

**THE PSYCHOLOGY OF E-LEARNING:  
A FIELD OF STUDY**

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**ABSTRACT**

In this article, we present our views of the psychology of E-learning as a field of study that is important, interdisciplinary, emerging, and promising. We first define E-learning as the third learning system in the history of human learning, specify two major E-learning practices in education and corporations, and indicate the importance of psychological studies of E-learning. We then point out the interdisciplinary nature of the psychology of learning and summarize the existing literature of the psychology of E-learning in cognitive, social, developmental, and school and counseling psychology. We comment on major accomplishments and limitations of the special issue, and conclude with a brief discussion of possible future research directions.

After two years of thinking and working, we are delighted to present this special issue, *The Psychology of E-learning: A Field of Study*, which Zheng Yan served as the guest editor. In this article, we as a research group of the psychology of E-learning will present a general background of E-learning, summarize existing literature of the psychology of E-learning, discuss accomplishments and constraints of the special issue, and point out possible future research directions.

## THE PSYCHOLOGY OF E-LEARNING AS AN IMPORTANT FIELD

### E-Learning

There are a wide variety of E-learning activities, from playing five-minute digital video in the classroom to implementing a one-semester online course through the Internet. E-learning involves various *technologies* (e.g., cable TV, the Internet, or palm-held computers), various *forms* (e.g., virtual learning, online learning, distance learning, and Web-based learning), and various *components* (e.g., e-book, e-dictionary, e-library, e-classroom, e-assessment, e-homework, and e-management). Given the complexity of E-learning and consequently the diversity in understanding E-learning, there exist various ways of defining E-learning (e.g., Huffaker & Calvert, 2003; Mayer, 2003).

We would consider E-learning in the context of history of human learning and define it as *the third learning system* that uses various electronic techniques as its primary medium for learning (also see Rosenberg, 2001; Snyder, 1998; Swan, Bowman, & Holmes, 2003). This particularly broad definition emphasizes on the historic significance of E-learning. Historically, there are three major types of learning systems on the basis of what medium is used in connecting learners with learning objects. The first learning system can be called S-learning, using speech as its primary medium to promote learning. Its prominence was gradually replaced by *P-learning*, the second learning system that uses paper as its primary learning medium. *E-learning* has become a pervasive and important learning phenomenon in the 1990s and can be considered the third learning system that uses the electronic technology as its primary medium for human learning.

In order to gain the knowledge of how to grow a plant, for example, S-learning may involve a conversation between a mother and her daughter in a tribe village; P-learning may take place when a student reads books in a school library to learn that knowledge, while being able to learn from their teachers, parents, or peers; for E-learning, a learner may learn the knowledge by searching Web sites or e-mailing to experts of agriculture in the world, while still being able to learn it from teachers, parents, peers, and books.

Thus, S-learning, P-learning, and E-learning essentially supplement or support each other rather than reject or replace each other. With three different types of medium (speech, paper, and electronics), however, these three learning systems differ from each other distinctively in how knowledge is presented, preserved, and/or delivered and how a learning process takes place (e.g., speed, timing, space, efficiency, and accuracy).

### E-Learning in Education and Corporations

The two most active areas of E-learning practice take place in educational and corporate settings (e.g., Bonk, 2001, 2002). E-learning activities have been widely

observed in both post-secondary education and K–12 education (Riley, Holleman, & Roberts, 2000; Schank, 2002). Good examples in post-secondary education include innovative E-learning programs (e.g., MIT's university-wide open course initiatives and State University of New York Learning Network) and virtual universities (e.g., University of Phoenix Online and Walden University). Good examples for K–12 education include Virtual High School, Keystone National High School, and Hundred High School in West Virginia. Virtual High School, for example, offered 87 different courses to about 1,700 students in 112 schools located in 29 states in 2000 (Riley et al., 2000).

Large corporations, such as IBM, GE, AT&T, and Merrill Lynch, use E-learning as one of their key competitive strategies to effectively train employees and distribute knowledge (Rosenberg, 2001; Schank, 2002). Chief Learning Officers and Chief Knowledge Officers are often appointed to manage E-learning programs in many companies (Baldwin & Danielson, 2001). Major E-learning companies, such as New Horizons, IBM, KnowledgePool, NIIT, and SmartForce, provide either E-training courses or E-training content (International Data Corporation, 2002). It is estimated that the worldwide corporate E-learning market will rise from \$6.6 billion in 2002 to \$23.7 billion in 2006 (American Society for Training & Development, 2002). Thus, the E-learning research community should investigate E-learning in both educational and corporate settings, especially since enormous funding for the latter has led to significant progress.

### **The Psychology of E-Learning**

Given the importance of E-learning in both education and industry, it is critical to study E-learning not only as a learning system but also as *a psychological phenomenon*. E-learning concerns how to improve people's learning with information technologies. Thus, there is a need to study people's psychological factors (e.g., learning styles and learning motivation), process (e.g., creative thinking and spatial cognition), and mechanisms (e.g., the dual-coding mechanism and the split-attention effect) that underlie E-learning so that the E-learning practice can move from technology-centered implementation to human-centered effective learning processes.

There exists extensive literature in describing various forms of E-learning, such as virtual learning, online learning, distance learning, computer-assisted learning, and Web-based learning (e.g., Harasim, Hiltz, Teles, & Turoff, 1995; Khan, 1997; Porter, 1997; Windschitl, 1998). Few efforts have been made, however, to systematically examine E-learning as a coherent learning system (e.g., Schank, 2002) and to effectively reveal psychological factors, processes, and mechanisms (e.g., Mayer, 2001). Thus, it is timely to explore the psychology of E-learning, synthesize the current understanding of E-learning from interdisciplinary perspectives, facilitate exchanges and collaboration among researchers and

practitioners, and develop strong and innovative research programs to inform millions of e-learners in their everyday E-learning experiences.

### **THE PSYCHOLOGY OF E-LEARNING AS AN INTERDISCIPLINARY FIELD**

The psychology of E-learning can be considered an interdisciplinary field of study for two major reasons. First, *E-learning* is a complex human learning phenomenon that one needs to study its multiple aspects from multiple angles. It is not only an educational phenomenon but also a complex phenomenon that involves cognitive, social, developmental, neurological, and other processes. Second, *psychology* is a complex scientific enterprise that includes more than 50 disciplines such as cognitive psychology, developmental psychology, social psychology, clinical psychology, and neurological psychology (Kazdin, 2002; Smelser & Baltes, 2001). Studying psychological factors, processes, and mechanisms of E-learning, one needs to recognize, appreciate, and integrate the exiting research literature across different psychological disciplines. In the text that follows, we briefly summarize important studies of E-learning from five psychological disciplines.

#### **Cognitive Psychology of E-Learning**

One of the most productive areas of the psychology of E-learning is studying the cognitive aspect of E-learning. Two classic theories, the dual-coding theory (Clair & Paivio, 1991; Paivio, 1986) and the cognitive load theory (Chandler & Sweller, 1991, 1992; Sweller & Chandler, 1994) were advanced one decade ago. The empirical research conducted by Richard Mayer and his collaborators since 1980s (see Mayer, 2003) can be considered as one of the earliest, largest, and strongest research programs in this area. Many research groups conducted a wide variety of representative research on the cognitive psychology of E-learning, such as John Black's at Teacher's College, John Branford's at Vanderbilt, Christopher Dede's at Harvard, Roy Pea's at Stanford, and Roger Shank's at Northwest, just to name a very few. This is an area of study where many "superstars" exist and more rise above the horizon. It might continue to be "the crown jewel" of the psychology of E-learning in the future.

#### **Social Psychology of E-Learning**

Another particularly active area in the psychology of E-learning is studying the social process of E-learning. Among leading researchers in this area include Everett Katz and Ronald Rice at Rutgers University, Robert Kraut and Sara Kiesler at Carnegie Mellon University, Sheryl Turkle at MIT, Joseph Turow at University of Pennsylvania, and Patricia Wallace at Johns Hopkins. For instance, the ongoing longitudinal project called HomeNet (Kiesler, Lundmark, Zdaniuk,

& Kraut, 2000; Kraut et al., 1998; Subrahmanyam, Greenfield, Kraut, & Gross, 2001) examines the impact of the Internet on daily lives of the average U.S. family. The findings of the first two-year study demonstrated mixed effects of using the Internet on people's psychological well being. Based on both the fast growing amount of the research literature and the fast growing number of research groups in the area, the social psychology of E-learning is likely to become one of the most influential areas in the psychology of E-learning.

### **Developmental Psychology of E-Learning**

The third important area of the psychology of E-learning is studying E-learning from the developmental perspective. The leading research groups include Sandra Calvert's at Georgetown, Rodney Cocking's at NSF, Michael Scaife's at Sussex University, Patricia Greenfield's at UCLA, Michael Resnick's at MIT Media Laboratory, and Jane Hawkins' at Harvard University. For example, Scaife and his associates (Scaife & van Duuren, 1995) explored how young children represented computational devices and found that older children shifted from describing perceptually salient features to more abstract ones. In another study, Scaife and Bond (1991) examined how children used computer input devices and found that younger children had more difficulties using the mouse or joystick than touch screen and key-push and most children mastered all the four devices at about eight years of age. Unfortunately, in the past three years, unfortunately, three esteemed developmental scientists, Scaife, Cocking, and Hawkins, passed on unexpectedly and left their celebrated legacies to the E-learning research community.

### **School and Counseling Psychology of E-Learning**

Another important research area includes the study of cognitive and behavioral interventions through E-learning applications in school settings. Horan and his colleagues (Clark, Horan, Tompkins Bjorkman, Kovalski, & Hackett, 2000; Horan, 1996; Kovalski & Horan, 1999), for example, used computer-based or Internet-based intervention programs to foster adolescents' self-esteem and to restructure maladaptive career beliefs. Bosworth and her associates (Bosworth, Espelage, & DuBay, 1998; Bosworth, Espelage, DuBay, Dahlberg, & Daytner, 1996; Bosworth, Espelage, DuBay, Daytner, & Karageorge, 2000) studied the application of computer-based violence prevention to improve students' knowledge on how to handle conflict through the use of interactive games, simulations animation, and interviews. Margalit and her group (Margalit, 1991, Margalit & Weisel, 1990; Margalit, Weisel, & Shulman, 1987) documented the efficacy of computer-assisted social skills learning with students with learning disabilities, mild retardation, and behavior disorders. These research examples clearly demonstrate the promise and importance of studying another E-learning application, *E-intervention*, in dealing with children's mental health.

The above review by no means exhausts all the important studies across over 50 psychological disciplines. Other promising areas of research, for example, are: a) neurological psychology of E-learning (e.g., Gazzaniga, 2000; Gerlič & Jaušovec, 1999, 2001; Kosslyn et al., 1999; McCluskey, 1997; Mikropoulos, 2001; Rose & Meyer, 2002; Von Melchner, Pallas, Sur, 2000), b) industrial psychology of E-learning (e.g., Norman, 1988; Shneiderman, 1998); and c) physiological psychology of E-learning (e.g., AOA, 1995; Anshel, 1997; Quilter, 1998).

It is clear that there is a rich literature about E-learning in a wide variety of psychological disciplines and there is a need for greater integration of these psychological studies on E-learning. Thus, this special issue assembles a collection of articles that is explicitly concerned with psychological processes of E-learning and provides an initial base for interdisciplinary integration.

## **THE PSYCHOLOGY OF E-LEARNING AS AN EMERGING RESEARCH FIELD**

### **Contributions to the Psychology of E-Learning**

This special issue has four theoretical articles. In the lead article of the special issue, Mayer explicitly proposed the concept of *science of E-learning* for the first time and presented his theory of E-learning based on his 15 years of research on this area. This work can be considered the first important theorizing achievement in the psychology of E-learning. In another theoretical article, Shah and Freedman reviewed the important literature, including their own latest work, on visuospatial cognition. To our knowledge, this is the first important review that effectively synthesizes a large body of the visualization literature for general educational readers. Based on the new science of learning, Huffaker and Calvert thoughtfully reviewed a series of innovative E-learning applications, such as Nintendo, Playstation, Parkworld, Game Design Project, KineticCity.com, and Junior Summit Project.

This special issue also includes five empirical studies. Roy and Chi developed a new method called *Search Diagram* to quantitatively analyze children's Web search behaviors. Chen and Fu's experimental study analyzed specific effects of multimodal representation by looking into its type (word-only versus word-plus-picture), channels (visual-only versus visual-plus-auditory), and media (computer versus paper). Guinee, Eagleton, and Hall's ethnographical study extensively investigated the Internet search strategies of adolescents. Thompson and Lynch's survey study identified psychological factors underlying students' opposition to Web-based instruction. Bergin and his 10 collaborators explored cognitive and social effects of the Interactive Simulated Patient, a well-received computer-based medical simulation. In sum, the articles contained in this special issue deal with various psychological factors, processes, and mechanisms of

E-learning and make theoretical, empirical, methodological, and/or practical contributions to the field of the psychology of E-learning.

### **Limitations of the Special Issue**

While explicit efforts from both theoretical and empirical article are made to describe psychological factors, processes, and mechanisms in E-learning, less well represented in this special issue are psychological studies focusing on both E-learning from multiple psychological disciplines and practice-based and policy-based issues of E-learning that have broad social compact.

Most of the articles, if not all, in this special issue mainly examine cognitive psychology issues (e.g., effects of multimedia learning, visuospatial cognition, judgment of learning, and navigation strategies). Only three of the articles in this special issue touched somehow non-cognitive issues (e.g., social success, gender differences, collaborative study). Only two were concerned with psychological studies of E-learning applications (entertainment program design and clinical simulation). None of the articles involves psychological studies of Federal and State's E-learning policies (e.g., the National Educational Technology Plan made by the Department of Education in 2000 and the Children's Internet Protection Act passed by the Congress in 2000). Thus, the title of the special issue was changed from "*The Psychology of E-learning: Interdisciplinary Studies*" to "*The Psychology of E-learning: A Field of Study*," to better reflect on the true nature of this special issue.

How to explain the phenomenon that cognitive studies of E-learning dominate the special issue? The first possible explanation could be that cognitive science and computing technologies have traditionally been intertwined, and as we pointed out before, cognitive studies of E-learning currently are still the mainstream in the field of the psychology of E-learning. The second reason could be that there was a short time period allotted in calling for articles and there was limited space that precluded many submitted articles. Starting from August 2002, the call for articles was sent to all the divisions in APA, APS, and AERA. But among all the initial inquiries and subsequent submissions, and the final collection of the articles predominately concerns applications of E-learning or cognitive studies of E-learning, with only two exceptions that focuses on issues of clinic and neurological psychology. Thus, no substantial evidence indicates that the special issue has missed a large number of potential manuscripts focusing on non-cognitive studies of E-learning. The other speculations could be: Is the field too young to synthesize much literature (e.g., in the case of neuropsychological studies on E-learning)? Is the time too early to generate enthusiastic responses (e.g., in the case of social psychology of E-learning)? Or is the task of interdisciplinary research too challenging to accomplish (e.g., in the case of the interdisciplinary studies on the Computer Vision Syndrome)? Given these speculations, however, one conclusion could be reached: Overall, the psychology of E-learning is a field

that is currently taking shape rather than in its full blossom. We believe that the resulting set of articles, submitted through an open call for papers and reviewed through the standard *JEER* editorial procedure, provides an authentic window of current status of psychological understanding of E-learning.

### THE PSYCHOLOGY OF E-LEARNING AS A PROMISING FIELD

To further build the psychology of E-learning as a promising field, we as the E-learning research community need to move forward in two important directions, “going one inch deeper” and “going one mile wider.”

#### “Going One Inch Deeper

First, we need more *empirical* research programs to study explicitly various psychological factors, processes, and mechanisms that underlie the E-learning practice. We should know better how and why some E-learning programs are successful and others are not. Second, we need more *theorizing* efforts to build powerful theories, like Mayer’s theory of E-learning, which can guide E-learning practices and studies. With the accumulation of research on E-learning, this need will become strong. Third, we need more systematical studies on the research *methodology* of E-learning. We should not only use the existing research techniques but also develop E-research that really take full advantage of modern information technologies to collect and analyze quality data on E-learning.

#### “Going One Mile Wider”

First, we need more *interdisciplinary* studies of E-learning. It is important to both bring in theories, methods, and studies from a wide variety of psychology disciplines and reach out to ask psychological scientists in different fields for their assistance in addressing challenging research questions and important policy issues of E-learning. We should develop interdisciplinary research agendas, conduct interdisciplinary research programs, and build interdisciplinary research teams. Second, we need more *policy*-based research so that major policy decisions can be based on solid research evidence. Third, we need more research-based *applications* so that the psychological studies of E-learning can be verified in the real life world and used to guide millions of E-learners and. In sum, we need to integrate research, theories, methods, practice, and policy to develop the psychology of E-learning, a promising field that will have distinctive intellectual identity and broad social impacts.

The completion of this special issue in a sense indicates another starting point rather than the ending point of an exciting but challenging intellectual journey. Due to the time and space constraints, this special issue only includes a small number of short articles. Thus, a book project is currently under consideration with



the hope to demonstrate effectively the interdisciplinary nature of the psychology of E-learning that integrates research, theories, practice, and policies. We welcome comments, inquiries, discussions, and contributions. If this special issue serves as the first base for showing that the psychology of E-learning is an emerging research field, the book project could serve as the second base for further building the psychology of E-learning into a growing.

To conclude, the psychology of E-learning is a field of study that is *important*, *interdisciplinary*, *emerging*, and *promising*. This special issue provides an authentic window of the current psychological knowledge of E-learning. We would like to thank Executive Editor of *JECR*, Robert Seidman, and Special Issue Editor of *JECR*, Karen Swan, for their vision and support; all the writers who submitted their manuscripts for choosing the special issue as the outlet of their work; all the external reviewers for their time and work, and all the authors whose work are included in the special issue for their multiple revision and important contributions. Without them, this special issue would have been simply impossible.

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