Health Education and Multimedia Learning: Educational Psychology and Health Behavior Theory (Part 1)

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When health education researchers began to investigate how individuals make decisions related to health and the factors that influence health behaviors, they referred to frameworks shared by educational and learning research. Health education adopted the basic principles of the cognitive revolution, which were instrumental in advancing the field. There is currently a new challenge to confront: the widespread use of new technologies for health education. To better overcome this challenge, educational psychology and instructional technology theory should be considered. Unfortunately, the passion to incorporate new technologies too often overshadows how people learn or, in particular, how people learn through computer technologies. This two-part article explains how educational theory contributed to the early development of health behavior theory, describes the most relevant multimedia learning theories and constructs, and provides recommendations for developing multimedia health education programs and connecting theory and practice.

One of the first conceptual frameworks used in health education, the health belief model (Hochbaum, 1958; Rosenstock, 1960), was developed in the 1950s by a group of psychologists working for the Public Health Service. During that time, social psychology was incorporating learning theory into models that attempted to understand and explain behavior (Glanz, Lewis, & Rimer, 1997). The two major schools of thought at that time, stimuli-response theory and cognitive theory, served as the basic theoretical

framework for the health belief model and, thereafter, health behavior theory. The work of Thorndike, Watson, Skinner, Hull, Tolman, and Lewin was shared by both education and health education research during the first half of the 20th century.

Some of the principles of the cognitive revolution, which emphasized learning as knowledge acquisition, were quickly adopted by health behavior research. The pioneer work of Dewey, describing the process and importance of active learning, started to dominate educational research during the 1950s and 1960s. His "experimental knowing" principle (Dewey, 1902) provided health behavior research the very much needed rationale for connecting theory and practice. Dewey described empirical investigation (or research) as the middle ground between theory and practice (Glanz et al., 1997). Another cognitive principle quickly adopted by health education was the curriculum-oriented instructional method. Because acquisition of knowledge is the focus of learning, the curriculum becomes its logical instrument (Mayer, 1992). Under this model, topics are structured into lesson plans; each lesson plan has to include goals; each goal has to be attained through measurable objectives; objectives are achieved through changes in knowledge, skills, attitude, and behavior; and so forth.

Health education also adopted one of the most basic elements of the cognitive revolution: its method of evaluation. Cognitive principles conceive of learning as a knowledge acquisition metaphor; therefore, the main purpose of instruction is to increase the amount of a learner's knowledge. For this reason, the most appropriate instrument for measuring how much is learned has been the achievement test (Mayer, 1992). It is not surprising that health education adopted this model: In the most simplistic terms, health education is defined as the "process of educating people about health" (McKenzie & Jurs, 1993). Although other more comprehensive definitions have been proposed (Green, Kreuter, Deeds, & Partridge, 1980; Joint Committee on Health Education Terminology, 1991), "learning" is still

too often considered the central issue and the achievement-based, pre-post test design continues to be the preferred evaluation device.

Another idea shared by educational and health education theory is that learning cannot be viewed as an isolated process. In 1977, Bandura proposed his concept of reciprocal determinism to illustrate that individual, environment, and behavior are continually interacting. This concept constitutes one of the main components of the social learning theory, which uses cognitive principles for explaining behavioral phenomena (Baranowski, Perry, & Parcel, 1997). Educational research addressed this same concept with what is known as "situated cognition." This movement conceives of cognition not as an isolated process but rather as an integral part of physical, social, and cultural contexts (Derry, 1992). Other major constructs of the social learning theory, such as self-efficacy, expectations, and modeling, are also shared by educational theory to explain how people learn. Bandura's approach is one of the most popular theoretical frameworks in health education today. The comprehensiveness of the social learning theory allows for the application of educational psychology theory to health behavior and behavioral change (Baranowski et al., 1997).

▶ CONSTRUCTIVISM AND HEALTH EDUCATION

Constructivists maintain that knowledge is the result of individual constructions of reality. There exist different views of constructivism, but in general, it can be summarized that constructivism emphasizes (a) active learning, (b) a link between new and previously acquired knowledge, and (c) the practical applicability of understanding (Good & Brophy, 1994). Although this approach to learning is not new, constructivism is becoming increasingly more influential in education (Eggen & Kauchak, 1997). How health education and

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health behavior theory have dealt with constructivism is a question that has not been fully addressed by the health education literature. Some authors support the idea that constructivism is present in health education (Glanz et al., 1997), although they do not provide further arguments to support this affirmation. Others believe that constructivism has been influential in health behavior theory ever since the earliest attempts to use social science in solving public health problems (Rosenstock, 1990).

A more objective assessment might conclude that constructivism has not been fully adopted by health education given that in many ways, it contradicts what today constitutes its most basic theoretical and practical principles. First, health education and health promotion rely heavily on the health sciences, namely, medicine and epidemiology, which are dominated by traditional thinking and deductive methods. Constructivism, to the contrary, is a relatively new paradigm and is inductive in nature. Second, constructivism is in clear contradiction with the organized and structured planning models that constitute today's scientific approach to health education. Certain popular models, such as the precede-procede model (Green & Kreuter, 1991), are useful to practitioners because they offer a systematic planning process. However, their closed schemes, prescribed conceptual approaches, and structured thinking are inconsistent with the process of discovery on which constructivism relies for explaining events.

Last, as mentioned elsewhere in this article, the scientific criteria self-imposed by health education and health promotion have accorded a primary role to a very schematic evaluation process. Each intervention needs to be tested for efficacy and effectiveness in a field dominated by quantitative, traditional thinking. Data collection methods are usually required, and success relies on standardized questionnaires with predetermined responses. These are, again, in clear contradiction with constructivism, which is a framework common to ethnography, phenomenology, and grounded theory. However, some authors contend that it is common practice in the fields of health education and health promotion to begin with a constructivist approach and then shift to a traditional design to answer specific research questions using "logical" positivist methods (Glanz et al., 1997).

▶ COMPUTER TECHNOLOGIES AND HEALTH EDUCATION

Computer technologies are increasingly being used in health education, and as in many other fields, the improved capability of personal computers is facilitating their use for much more than simply accessing information. Today, computer- and Internet-based health programs are aimed at using multimedia capabilities for many purposes. The health literature has recently included reports on programs that successfully deal

with a variety of issues. Some use computer software for assessment and delivery of information and tailored education messages (Brug, Steenhuis, van Assema, Glanz, & de Vries, 1999; Dijkstra, de Vries, & Roijackers, 1998; Strecher, 1999; Sutherland, Campbell, Ornstein, Wildemuth, & Lobach, 2001). Others use computer technology in the form of multimedia software, such as CD-ROM, for disease prevention and behavioral change facilitation among children and adults (Block et al., 2000; Buller et al., 1999; DePalma, 2000; Hewitt, Denman, Hayes, Pearson, & Wallbanks, 2001; Hornung et al., 2000; Yawn et al., 2000). Another approach is the use of the Internet and the World Wide Web for education and distribution of health-related software (Lehmann, 1999; Stewart, Hawkins, & Gustafson, 2001).

Although these programs use computers and/or the Internet, their purpose and approaches may be very different according to their particular goals and objectives, whether they use health behavior theories, their participant population, the setting where the intervention takes place, and so forth. What is clear, however, is that the same literature that reports on the effective use of computers in health education usually fails to mention or apply educational psychology or instructional technology research and theory. As a consequence, health practitioners may find it difficult to understand the particular, distinguishing features of those programs and they may be missing the basic principles that would allow for an appropriate use and evaluation of the materials. In addition, health education may be duplicating basic multimedia learning research.

For more than two decades, educational psychology and instructional technology have been searching for answers to key questions, such as how people learn, how people learn with media, and how computers and multimedia capabilities affect learning. Although some important issues remain unanswered, considerable progress has been made in areas relevant to health education, including the fact that it may be difficult to apply conventional program planning and evaluation approaches to computer- and multimedia-based programs. These approaches call for planning processes in which both macro-level (instructional sequence) and micro-level (message) components are prestructured to achieve specific goals and objectives. The sequencing of a health education program is mostly based on logical dependencies and on the achievement of predetermined learning and/or behavioral objectives. This very scheme has been translated to new technologies, and health education research applies traditional program planning and behavior theory approaches to computer-based health education. Consistently, the criteria for assessing a program relies on whether it is theory based,

TABLE 1
Main Multimedia Learning Theories and Concepts

Theory and practice of media in teaching
  Media does not affect learning under any conditions (Clark, 1983)
  The effect of a medium on learning depends to a large degree on the characteristics of the learner (Kozma, 1991)
Cognitive approaches to learning
  Learning depends on how the person perceives the source of information (Salomon, 1983)
Dual coding theory
  Verbal and nonverbal information is independently processed by two separate systems (Baggett, 1989; Paivio, 1990)
Cognitive load theory
  Cognitive load influences learning (Sweller, 1994)
Conditions for the effective use of media
  Coordinated visual and verbal explanations enhance learning (Mayer, 1997)
  Multimedia learning occurs when learners construct and coordinate multiple representations of the same material (Mayer, 1997)
Individual differences in learning with multimedia
  Inconsistency between personal cognitive style and instructional method might inhibit learner's transformation of knowledge (Ausburn & Ausburn, 1978)

includes realistic goals and measurable objectives, and has a research design that allows for a quantitative evaluation (Harding & Reis, 1997). In the constructivist view of today's computer technologies in general and multimedia learning in particular, this approach might be called into question. The main advantage of multimedia is that it allows for the development of learning environments that facilitate and encourage multiple perspectives for the construction of understanding (Bednar, Cunningham, Duffy, & Perry, 1995; Tennyson, Schott, Seel, & Dijkstra, 1997). The schematic and structured approach usually followed by developers of computer-based health education programs simply precludes that constructive activity. In addition, the fact that the effectiveness of such programs must rely on cognitive and behavioral outcome measures that can be compared to preestablished goals and objectives is another indicator of how difficult it may be for health education to be consistent with current instructional technology thinking. Evaluation from the constructivist view must examine the thinking process, such as newly developed perspectives in the content area, and the rationale for defending judgment (Bednar et al., 1995).

▶ MULTIMEDIA LEARNING THEORY

A second issue of relevance for health education, should it continue dedicating resources to computer-based interventions, is to acquire certain familiarity with computer and multimedia learning theory. A number of relevant theoretical and practical approaches from instructional technology and multimedia have

been developed during the past 20 years. These include theory and practice of media in teaching (Clark, 1983; Kozma, 1991), cognitive approaches to media (Salomon, 1983), dual coding theory (Baggett, 1989; Paivio, 1990), the conditions for the effective use of media (Mayer, 1997; Plass, Chun, Mayer, & Leutner, 1998), cognitive load theory (Sweller, 1994), and the individual differences in learning with multimedia (Ausburn & Ausburn, 1978; Plass et al., 1998). These theories, summarized in Table 1, should inform developers of computer-based health education programs. They will be explained in the next issue of *Health Promotion Practice*.

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