

教育工学の定義の変遷

—AECTと日本教育工学会の視点から—

Changes in the Definition of Educational Technology by the AECT and JSET

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ABSTRACT

本稿は、まず、Association for Educational Communications and Technology (AECT) の「教育工学」の定義を教育とテクノロジーの発展に従い考察する。教育工学の定義は、大きく4つの時期に分類できる (Reiser & Dempsey, 2007)。第一に、インストラクショナル・テクノロジーがメディアとして存在した時期、第二に1960年代から70年代にかけて、インストラクショナル・テクノロジーがプロセスを重視した時期、第三にインストラクショナル・テクノロジーが、プロセス重視を超えた時期、第四に最近の定義である。続いて日本教育工学会の研究者の視点から「教育工学」の定義を考察する。本稿では、坂元、中野、水越、赤堀に焦点をあてる。考察の結果、教育工学の定義は、教育学とテクノロジーの変化に伴い推移をしていることが明らかになった。

This paper discusses the changes in the definition of the term 'educational technology', in relation to pedagogical and technological developments, as facilitated by the Association for Educational Communications and Technology (AECT). It also elaborates and discusses the views of the Japan Society for Educational Technology (JASET) regarding these issues. The first part of this paper chronologically discusses the definition according to the four categories defined by Reiser and Dempsey (2007). These are: 1) instructional technology viewed as media, 2) instructional technology viewed as a process (1960s to the 1970s), 3) beyond viewing instructional technology as a process, and 4) recent definitions. The second part provides the definitions

presented by four major Japanese scholars in this field, namely, Takashi Sakamoto, Terumi Nakano, Toshiyuki Mizukoshi, and Kanji Akahori. In conclusion, it becomes evident that changes in the definition of ‘educational technology’ have evolved with the advancement of technology and pedagogy.

1. Introduction

“Educational technology” comprises two words: “education” and “technology.” What has caused the evolving definition of this term? One simple answer lies in one of the words comprising the phrase: technology. As technology has never stopped evolving, the accompanying changes have also created an impact upon pedagogy. From previous examples, we can see that technological evolution does occur and that it influences prevailing teaching practices. For instance, the teaching of English as a Foreign Language (EFL), is one of the areas that has undergone a parallel development alongside technology. In the early age of the Language laboratory (LL) in the 1970s, open reel tapes were used and the students repeated the sentences as recorded; which is the so-called audio-lingual approach. These tapes were eventually replaced by cassette tapes and videotapes. Later, compact disks (CDs), mini disks (MDs), and then digital video disks (DVDs) came to replace these tapes. In this way, Communicative approach began to gain support from the EFL teachers. Recently, the LL evolved to the Computer Assisted Language Lab (CALL). The study of EFL through the Internet has gained popularity in recent years. This has led to open sources and has provided a broader range of opportunities where learners can avail of participatory learning. Through this particular area, we witnessed how the advancement of technology has given a huge impact on pedagogy. In view of these technological transformations, this paper discusses changes in the definition of educational technology in relation to pedagogy and technology.

The purpose of this paper is to discuss and

understand the changes in the definition of educational technology in relation to pedagogical and technological development including both the AECT and JSET perspectives.

This discussion is important because it reflects the whole scope of evolution of educational technology. As seen in Fig. 1, definitions evolve with technological and pedagogical advancements. Technological advancements influence pedagogy, which in turn, changes the definitions.

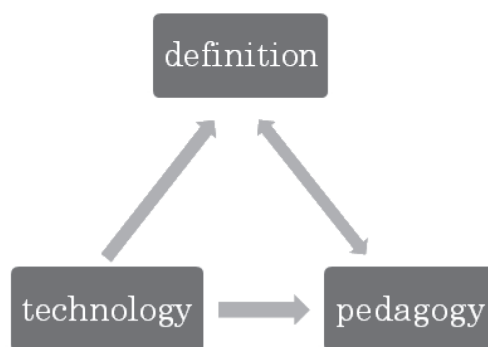


Figure 1. Changes in the definition of educational technology

Educational Technology vs Instructional Technology. Seels and Richey (1994) point out that the terms “Educational Technology” and “Instructional Technology” are used interchangeably by most professionals in the field. The term “Instructional Technology” was first used in the 1994 definition. The following reasons could be cited for such preference: (1) ‘Instructional Technology’ is more commonly used in the United States, (2) it encompasses many practice settings, (3) it describes more precisely the function of technology in education, and (4) it allows for an emphasis on both instruction and learning in the same definitional sentence. Despite these differences, however, the two

terms are considered synonymous (Seels and Richey, 1994).

AECT and JSET. The AECT, which stands for the Association for Educational Communications and Technology, has been described by M. Molenda (n. d.) in its homepage as a “professional association of thousands of educators and others whose activities are directed towards improving instruction through technology.” Founded in the USA in 1923, the association has the longest history in scholarship and practice in this field, and has maintained a central position within it. It currently has over 2000 registered members. The mission of this association is “to provide international leadership by promoting scholarship and best practices in the creation, use, and management of technologies for effective teaching and learning in a wide range of settings” (AECT).

Over at the other side of the world, JSET, which stands for Japan Society for Educational Technology was founded in 1984. Although its history is not as long as that of AECT, this association has served as the most prominent one in the field of Japanese educational technology. Over the years, its roster of members has rapidly increased with as many as 2500 members by July, 2009 (Nagano, 2009).

These two associations have been playing key roles in American and Japanese educational technology. For this reason, their definitions of “educational technology” could be considered influential to scholars, as well as practitioners both in America and Japan. Thus, it is quite reasonable to choose these two associations to follow the changes in the definitions of educational technology.

2. The Definitions of Educational Technology by AECT

This section of the paper deals with how AECT has defined educational technology throughout the years. It also discusses how, in the past years

up to the present, these definitions have come to incorporate issues related to the fields of pedagogy and technology. The definitions are discussed according to the four categories defined by Reiser and Dempsey (2007).

2. 1 Early Definitions: Instructional Technology Viewed as Media

2. 1. 1 Visual Instruction.

The focus of the early definitions of educational technology was on the media used for educational purposes. This trend can be traced back to the beginning of the 20th century when the visual instruction movement had started. Historically, short films began to emerge around 1910, and silent films began to be used in schools by as early as 1910s. These silent pictures and motion pictures gained wide acceptance, and the use of visual materials such as films, pictures, and lantern slides was markedly increased. These activities were called the visual instruction movement. The visual instruction movement was regarded as the first paradigm in educational technology, though it was not explicitly guided by pedagogical theories (Reiser, R. A. and J. V. Dempsey, 2007; Spector, J. Merrill, M. Merrienboer, J. & M. Driscoll, 2008). Dorris (1928) defined it as “the enrichment of education through the ‘seeing experience’ [involving] the use of all types of visual aids such as the excursion, flat pictures, models, exhibits, charts, maps, graphs, stereographs, stereopticon slides, and motion pictures” (p.6).

2. 1. 2 Audio-visual Instruction.

During the 1920s and 1940s, along with the advancements in technology, visual instruction shifted to audio-visual instruction. Resources included sounds such as sound recordings, radio broadcasting, and motion pictures with sound appeared.

Radio broadcast became the prime mass communication medium in the 1920s and 1930s

(Molenda, 2008). The British Broadcasting Corporation (BBC) led the way and many other countries followed. For example, the NHK in Japan initiated a nationwide broadcast in 1935, while in America, the CBC subsumed the Canadian National Railways, CNR in 1933. Generally though, programming tended to be “informally educative” rather than directly instructional (Levenson & Staffsheff, 1952). The interest in audio-visual media continued with the growth of television in 1950s. In the first half of the twentieth century, the focus of educational technology was on the various forms of instructional media that emerged at the time (Reiser & Dempsey, 2007).

During the early 1950s, when educational radio and television programs became influential, communication theory became the dominant paradigm in social science. The theories or models stressed that communication is a process involving a sender and a receiver of a message, as well as a channel or medium through which that particular message is sent (Shannon & Weaver, 1949). Leaders of the audiovisual movement such as Dale (1953), Finn (1954), and Berlo (1963) emphasized the importance of the communication process rather than the medium itself. They argued that “the process is central and that the media, though important, are secondary” (p. 378). This perspective helped expand the focus of the audiovisual movement (Ely, 1963, 1970; Reiser & Dempsey, 2007) However, it should be noted that educators who used learning resources recognized that the communication paradigm did not sufficiently explain what the learners did with the messages upon receiving them.

The communication theory is in line with Behaviorism in the sense that a sender sends a message and the receiver decodes the meaning. In the field of pedagogy, Behaviorism became mainstream in the 1950s. This theory is associated with B.F. Skinner and his stimulus-response theory, the fundamental premise of which is that “there is

a predictable and reliable link between a stimulus and the response” (Jonassen, D.H., 2004, p. 102). Reiser and Dempsey (2007) contend that the core of this radical Behaviorism is that learning can be understood, explained, and predicted entirely on the basis of observable events, namely, the behavior of the learner along with its environmental antecedents and consequences. Furthermore early behaviorists held wider perspectives and believed that a variety of behaviors can be observed and measured. Virtually, early ID models are based on the Behaviorism with systems approach.

During World War II, educational technology was advanced to win the war, and the gathering of outstanding scholars resulted in major contributions to the field. Among them was Gagné who pioneered the science of instruction during WWII for the training of the air force pilots. Motion pictures were also extensively used for propaganda purposes. In fact, millions of combat and industrial workers were trained using films.

In sum, the early definition was written based on educational technology viewed through developments in media, from visual to audio-visual education. During the 1950s, the communication theory, which espoused the importance of communication as a process, became predominant in the field of social science. This means that the field of interest was extended from the media to its various processes. In line with the communication theory, Behaviorism also became influential, primarily through B.F. Skinner’s S-R theory. The above mentioned theories correspond to the Systems view of educational technology. They highlighted the process of education as one wherein observable outcomes should be given emphasis. Those conditions resulted in the 1963 definition, which was a departure from the traditional view of educational technology as a form of media.

2. 2 1960-1970s Viewed as a “Process”

2. 2. 1 The 1963 Definition.

The 1963 definition of audiovisual communication was the first formal definition of educational technology (AECT, 1977). This was developed by the Commission on Definition and Terminology of the Department of Audiovisual Instruction (DAVI), now called the Association for Educational Communication and Technology. Januszewski and Molenda (2008) stated that the authors of subsequent definitions all seemed to adhere, at least in part, to the purposes and criteria identified in the 1963 definition. Thus, this definition, which appears below, is a special benchmark in the history of educational technology.

Audiovisual communications is that branch of educational theory and practice primarily concerned with the design and use of messages which control the learning process. It undertakes: (a) the study of the unique and relative strengths and weaknesses of both pictorial and nonrepresentational messages which may be employed in the learning process for any purpose; and (b) the structuring and systematizing of messages by men and instruments in an educational environment. These undertakings include the planning, production, selection, management, and utilization of both components and entire instructional systems. Its practical goal is the efficient utilization of every method and medium of communication which can contribute to the development of the learner’s full potential (Ely, 1963, pp. 18-19).

Reiser and Dempsey (2007) identified three features which distinguish the definition from prior views: 1) the definition focused on “the design and use of messages which control the learning process” rather than the media, 2) it identified the steps the individual has to take in designing and using such messages, and 3) it emphasized learning rather than instruction.

2. 2. 2 The 1970 Definitions

The Commission on Instructional Technology (1970) provided two definitions of the term “Instructional Technology.” The focus of the first definition is the media, which reflects the traditional view:

In its more familiar sense, it means the media born of the communications revolution which can be used for instructional purposes alongside the teacher, textbook and blackboard...The pieces that make up instructional technology [include]: television, films, overhead projectors, computers, and other items of “hardware” and “software”...(p.21)

The second definition defines Instructional Technology as a process:

The second and less familiar definition of Instructional Technology goes beyond any particular medium or device. In this sense, Instructional Technology is more than the sum of its parts. It is a systematic way of designing, carrying out, and evaluating the whole process of learning and teaching in terms of specific objectives, based on research on human learning and communication, and employing a combination of human and nonhuman resources to bring about more effective instruction (p.21).

While the first definition reflects the traditional view, the second introduced the “systematic process” of Instructional Technology. Moreover, the second definition reflected the professional literature of this field, such as those written by Finn, Gagné (Rieser and Dempsey 2007). It also clearly stated that the field is based on research to enhance effective instruction with the use of human and non- human resources.

2. 2. 3 The 1977 Definition.

The 1977 definition adopted by AECT consisted of 16 statements noteworthy for their respective lengths. The authors indicated that these 16 parts made up the entire definition. This definition, while emphasizing the systematic design process, as

was the case in the 1970 definition, mentioned the analysis phase of the planning process (Reiser & Dempsey, 2007):

“Educational technology is a complex, integrated process, involving people, procedures, ideas, devices and organization, for analyzing problems and devising, implementing, evaluating and managing solutions to those problems, involved in all aspects of human learning (AECT, 1977, p.1).”

In sum, the definitions formulated during the 1970s could be characterized as adhering to the “systems approach.” Technologically speaking, the computer first gained scholarly attention during the 1950s. In fact, at that time, IBM launched an instruction program using computers called Computer-Assisted Instruction (CAI). In the 1980s, micro-computers became available to the general public. By the mid-1990s, their impact on instructional practice was rather small compared with that of the following years. Corresponding to the popularization of computer, Cognitivism gained power which especially influenced the message design.

2.3 *The 1994 Definition: Beyond Instructional Technology as a Process.*

Instructional Technology refers to the theory and practice of the design, development, utilization, management, and evaluation of the processes and resources for learning.

The definition was first introduced in “Instructional Technology: The Definitions and Domains of the Field” (Seels & Richey, 1994). In this book, the concept of the definition is clearly visualized in the figure “The Five Domains of Instructional Technology” (p.10).

This representation scheme greatly helps to understand the characteristics of the 1994 definition. First, “theory” and “practice” are placed at the center of this scheme, thereby indicating that the field of Instructional Technology is not limited

to practice but includes the field of research and study. Moreover, five domains, namely, design, development, utilization, management, and evaluation are independently connected with the center to prevent the common misunderstanding that these domains are linearly related (Seels & Richey, 1994). Reiser and Dempsey (2007) mentioned that “authors purposely excluded the word ‘systematic’ so as to reflect current interest in alternative design methodologies such as constructivist approaches.” Nevertheless, a good deal of attention has been given to instructional processes at that time, and the five domains became similar to the steps enumerated in the 1970 and 1977 definitions. Thus, by intentionally avoiding the word “systematic,” the 1994 definition went beyond viewing instructional technology as a process.

2.4 *The Recent Definition.*

Educational technology is the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources (Januszewski & Molenda, 2008, p.1).

The recent definition issued in 2006 reflects a more constructivist view. The definition, for example, positions professionals in this field as “facilitators,” and gives learners important roles in the act of deciding what they will learn. Another characteristic is the high value that the definition places on “ethics” and “improving performance.” Furthermore, the goal is not only to acquire knowledge but also apply the new skill and knowledge that a learner has gained. As such, this recent definition relate to human performance technology.

In summary, the definition formulated during the 1990s covers a wider range of theory and practice, mainly including Behaviorism, Cognitivism, and Constructivism. The latter approach, for example, fits into these definitions. The changes in the

definitions indicate that the climate of research and practice has been undergoing a constant evolution. The widespread use of the Internet and the subsequent transformation of technology have allowed the general public's participation through the World Wide Web. This open sharing of cultures however, serves as a warning to the participants to adhere to ethical conduct.

With the overview of the history of the American educational technology, it became evident that the definition of educational technology has changed according to the advancements in the fields of technology and pedagogy. In the early 1900s, the definition was limited to simple media tools. After that, the technology advanced to audio-visual, which later expanded to include computers as a popular medium. In those days, Behaviorism and the System approach were dominant, while the definitions of the 1970s reflected the process view. With the widespread advancements in computer technology, Cognitivism became popular as reflected in the 1994 definition. When the influence of computers deepened, pedagogical constructivism gained attention in the field. As a result, the definition needed to reflect those changes. The field experienced a paradigm shift, and the 2006 definition came into being. Education became more learner-centered and more focus was placed on constructing knowledge rather than transmitting it. 'Ethics,' as another characteristic of the 2006 definition, was highlighted. An example is ethics for copyright.

3. The Definition of Educational Technology in Japan

The Japanese definition of "educational technology" is reviewed through the works of Takashi Sakamoto, Terumi Nakano, Toshiyuki Mizukoshi and Kanji Akahori, all of whom are prominent scholars of educational technology in Japan. Sakamoto, Mizukoshi and Akahori served

as past Presidents of JSET, while Nakano was a professor at the International Christian University.

3. 1 Definition by Sakamoto (1971).

「教育工学は、教育に関係した操作可能なすべての諸要因，すなわち，教育目標，教育内容，教材・教具，教育方法，教育環境，児童・生徒の行動，教師の行動やそれらの相互関係を制御して，教育効果を最大ならしめることを実証的に研究する工学であり，教育行財政，学校学級管理経営や知育，訓練，カウンセリングなどの教授活動，および時間割り作成，出欠成績などの教務のような実践領域において，工業技術，情報科学，理学，行動科学，人間工学の成果を縦横に利用して，教育の効率化をはかる研究分野である。」

Educational technology is a field of empirical studies in technology that aims to maximize educational outcomes by managing all operational factors related to education; educational goal; educational content; educational material and aids; educational methods; educational environment; pupils and students' behavior; teachers' behavior as well as their interrelationships. In addition, the field aims to improve the efficiency of education in the area of practicing instructional activities, which includes educational administration, school and classroom management, intellectual education, training, and counseling, and practical educational affairs which include time scheduling, attendance, and grades by taking full advantage of the results from Engineering Technology, Information Science, Science, Behavioral Science, and Human Engineering (Sakamoto, 1971).

The definition put forward by Sakamoto, the second JSET President, definitively claimed that educational technology is not limited to media use. He argued that educational technology a field of research and its application which aims to make education more efficient. Another point he made in relation to this definition was that educational conduct should not be limited in the classroom, but must include broader areas such as planning,

management, and implementation of education (Nakano, 1979). In comparing this with the definition put forward by DAVI in 1963, which corresponds to a similar period, DAVI used audiovisual communication to the field, while Sakamoto used the term, educational technology. In addition to this basic difference, Sakamoto's definition was more specific. In fact, he even identified the subjects to be utilized such as Engineering Technology, Information Science, Science, Behavioral Science, and Human Engineering, while DAVI uses general terms such as "learning process."

3.2 Definition by Nakano (1979).

教育工学的思考 (pp.3-4) では、「ハードウェアとソフトウェアの両テクノロジーの教育過程への適用として教育工学が発展を遂げてきたことは事実であるし、これら、いわば「テクノロジーによる教育」としての教育工学の役割も重要である。しかし、現在の教育工学は、教育過程そのものをテクノロジーとしてとらえ直すという役割を担っており、この「教育過程を意識化する」方法としての教育工学の枠割をとらえる立場を、前者（「テクノロジーによる教育」）に対して「テクノロジーとしての教育」という観点に立つ教育学とすることができる（中野輝海, 1979, p4）。

Nakano explained the 'educational technology way of thinking' by claiming that educational technology has advanced by applying both hardware and software technologies to education. It is important for educational technology to play the role of "education using technology." Recently however, educational technology came to be considered as the Technology that includes the process of education. While the former is "education using technology," the latter came to be known as "education as technology" (p. 4). In his book, he adapted Azuma's definition that "educational technology is technology which enables educators to choose more appropriate educational conducts" (p. 13). He described the five principles of educational technology namely, 1) systems approach, 2) flexible thinking, 3) problem-

oriented, decision-oriented, 4) generalization of mastership, and 5) empirical and inductive approach. To conclude, Nakano took the System approach when he discussed educational technology. He has a common thread with the definitions of AECT in the 1970s, which placed importance on the systematic design process.

3.3 Definition by Sakamoto (2000)

Recently, Sakamoto worked on the definition of "educational technology" again in the *Encyclopedia of Educational Technology*. In this encyclopedia, he wrote:

「教育工学は、教育改善のための理論、方法、環境設定に関する研究開発を行い、実践に貢献する学際的な研究分野であり、教育の効果あるいは効率を高めるためのさまざまな工夫を具体的に実現し、成果をあげる技術を、開発し、体系化する学である。」(坂元, 2000)

Educational technology is a field of interdisciplinary study which develops theories, methodology and environmental settings to improve education and contribute to the practice, and it is a study which develops and systematizes technologies which realize various concrete ideas to improve educational effectiveness and efficiency (Sakamoto, 2000, 教育工学事典).

「すなわち、教育課程を、数多くの要素からなる複合システムの統合体ととらえ、教育や学習の目標を効果的に達成するために、①構成要素の最適な組み合わせを追求し、②それに役立つ各種技法、道具、しくみを開発、活用し、③開発した技法、道具、仕組みを体系化することを繰り返しながら、教育の改善をする。」(Sakamoto, 2000)

Education curriculum is a complex, integrated system consisting of various elements. Education is improved by repeating the following process: 1) pursuing the optimal combination of elements, development, and utilization of various useful methods, tools and systems; and 2) systematizing developed methods, tools, and systems (p.142).

Thus, it can be said that this definition also takes

the system approach as seen in the expression “repeating the process.”

3.4 Definition by Mizukoshi.

The definition of Mizukoshi, the third JSET president, could not be found in his books, although he has many publications in this field. However it has become evident that he placed importance in media literacy. When he talked about media education in the future, Mizukoshi (2000) emphasized two points: one was to make a good sequence in information education from the curriculum perspective, and the other was to promote media literacy education. In relation to this, Jung (2005) mentioned in his edited book that the term “information society” has become so common that we have to be more attentive to the ethical aspect of the use of the word “technology,” particularly because we hear a lot of incidents due to incorrect usage. The author likewise claimed that the ethical use of technology must be dealt with at the schools, as well as at home and in society. This ethical issue is in agreement with the recent 2006 AECT definition of educational technology. Thus, it can be said that the AECT definition accurately reflects the concerns of the people in the field.

3.5 Definition by Akahori (2007)

The fifth President, Akahori, introduced educational technology on the homepage of JSET. He did so especially because many people have been asking him what the disciplines and methodologies of educational technology. Akahori asserted that the “major theme is the promotion of educational technology research, as well as highly-developed educational methods and educational systems.” He identified three major research topics: 1) research on new educational systems and ICT development, 2) research on the development and promotion of high quality and effective educational methods, and 3) the systematization of educational technology research and practical research (Akahori, 2007).

In identifying the characteristics of educational

technology, he asserted that “changes with time” is one of the defining characteristics of this term. First, research topics change with time; second, educational technology changes along with education policies such as promoting information education; third, research methodology also changes with time; fourth, the themes have always been related to practice in the classroom; fifth, the field places its significance on educational practice; sixth, the use of tools; and finally, usefulness in practice.” (Akahori, 2007). Thus, his definition clearly states that educational technology is concerned with both research and practice. Furthermore, Akahori’s definition is characterized in his view of time as a changing agent.

4. Conclusion

In conclusion, reviewing the definitions of “educational technology” in the American and Japanese contexts provides the opportunity to look at a comprehensive view of this field. Since the emergence of visual education, technology and pedagogy have also evolved, leading to the changes in the definitions. Though pedagogy and technology may change from time to time, it does not mean that pedagogy and technology have actually been replaced. We should keep in mind that what we are standing on now is built on our predecessors’ respective contributions to educational technology. Stated in another way, the comprehensive view will indicate where we can locate ourselves in the whole spectrum of educational technology. Aside from giving us the insight as to where we should position ourselves, Akahori (2009) mentioned that the definition of educational technology will help us gain a thorough understanding from scholars in other fields with regard to what we are doing and why it is important for us. Clearly, this indicates what we value and what we are doing for that purpose. The review of the definitions is a foundation to

understand the panoramic view of this field.

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