The Definition of Educational Technology

by
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The Definition

Conceptions of educational technology have been evolving as long as the field has, and they continue to evolve. Therefore today's conception is a temporary one, a snapshot in time. In today's conception, Educational Technology can be defined as an abstract concept or as a field of practice. First, the definition of the *concept*:

> **Educational technology is the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources.**

Elements of the Definition

Each of the key terms used in the definition will be discussed as to their intended meaning in the context of the definition.

Study. The theoretical understanding of, as well as the practice of, educational technology, requires continual knowledge construction and refinement through research and reflective practice, which are encompassed in the term "study." That is, "study" refers to information gathering and analysis beyond the traditional conceptions of research. It is intended to include quantitative and qualitative research as well as other forms of disciplined inquiry such as theorizing, philosophical analysis, historical investigations, development projects, fault analyses, system analyses, and evaluations. Research has traditionally been both a generator of new ideas and an evaluative process to help improve practice. Research can be conducted based upon a variety of methodological constructs as well as several contrasting theoretical constructs. The research in educational technology has grown from investigations attempting to "prove" that media and technology are effective tools for learning, to investigations created to describe and detail the appropriate applications of processes and technologies to the improvement of learning.

Important to the newest research in educational technology is the use of authentic environments and the voice of practitioners as well as researchers. Inherent in the word "research" is the iterative process it encompasses. Research seeks to resolve problems by investigating solutions, and those attempts lead to new practice and therefore new problems and questions. Certainly, the ideas of reflective practice and inquiry based upon authentic settings are valuable perspectives on research. Reflective practitioners consider the problems in their environment (for example, a learning problem of their students) and attempt to resolve the problems by changes in practice, based upon both research results and professional experience. Reflection on this process leads to changes in the considered solution and further attempts to identify and solve problems in the environment, a cyclical process of practice/reflection that can lead to improved practice. (Schön, 1990)

Current inquiry problem areas are often determined by the influx of new technologies into educational practice. The history of the field has recorded the many research programs initiated in response to new technologies, investigating their best design, development, utilization, and management. However, more recently, the inquiry programs in educational technology have been influenced by growth and change in major theoretical positions in learning theory, information management, and other allied fields. For example, the theoretical lenses of cognitive and constructivist theories have changed the emphasis in the field from teaching to learning. Attention to learners' perspectives, preferences, and ownership of the learning process has grown. These theoretical shifts have changed the orientation of the field dramatically, from a field driven by the design of instruction to be "delivered" in a variety of formats (technologies or strategies) to a field which seeks to create learning environments in which learners can explore—often assisted by electronic support systems—in order to arrive at meaningful understanding. The research emphasis has shifted toward observing learners' active participation and construction of their own path toward learning. In other words, interest is moving away from the design of pre-specified instructional routines and toward the design of environments to facilitate learning

Ethical practice. Educational technology has long had an ethical stance and a list of ethical practice expectations. The AECT Ethics Committee has been active in defining the field's ethical standards and in providing case examples from which to discuss and understand the implications of ethical concerns for practice. In fact, the recent emphasis in society on the ethical use of media and on respect for intellectual property has been addressed by this AECT committee for the educational technology field.

There has been an increase in concerns and attention to the ethical issues within educational technology. Ethics are not merely "rules and expectations" but are a basis for practice. In fact, ethical practice is less a series of expectations, boundaries, and new laws than it is an approach or construct from which to work. Our definition considers ethical practice as essential to our professional success, for without the ethical considerations being addressed, success is not possible.

From the perspective of critical theory, professionals in educational technology must question their practices and concern themselves with their appropriate and ethical use. From the perspective of critical theory, it is vital to question even basic assumptions such as the efficacy of traditional constructs such as the systems approach and technologies of instruction, as well as the power position of those designing and developing the technological solutions. A postmodern stance might impel educational technologists to consider their learners, the environments for learning, and the needs and the "good" of society as they develop their practices. Considering who is included, who is empowered, and who has authority are new issues in the design and development of learning solutions, but an ethical stance insists that educational technologists question their practice areas in these ways as well as in the more traditional constructs of efficiency or effectiveness.

The AECT Code of Ethics includes principles “intended to aid members individually and collectively in maintaining a high level of professional conduct” (Welliver, 2001). AECT’s code is divided into three categories: Commitment to the Individual, such as the protection of rights of access to materials, and efforts to protect the health and safety of professionals; Commitment to Society, such as truthful public statements regarding educational matters or fair and equitable practices with those rendering service to the profession, and Commitment to the Profession, such as improving professional knowledge and skill, and giving accurate credit to work and ideas published. Each of the three principle areas has several listed commitments which help inform educational technology professionals regarding their appropriate actions, regardless of their context or role. Consideration is provided for those serving as researchers, professors, consultants, designers, and learning resource directors, for example, to help shape their own professional behaviors and ethical conduct.

Facilitating. The shift in views of learning and instruction reflected in cognitive and constructivist theories has caused a dramatic change in assumptions about the connection between instruction and learning. Earlier definitions in this field implied a more direct cause-and-effect relationship between instructional interventions and learning. For example the 1963 AECT definition refers to “the design and use of messages which *control the learning process*.” Later definitions were less explicit, but continued to imply a relatively direct connection between well-designed, well-delivered instruction and effective learning. With the recent paradigm shift toward greater learner ownership and responsibility has come a role for technology that is more facilitative than controlling.

In addition, as learning goals in schools, colleges, and other organizations have shifted toward deep rather than shallow learning, the learning environments have become more immersive and more authentic. In these environments, the key role of technology is not so much to present information in drill-and-practice format (to *control* learning) but to provide the problem space and the tools to explore it (to *support* learning). In such cases, the immersive environments and cognitive tools educational technologists help design and use are created to guide learners, to make learning opportunities available, and to assist learners in finding the answers to their questions. Therefore, educational technology claims to *facilitate learning* rather than to cause or control learning; that is, it can help create an environment in which learning more easily could occur.

Facilitating includes the design of the environment, the organizing of resources, and the providing of tools. It may still entail the use of direct instruction within a pre-specified framework in some cases, or the use of open-ended inquiry methods to guide further learning in other cases. The learning events can take place in face-to-face settings or in virtual environments, as in micro-worlds or distance learning.

Learning. The term “learning” does not connote today what it connoted forty years ago when the first AECT definition was developed. There is a heightened awareness of the difference between the mere retention of information for testing purposes and the acquisition of skills used beyond the classroom walls.

Learning tasks can be categorized according to various taxonomies. A straightforward one is suggested by Perkins (1992). The simplest type of learning is *retention* of information. In schools and colleges learning may be assessed by means of tests that require demonstration of such retention. Computer-based instruction units (as in “integrated learning systems”) frequently operate this way. The learning goal may include *understanding* as well as retention. Assessments that require paraphrasing or problem solving may tap the understanding dimension. Such forms of assessment are more challenging, mainly because they are more labor-intensive to evaluate. Learning goals may be more ambitious, such that the knowledge and skills are applied in *active use*. To assess this level of learning requires real or simulated problem situations, something that is obviously challenging to arrange. Some would characterize these differences in types of learning simply as *surface* vs. *deep* learning (Weigel, 2001).

Such types or levels of learning have long been acknowledged, but there has been a growing demand in schools, higher education, and corporate training for more attention to the active-use level. It is increasingly perceived that time and money spent on inculcating and assessing "inert knowledge" is essentially wasted. If learners don't use the knowledge, skills, and attitudes outside the classroom, what is the point of teaching them? So today when educators talk about the pursuit of learning they usually mean productive, active-use, deep learning. Pursuing deep learning implies different instructional and assessment approaches than surface learning, so this shift in connotation has profound implications for what processes and resources are "appropriate."

The shift in views of learning and instruction reflected in cognitive and constructivist theories previously discussed has caused a dramatic change in assumptions about the connection between instruction and learning. Earlier definitions in this field implied a more direct cause-and-effect relationship between instructional interventions and learning. For example, the earliest AECT definition (Ely, 1963) refers to "the design and use of messages which *control the learning process*." Later definitions were less explicit, but continued to imply a relatively direct connection between well-designed, well-delivered instruction and effective learning. With the recent paradigm shift toward greater learner ownership and responsibility has come a role for technology that is more facilitative than controlling.

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Improving. For a field to have any claim on public support it must be able to make a credible case for offering some public benefit. It must provide a superior way to accomplish some worthy goal. For example, for chefs to claim to be culinary professionals they must be able to prepare food in ways that are somehow better than non-specialists—more appealing, safer, more nutritious, prepared more efficiently, or the like. In the case of educational technology, to "improve performance" most often entails a claim of effectiveness: that the processes lead predictably to quality products, and that the products lead predictably to effective learning, changes in capabilities that carry over into real-world application.

Effectiveness often implies efficiency, that is, that results are accomplished with the least wasted time, effort, and expense. But what is efficient depends on the goals being pursued. If you want to drive from San Francisco to Los Angeles in the shortest time, Interstate Highway 5 is likely to be efficient. However, if your real goal is to see the ocean views along the way, State Highway 1, which winds along the coastline, would be more efficient. Likewise, designers might well disagree on methods if they do not have the same learning goals in mind. To a great extent, the systematic instructional development movement has been motivated by concerns of efficiency, defined as helping learners reach predetermined goals that are measured by objective assessments.

The concept of efficiency is viewed differently in the constructivist learning approach. In this approach, designers place greater emphasis on the appeal of the instruction and on the extent to which learners are empowered to choose their own goals and their own learning paths. They would more likely measure success in terms of knowledge that is deeply understood and experienced, and able to be applied to real-world problems as opposed to less authentic or embedded measures of learning, such as objective tests. Such designs, however, would still need to be planned for learning to occur within a particular time frame with some goals in mind and resources for meeting those goals. Among parties who have managed to agree on goals, efficiency in reaching those goals surely would be regarded as a plus.

With high expectations for learning, and high stakes for successful achievement becoming ever more important in society, *other things being equal,* faster is better than slower and cheaper is better than more expensive.

Performance. In the context of this definition, performance refers to the learner's ability to use and apply the new capabilities gained. Historically, educational technology has always had a special commitment to results, exemplified by programmed instruction, the first process to be labeled educational technology. Programmed instruction materials were judged by the extent to which users were able to perform the "terminal objective" after instruction. Terminal objectives were stated in terms of the actual conditions for which people were being trained or educated and were assessed according to how well learners functioned under these conditions.

The reference to "improving performance" also reinforces the newer connotation of learning: not just inert knowledge but usable capability.

The use of "performance" in this definition is not meant to imply that educational technology encompasses all forms of performance improvement. As is advocated in the related field of performance technology, there are many different sorts of interventions that may be used in the workplace to improve performance: tool, incentives, organizational change, cognitive support, job redesign, in addition to instruction (Stolovitch and Keeps, 1992). Since it encompasses all these sorts of interventions, performance technology is a broader concept than educational technology.

The definition mentions three major functions that are integral to the concept of Educational Technology—creating, using, and managing. These functions can be viewed as separate sets of activities that might be carried out by different people at different times. They can also be viewed as phases of the larger process of instructional development. Advocates of a systems approach to instructional development would go further to specify that these functions be accompanied by evaluation processes at each phase. Monitoring decisions and taking corrective actions at each phase are critical attributes of the systems approach. Examples of such evaluation activities are mentioned under the headings of Creating, Using, and Managing below.

Creating. Creation refers to the research, theory, and practice involved in the *generation of learning environments* in many different settings, formal and nonformal. Creating can include a variety of activities, depending on the design approach that is used. Design approaches can evolve from different developer mindsets: aesthetic, scientific, engineering, psychological, procedural, or systemic, each of which can be employed to produce the necessary materials and conditions for effective learning.

A systems approach, for example, might entail procedures for *analyzing* an instructional problem, *designing* and *developing* a solution, *evaluating* and revising decisions made at each step, and then *implementing* a solution. Assessing results and taking corrective action along the way is referred to as *formative evaluation*, while assessing the impact of the project at the end is referred to as *summative evaluation*. Different sorts of evaluative questions are asked at different stages. At the *front-end analysis* stage: is there a performance problem and does it entail instructional needs? In *learner analysis*: what are the characteristics of the learners? In *task analysis*: what capabilities must the learners master? At the design stage: What are the learning objectives? Is the blueprint aligned with those objectives? Do instructional materials instantiate the principles of *message design*? At the development stage: does the prototype actually guide learners toward the objectives? At the implementation stage: is the new solution being used and used properly? What is its impact on the original problem?

Design and development processes are influenced by the varied analog and digital technologies used to create learning environments. Designing for teacher-led classroom instruction, for example, may follow a different path than designing for a computer-based simulation game. What is created may be not only the materials for instruction and the surrounding learning environments, but also databases for knowledge management, online databases for problem exploration, automated help systems, and portfolios for displaying and assessing learning.

Using. This element refers to the theories and practices related to bringing learners into contact with learning conditions and resources. As such, it is Action Central, where the solution meets the problem. Using begins with the *selection* of appropriate processes and resources—methods and materials, in other words—whether that selection is done by the learner or by an instructor. Wise selection is based on *materials evaluation*, to determine if existing resources are suitable for this audience and purpose. Then the learner's encounter with the learning resources takes place within some environment following some procedures, often under the guidance of an instructor, the planning and conduct of which can fit under the label of *utilization.* If the resources involve unfamiliar media or methods, their *usability* may be tested before use.

In some cases there is a conscious effort to bring an instructional innovation to the attention of instructors, to market it. This *diffusion* process can be another phase of using. When teachers incorporate new resources into their curricular plans, this is referred to as *integration*; when such integration takes place on a larger scale, incorporating the innovation into the organizational structure, it is referred to as *institutionalization*.

In a systems approach, the design team would monitor the effectiveness of the usage at each phase and take corrective actions where indicated.

Managing. One of the earliest responsibilities of professionals in the field of educational technology has been management; in the early years this took the form of *directing the operations* of audiovisual centers. As media production and instructional development processes became more complicated and larger-scale, they had to master *project management* skills as well. As distance education programs based on information and communications technologies (ICT) developed, educational technologists found themselves involved in *delivery system management*. In all of these managerial functions, there are sub-functions of *personnel management* and *information management,* referring to the issues of organizing the work of people and planning and controlling the storage and processing of information in the course of managing projects or organizations. Prudent management also requires *program evaluation*. In the systems approach, this entails *quality control* measures to monitor results and *quality assurance* measures to enable continuous improvement of the management processes.

People who carry out management functions may be seen as exercising *leadership,* combining management expertise with support of ethical practice in all phases of educational technology practice.

Appropriate. The term "appropriate" is meant to apply to both processes and resources, denoting suitability for and compatibility with their intended purposes.

The term "appropriate technology" is widely used internationally in the field of community development to refer to a tool or practice that is the simplest and most benign solution to a problem. The concept grew out of the environmental movement of the 1970s, sparked by the book, *Small is Beautiful* (Schumacher, 1975), in which the term was coined. In this sense, appropriate technologies are those that are connected with the local users and cultures and are sustainable within the local economic circumstances. Sustainability is particularly critical in settings like developing countries, to ensure that the solution uses resources carefully, minimizes damage to the environment, and will be available to future generations.

AECT's professional standards have longed recognized that appropriateness has an ethical dimension. A number of provisions in the AECT Code of Ethics (Welliver, 2001) are relevant. Section 1.7 is the broadest and perhaps most directly relevant item, specifying the requirement to "promote current and sound professional practices in the use of technology in education." Section 1.5 requires "sound professional procedures for evaluation and selection of materials and equipment." Section 1.6 requires researchers and practitioners to protect individuals "from conditions harmful to health and safety." Section 1.8 requires the avoidance of content that promotes gender, ethnic, racial or religious stereotypes, and it encourages the "development of programs and media that emphasize the diversity of our society as a multicultural community." Further, Section 3 of AECT's Code calls for providing "opportunities for culturally and intellectually diverse points of view" and avoiding "commercial exploitation", as well as following copyright laws and conducting research and practice using procedures guided by professional groups and institutional review boards.

Of course, a practice or resource is appropriate only if it is likely to yield results. This implies a criterion of effectiveness or usefulness for the intended purpose. For example, a particular computer-based simulation game might be selected by a social studies teacher if past experience indicated that it stimulated the sort of pertinent discussion that she intended. It would be judged appropriate in terms of usefulness.

"Appropriateness" has sometimes been used as a rubric for attempts to censor books or other instructional materials. Challenges may be based on claims that the material is sexually explicit, contains offensive language, or is otherwise unsuited to a particular age group. That is not the connotation or the context intended in this definition.

In summary, the selection of methods and media should be made on the basis of "best practices" applicable to a given situation, as specified in Section 1.7 of the Code of Ethics. This implies that educational technology professionals keep themselves updated on the knowledge base of the field and use that knowledge base in making decisions. Random choices, which might be acceptable for those outside the profession, do not meet the criterion of "appropriate." Informed, professionally sound choices help learners learn productively while making wise use of the time and resources of the organization, including the time and effort of educational technologists themselves.

Technological. In terms of lexicography, it is undesirable to use the word "technological" in a definition of "educational technology." In this case, the use is justified because "technological" is a shorthand term that describes an approach to human activity based on the definition of technology as "the systematic application of scientific or other organized knowledge to practical tasks" (Galbraith, 1967, p. 12). It is a way of thinking that is neatly summarized in one word. It would be more awkward to paraphrase the concept of "technological" within the new definition than to simply use the shorthand term.

The term modifies both processes and resources. First, it modifies processes. There are "non-technological" processes that could be used in planning and implementing instruction, such as the everyday decision-making processes of teachers, which may be significantly different from those advocated in this field. The field advocates the use of processes that have some claim of worthy results, based on research or at least reflective development. Without the "technological" modifier, any sorts of models, protocols, or formulations could be included in the ambit of educational technology, blurring the boundaries with Curriculum and Instruction or education in general.

Second, the term also modifies resources, the hardware and software entailed in teaching—still pictures, videos, audiocassettes, satellite uplinks, computer programs, DVD disks and players, and the like. These are the most publicly visible aspects of educational technology. To ignore them in this definition would be to create a greater communication gap between specialists and non-specialist readers.

Processes. A process can be defined as a series of activities directed toward a specified result. Educational technologists often employ specialized processes to design, develop, and produce learning resources, subsumed into a larger process of *instructional development*. From the 1960s through the 1990s a central concern of the field was the pursuit of a *systems approach* to instructional development. To many, the systems approach was and is central to the identity of the field.

A paradigm shift occurred in the decade since the prior (1994) AECT definition, involving postmodern and constructivist influences among others. To simplify, the focus moved from what the instructor is doing to what the learner is doing. In this view, individuals construct their own knowledge and gain ownership based on their struggles to make sense of their experience. To the extent that the teaching-learning experience is abstracted from real-world application and to the extent that it is controlled and possessed by the teacher, it diminishes the likelihood of learner engagement, mastery, and transfer of the skill. This sensibility came into conflict with the plan-and-control sensibility of systematic instructional development, a conflict whose resolution is still being negotiated.

In the context of the definition, "processes" also include those of using and managing resources as well as those of creating them.

Resources. The many resources for learning are central to the identity of the field. The pool of resources has expanded with technological innovations and the development of an understanding regarding how these technological tools might help guide learners. Resources are people, tools, technologies, and materials designed to help learners. Resources can include high-tech ICT systems, community resources such as libraries, zoos, museums, and people with special knowledge or expertise. They include digital media, such as CD-ROMs, Web sites and WebQuests, and electronic performance support systems (EPSS). And they include analog media, such as books and other print materials, video recordings, and other traditional audiovisual materials. Teachers discover new tools and create new resources; learners can collect and locate their own resources; and educational technology specialists add to the growing list of possible resources as well.

Conclusion

What is proposed here is a revised definition of the concept of educational technology, built upon AECT's most recent prior definition of instructional technology (Seels and Richey, 1994). It is a tentative definition, subject to further reconsideration over time. Educational technology is viewed as a construct that is larger than instructional technology, as education is more general than instruction. Further, educational or instructional technology can be seen as discrete elements within performance technology, the holistic approach to improving performance in the workplace through many different means, including training.

The *concept* of educational technology must be distinguished from the field and the profession of educational technology. The validity of each can be judged separately from the others and can be judged by different criteria.

This definition differs from previous ones in several regards. First, the term "study" instead of "research" implies a broader view of the many forms of inquiry, including reflective practice. Second, it makes an explicit commitment to *ethical* practice.

Third, the object of educational technology is cast as "*facilitating* learning," a claim more modest than that of controlling or causing learning. Fourth, it is intentional that learning is placed at the center of the definition, to highlight the centrality of learning to educational technology. It is the goal of promoting learning that is distinctive about the field, compared to other fields with which it might be conflated, such as information technology or performance technology.

Fifth, "improving performance" implies a quality criterion, a goal of facilitating learning better than is done with approaches other than Educational Technology, leading to usable skills, not just inert knowledge.

Sixth, it describes the major functions of the field (creation, use, and management) in broader, less technical terms than previous definitions in order to reflect an eclectic view of the design process.

Seventh, it specifies that the tools and methods of the field be “appropriate,” meaning suited to the people and conditions to which they are applied. Finally, it makes the attribute of “technological” explicit, with the rationale that tools and methods that are not technological fall outside the boundaries of the field.

The terms “improving” and “appropriate” are explicitly included in the definition in order to recognize the centrality of such values to the core meaning of educational technology. If the work of the field is not done “better” by professionals than it is by amateurs, the field has no justification for public recognition or support. It must represent some specialized expertise that is applied with professional soundness.

References

Ely, D.P. (1963). The changing role of the audiovisual process: A definition and glossary of related terms. *Audiovisual Communication Review* 11:1, Supplement 6.

Galbraith, J.K. (1967). *The new industrial state.* Boston: Houghton Mifflin.

Perkins, D. N. (1992). Technology meets constructivism: Do they make a marriage? In T. M. Duffy & D.H. Jonassen (Ed’s), *Constructivism and the technology of education: A conversation*. Hillsdale, NJ: Lawrence Erlbaum.

Schön, Donald A. (1990). *Educating the reflective practitioner*. San Francisco: Jossey-Bass.

Schumacher, E. F. (1975). *Small is beautiful: economics as if people mattered*. New York: Harper & Row

Seels, B., & Richey, R. (1994). *Instructional technology: The definition and domains of the field.* Washington DC: Association for Educational Communications and Technology.

Stolovitch, H., & Keeps, E., ed’s. (1992). *A handbook of performance technology*. San Francisco: Jossey Bass.

Weigel, V. B. (2001). *Deep learning for a digital age: Technology's untapped potential to enrich higher education.* San Francisco: Jossey-Bass.

Welliver, P. W., ed. (2001). *A Code of Professional Ethics: A guide to professional conduct in the field of Educational Communications and Technology*. Bloomington, IN: Association for Educational Communications and Technology