services and in industry. For example, during the war the United States Army Air Force produced more than 400 training films and 600 filmstrips, and during a two-year period (from mid-1943 to mid-1945) it was estimated that there were more than four million showings of training films to United States military personnel. Although there was little time and opportunity to collect hard data regarding the effect of these films on the performance of military personnel, several surveys of military instructors revealed that they felt that the training films and filmstrips used during the war were effective training tools (Saettler, 1990). Apparently, at least some of the enemy agreed; in 1945, after the war ended, the German Chief of General Staff said: "We had everything calculated perfectly except the speed

with which America was able to train its people. Our major miscalculation was in underestimating their quick and complete mastery of film education" (cited in Olsen & Bass, 1982, p. 33).

During the war, training films also played an important role in preparing civilians in the United States to work in industry. In 1941, the federal government established the Division of Visual Aids for War Training. From 1941 to 1945, this organization oversaw the production of 457 training films. Most training directors reported that the films reduced training time without having a negative impact on training effectiveness, and that the films were more interesting and resulted in less absenteeism than traditional training programs (Saettler, 1990).

In addition to training films and film projectors, a wide variety of other audiovisual materials and equipment were employed in the military forces and in industry during World War II. Those devices that were used extensively included overhead projectors, which were first produced during the war; slide projectors, which were used in teaching aircraft and ship recognition; audio equipment, which was used in teaching foreign languages; and simulators and training devices, which were employed in flight training (Olsen & Bass, 1982; Saettler, 1990).

Post-World War II Developments and Media Research

The audiovisual devices used during World War II were generally perceived as successful in helping the United States solve a major training problem—namely, how to train effectively and efficiently large numbers of individuals with diverse backgrounds. As a result of this apparent success, after the war there was a renewed interest in using audiovisual devices in the schools (Finn, 1972; Olsen & Bass, 1982).

In the decade following the war, several intensive programs of audiovisual research were undertaken (e.g., Carpenter & Greenhill, 1956; Lumsdaine, 1961; May & Lumsdaine, 1958). The research studies that were conducted as part of these programs were designed to identify how various features, or attributes, of audiovisual materials affected learning; the goal being to identify those attributes that would facilitate learning in given situations. For example, one research program, conducted under the direction of Arthur A. Lumsdaine, focused on identifying how learning was affected by various techniques for eliciting overt student response during the viewing of instructional films (Lumsdaine, 1963).

The post-World War II audiovisual research programs were among the first concentrated efforts to identify principles of learning that could be used in the design of audiovisual materials. However, educational practices were not greatly affected by these research programs in that many practitioners either ignored, or were not made aware of, many of the research findings (Lumsdaine, 1963, 1964).

Most of the media research studies conducted over the years have compared how much students have learned after receiving a lesson presented via a particular medium, such as film, radio, television, or the computer, versus how much students have learned from live instruction on the same topic. Studies of this type, often called media comparison studies, have usually revealed that students learned equally well regardless of the means of presentation (Clark, 1983, 1994; Schramm, 1977). In light of these repeated findings, critics of such research have suggested that the focus of such studies should change. Some have argued that researchers should focus on the attributes (characteristics) of media (Levie & Dickie, 1973); others have suggested an examination of *how* media influence learning (Kozma, 1991, 1994); and still others have suggested that the research focus should be on instructional methods, rather than on the media that deliver those methods (Clark, 1983, 1994). In recent years, some of these types of studies have become more prevalent.

Theories of Communication

During the early 1950s, many leaders in the audiovisual instruction movement became interested in various theories or models of communication, such as the model put forth by Shannon and Weaver (1949). These models

focused on the communication process, a process involving a sender and a receiver of a message, and a channel, or medium, through which that message is sent. The authors of these models indicated that during planning for communication it was necessary to consider all the elements of the communication process, and not just focus on the medium, as many in the audiovisual field tended to do. As Berlo (1963) stated: "As a communication man I must argue strongly that it is the process that is central and that the media, though important, are secondary" (p. 378). Several leaders in the audiovisual movement, such as Dale (1953) and Finn (1954), also emphasized the importance of the communication process. Although at first, audiovisual practitioners were not greatly influenced by this notion (Lumsdaine, 1964; Meierhenry, 1980), the expression of this point of view eventually helped expand the focus of the audiovisual movement (Ely, 1963, 1970; Silber, 1981).

Instructional Television

Perhaps the most important factor to affect the audiovisual movement in the 1950s was the increased interest in television as a medium for delivering instruction. Prior to the 1950s, there had been a number of instances in which television had been used for instructional purposes (Gumpert, 1967; Taylor, 1967). During the 1950s, however, there was a tremendous growth in the use of instructional television. This growth was stimulated by at least two major factors: (a) the setting aside by the Federal Communications Commission of educational channels, and (b) Ford Foundation funding.

The 1952 decision by the Federal Communications Commission to set aside 242 television channels for educational purposes, led to the rapid development of a large number of public (then called "educational") television stations. By 1955, there were 17 such stations in the United States, and by 1960 that number had increased to more than 50 (Blakely, 1979). One of the primary missions of these stations was the presentation of instructional programs. As Hezel (1980) indicated: "The teaching role has been ascribed to public broadcasting since its origins. Especially prior to the 1960s, educational broadcasting was seen as a quick, efficient, inexpensive means of satisfying the nation's instructional needs" (p. 173).

It has been estimated that during the 1950s and 1960s the Ford Foundation and its agencies spent more than $170 million on educational television (Gordon, 1970). Those projects sponsored by the foundation included a closed-circuit television system that was used to deliver instruction in all major subject areas at all grade levels throughout the school system in Washington County (Hagerstown), MD; a junior-college curriculum that was presented via public television in Chicago; a large-scale experimental research program designed to assess the effectiveness of a series of college courses taught via closed circuit television at Pennsylvania State University; and the Midwest Program on Airborne Television Instruction, a program designed to transmit televised lessons from an airplane to schools in six states simultaneously.

By the mid-1960s, much of the interest in using television for instructional purposes had abated. Many of the instructional television projects developed during this period had short lives. This problem was partly because of the mediocre instructional quality of some of the programs that were produced; many of them did little more than present a teacher delivering a lecture. In 1963, the Ford Foundation decided to focus its support on public television in general, rather than on in-school applications of instructional television (Blakely, 1979). In many cases, school districts discontinued instructional television demonstration projects when the external funding for those projects was halted (Tyler, 1975). Instructional programming was still an important part of the mission of public television, but that mission was now wider, encompassing other types of programming, such as cultural and informational presentations (Hezel, 1980). In light of these and other developments, in 1967 the Carnegie Commission on Educational Television concluded:

> The role played in formal education by instructional television has been on the whole a small one . . . nothing which approached the true potential of instructional television has been realized in practice . . . . With minor exceptions, the total disappearance of instruc-

tional television would leave the educational system fundamentally unchanged. (pp. 80–81)

Many reasons have been given as to why instructional television was not adopted to a greater extent. These include teacher resistance to the use of television in their classrooms, the expense of installing and maintaining television systems in schools, and the inability of television alone to adequately present the various conditions necessary for student learning (Gordon, 1970; Tyler, 1975).

Shifting Terminology

By the early 1970s, the terms *educational technology* and *instructional technology* began to replace *audiovisual instruction* to describe the application of media for instructional purposes. For example, in 1970, the name of the major professional organization within the field was changed from the Department of Audiovisual Instruction to the Association for Educational Communications and Technology, and later in the decade, the names of the two journals published by AECT were also changed—*Audiovisual Communication Review* became *Educational Communications and Technology Journal, and Audiovisual Instruction* became *Instructional Innovator*. Moreover, the group the United States government established to examine the impact of media on instruction was called the Commission on Instructional Technology. Regardless of the terminology, however, most individuals in the field agreed that, up to that point, instructional media had had minimal impact on educational practices (Commission on Instructional Technology, 1970, Cuban, 1986).

Computers: From the 1950s to 1995

After the interest in instructional television faded, the next technological innovation to catch the attention of a large number of educators was the computer. Although wide-spread interest in the computer as an instructional tool did not occur until the 1980s, computers were first used in education and training at a much earlier date. Much of the early work in computer-assisted instruction (CAI) was done in the 1950s by researchers at IBM, who developed the first CAI author language and designed one of the first CAI programs to be used in the public schools. Other pioneers in this area included Gordon Pask, whose adaptive teaching machines made use of computer technology (Lewis & Pask; 1965; Pask, 1960; Stolorow & Davis, 1965), and Richard Atkinson and Patrick Suppes, whose work during the 1960s led to some of the earliest applications of CAI at both the public school and university levels (Atkinson & Hansen, 1966; Suppes & Macken, 1978). Other major efforts during the 1960s and early 1970s included the development of CAI systems such as PLATO and TICCIT (Saettler, 1990). However, in spite of the work that had been done, by the end of the 1970s, CAI had had very little impact on education (Pagliaro, 1983).

By the early 1980s, a few years after microcomputers became available to the general public, the enthusiasm surrounding this tool led to increasing interest in using computers for instructional purposes. By January 1983, computers were being used for instructional purposes in more than 40% of all elementary schools and more than 75% of all secondary schools in the United States (Center for Social Organization of Schools, 1983).

Many educators were attracted to microcomputers because they were relatively inexpensive, were compact enough for desktop use, and could perform many of the functions performed by the large computers that had preceded them. As was the case when other new media were first introduced into the instructional arena, many expected that this medium would have a major impact on instructional practices. For example, in 1984, Papert indicated that the computer was going to be "a catalyst of very deep and radical change in the educational system" (p. 422) and that by 1990 one computer per child would be a very common state of affairs in schools in the United States.

Although computers may eventually have a major impact on instructional practices in schools, by the mid-1990s that impact had been rather small. Surveys revealed that by 1995, although schools in the United States possessed,

on average, one computer for every nine students, the impact of computers on instructional practices was minimal, with a substantial number of teachers reporting little or no use of computers for instructional purposes. Moreover, in most cases, the use of computers was far from innovative. In elementary schools, teachers reported that computers were being primarily used for drill and practice, and at the secondary level, reports indicated that computers were mainly used for teaching computer-related skills such as word processing (Anderson & Ronnkvist, 1999; Becker, 1998; Office of Technology Assessment, 1995).

Recent Developments

Since 1995, rapid advances in computer and other digital technology, as well as the Internet, have led to a rapidly increasing interest in, and use of, these media for instructional purposes, particularly in training in business and industry. For example, a recent survey of more than 750 training industry companies (Bassi & Van Buren, 1999) revealed that the percentage of training delivered via such new technologies as CD-ROM, intranets and the Internet rose from less than 6% in 1996 to more than 9% in 1997, and was expected to rise to more than 22% by 2000. Another recent survey reported that, in 1999, 14% of all formal training was delivered via computers (Industry Report 1999).

In the past few years, interest in using the Internet for instructional purposes has also been rapidly growing in higher education and the military. For example, between the 1994–95 and the 1997–98 academic years, enrollments in distance learning courses in higher education institutions in the United States nearly doubled, and the percentage of institutions that offered distance learning courses rose from 33% to 44%, with 78% of public four-year institutions offering such courses. Moreover, whereas in 1995 only 22% of the higher education institutions offering distance learning courses used asynchronous Internet-based technologies, by the 1997–98 academic year 60% of the institutions did so (Lewis, Snow, Farris, Levin, & Greene, 1999). In the military, in 2000, the Secretary of the United States Army announced that $600 million would be spent over the next six years to enable soldiers to take distance education courses via the Internet (Carr, 2000).

Since 1995, there has also been a significant increase in the amount of technology available in schools in the United States. For example, results of a 1998 national survey (Anderson & Ronnkvist, 1999) revealed that whereas in 1995 there was an average of one computer for every nine students, by 1998 there was one computer for every six students. Moreover, the percentage of schools that had Internet access increased from 50% in 1995 to 90% in 1998. However, as has been the case throughout the history of instructional media, an increased presence of technology in the schools does not necessarily mean an increased use of that technology for instructional purposes. Anderson & Ronnkvist also stated that although the number of computers in schools has been increasing, most of the computers are quite limited in terms of the software they can run. Furthermore, they indicated that although the vast majority of schools now have Internet access, in many schools student access to the Internet is limited, with few students being able to use it for their school work. These observations make it difficult to ascertain the extent to which instructional practices in schools have been influenced by the increased presence of media.

In spite of the uncertainty regarding the extent of media usage in the schools, most of the evidence cited above clearly indicates that, since 1995, there has been a significant increase in the use of instructional media in a variety of settings, ranging from business and industry to the military and higher education. What are some of the reasons for this increased usage? In business and industry and the military, the Internet has been viewed as a means of providing instruction and information to widely dispersed learners at a relatively low cost. Moreover, in many cases, the easy accessibility of computers makes it possible for learners to receive instruction, performance support (often in the form of an electronic performance support system or knowledge management system), or both, when and where they need it, as they are performing particular job tasks.

In higher education, distance education via the Internet has been seen as a low-cost method of providing instruction to students who, because of a variety of factors (e.g., job and family responsibilities, geography), might not otherwise have been able to receive it. However, questions regarding the cost effectiveness of such instruction remain unanswered (Hawkridge, 1999).

Another reason that the newer media are being used to a greater extent may be their increased interactive capabilities. Moore (1989) described three types of interactions among the agents usually involved in an instructional activity. These interactions are (a) between learners and instructional content, (b) between learners and the instructor, and (c) among learners themselves. Because of their attributes, the instructional media that were prevalent during some portion of the first two thirds of the past century (e.g., films and instructional television) were primarily employed as a means of having learners interact with instructional content. In contrast, through the use of such features as e-mail, chat rooms, and bulletin boards, the Internet is often used as a means of having learners interact with their instructor and with other learners, as well as with instructional content. This is one example of how some of the newer media make it easier to promote the various types of interactions described by Moore.

In addition, advances in computer technology, particularly with regard to the increasing multimedia capabilities of this medium, have made it easier for educators to design learning experiences that involve more complex interactions between learners and instructional content than has previously been the case. For example, as the amount and type of information (e.g., print, video, audio) that can be presented by computers has increased, the type of feedback, as well as the type of problems, that can be presented to learners has greatly expanded. These increased instructional capabilities have attracted the attention of many educators. Moreover, the ability of computers to present information in a wide variety of forms, as well as to allow learners to easily link to various content, has attracted the interest of instructional designers having a constructivist perspective. They and others who are particularly concerned with presenting authentic (i.e., real-world) problems in learning environments in which learners have a great deal of control of the activities they engage in and the tools and resources they use, find the new digital technology more accommodating than its predecessors.

As some of the examples in the previous few paragraphs demonstrate, in the past few years computers, the Internet and other digital technology have often been used to promote learning and performance via some "nontraditional" means. For instance, computer-assisted electronic performance support systems (Stevens & Stevens, 1995), knowledge management systems (Rossett & Donello, 1999), and learner-centered learning environments often serve as alternatives to training or direct instruction. When the current-day impact of "instructional" media is being considered, these types of applications should not be overlooked.

Conclusion

Of the many lessons we can learn by reviewing the history of instructional media, perhaps one of the most important involves a comparison between the anticipated and actual effects of media on instructional practices. As Cuban (1986) has pointed out, as you look back over the past century of media history, you are likely to note a recurrent pattern of expectations and outcomes. As a new medium enters the educational scene, there is a great deal of initial interest and much enthusiasm about the effects it is likely to have on instructional practices. However, enthusiasm and interest eventually fade, and an examination reveals that the medium has had a minimal impact on such practices. For example, Edison's optimistic prediction that films would revolutionize education proved to be incorrect, and the enthusiasm for instructional television that existed during the 1950s greatly abated by the mid-1960s, with little impact on instruction in the schools. Both of these examples involve the use of media in schools, the setting in which the use of instructional media has been most closely examined. However, data regarding the use of instructional media in business and

industry supports a similar conclusion: namely that, in spite of enthusiasm about the use of instructional media in business and industry, until recently media have had a minimal impact on instructional practices in that environment.

What about the predictions, first made in the 1980s, that computers would revolutionize instruction? As the data from schools reveal, by the mid-1990s that revolution had not occurred. However, data from the second half of the decade indicate a growing presence, and perhaps instructional use, of computers and the Internet in schools. Moreover, during the past five years, these media have taken on an increasingly larger instructional and performance support role in other settings such as business and industry and higher education.

Will the impact of media on instruction be greater in the future than it has been in the past? In light of the aforementioned reasons for the increasing use of the newer media, I think it is reasonable to predict that over the next decade, computers, the Internet, and other digital media will bring about greater changes in instructional practices than the media that preceded them. However, in light of the history of media and its impact on instructional practices, I also think it is reasonable to expect that such changes, both in schools and in other instructional settings, are likely to come about more slowly and be less extensive than most media enthusiasts currently predict. □

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