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Learning Features in an Open, Flexible, and Distributed Environment

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The Internet, supported by various digital technologies, is well-suited for open, flexible, and distributed e-learning. Designing and delivering instruction and training on the Internet requires thoughtful analysis and investigation, combined with an understanding of both the Internet's capabilities and resources and the ways in which instructional design principles can be applied to tap the potential of the Internet. This article identifies seven categories of e-learning components or tools that can be used in e-learning programs to provide various features conducive to learning.

New developments in learning science and technology provide opportunities to create well-designed meaningful learning environments for diverse learners. With the increasing use of a variety of approaches in learning in the information age, learners are moving away from wanting to be taught mostly in lectures or direct training sessions. There is no doubt that they now expect more variety in the ways that they can learn, and flexible learning helps provide this variety (Race, 1996). Today, learners expect on-demand, anytime/anywhere, high-quality instruction with good support services. To stay viable in this global competitive market, providers of education and training must develop efficient and effective learning systems to meet learners' needs. Therefore, there is a tremendous demand *for affordable, efficient, easily accessible, open, flexible, well-designed, learner-centered, distributed, and facilitated learning environments.*

Rosenberg (2001) stated, "Internet technologies have fundamentally altered the technological and economic landscapes so radically that it is now possible to make quantum leaps in the use of technology for learning." Hall (2001) reported that "E-learning is the fastest-growing and most promising market in the education industry. According to WR Hambrecht & Co., e-learning is poised to explode, and the company anticipates the market to more than double in size each year through 2002."

The Primary Research Group conducted a survey of distance learning programs in higher education in 2002. The survey results show continued astounding growth in the higher education distance learning market. The mean annual enrollment growth rate for 2002 reported by the 75 college distance learning programs in the study was 41%, and 92% of programs sampled say that their enrollment growth rate has been either "very strong" or "fairly good." Not a single college in the survey experienced a decline in total distance learning course enrollment. In a 2004 survey, the Primary Research Group found that college distance learning programs increased their revenues by a mean of 9.67% in 2003 (source: The Survey of Distance & Cyberlearning Programs in Higher Education, 2002 Edition and 2004 Edition).

Eduventures Inc., a Boston-based research firm, announced that it expects total enrollment in online education programs to hit the 1 million mark by 2005. The report, Online Distance Education Market Update: A Nascent Market Matures, found that the majority of U.S. colleges and universities offer some form of online education, helping the market grow more than 50% in 2002 to reach $3.7 billion. The report also estimates that the growth rate for online education will exceed 30% for "a number of years to come (Source: Boston Business Journal, http://boston.bizjournals.com/boston/stories/2004/03/08/daily22.html).

With the advent of the Internet and online learning methodologies and technologies, providers of education and training are creating e-learning materials to fulfill the demand. Online learning is becoming more and more accepted in the workplace. Institutions are investing heavily in the development and deployment of online programs. Academic institutions, corporations, and government agencies worldwide are increasingly using the Internet and digital technologies to deliver instruction and training. At all levels of these institutions, individuals are being encouraged to participate in online learning activities. Many instructors and trainers are being asked by

their institutions to convert their traditional face-to-face (f2f) courses to e-learning. Individuals involved in designing e-learning or converting f2f courses to online environments are faced with many challenges: What does it take to create meaningful e-learning? Singh (2003) noted that we should use a blend of learning features in our strategies to get the right content in the right format to the right people at the right time.

This article discusses e-learning as an open, flexible, and distributed learning environment and how its various learning features can be designed to address critical issues of the e-learning environment. The following is an outline for the article:

- E-learning
- Open, flexible, and distributed learning environment
- Learner-focused e-learning system
- Components and features of e-learning
- Review of e-learning features and e-learning issues
- Conclusion
- Future work in e-learning

E-LEARNING

With the rapid growth of the Internet and digital technologies, the Web has become a powerful, global, interactive, dynamic, economic, and democratic medium of learning and teaching at a distance (Khan, 1997a). The Internet provides an opportunity to develop learning-on-demand and learner-centered instruction and training. There are numerous names for online learning activities, including e-learning, web-based learning (WBL), web-based instruction (WBI), web-based training (WBT), Internet-based training (IBT), distributed learning (DL), advanced distributed learning (ADL), distance learning, online learning (OL), mobile learning (or m-learning) or nomadic learning, remote learning, off-site learning, a-learning (anytime,

anyplace, anywhere learning), and so forth. In this article, the term e-learning is used to represent open, flexible, and distributed learning.

Designing and delivering instruction and training on the Internet requires thoughtful analysis and investigation, combined with an understanding of both the Internet's capabilities and resources and the ways in which instructional design principles can be applied to tap the Internet's potential (Ritchie & Hoffman, 1997). Designing e-learning for open, flexible, and distributed learning environments is new to many of us. After reflecting on the factors that must be weighed in creating effective open, distributed, and flexible learning environments for learners worldwide, the following definition of e-learning is formulated in this article.

> E-Learning can be viewed as an innovative approach for delivering well-designed, learner-centered, interactive, and facilitated learning environments to anyone, anyplace, anytime by utilizing the attributes and resources of various digital technologies along with other forms of learning materials suited for open, flexible, and distributed learning environments.

This definition of e-learning raises the question of how various attributes of e-learning methods and technologies can be used to create learning features appropriate for diverse learners in an open, flexible, and distributed environment.

OPEN, FLEXIBLE, AND DISTRIBUTED LEARNING ENVIRONMENTS

A clear understanding of the open, flexible, and distributed nature of online learning environments will help us create meaningful e-learning. According to Calder and McCollum (1998), "The common definition of open learning is learning in your own time, pace and place" (p. 13). Ellington (1995) noted that open and flexible learning allows learners to have some say in how, where, and when learning takes place. Therefore, in this article, I use the terms *open* and *flexible* to mean *in your own time, pace, and place*. Saltzbert and Polyson (1995) noted that distributed learning is not synonymous with distance learning, but, they stress its close relationship with the idea of distributed resources:

> Distributed learning is an instructional model that allows instructor, students, and content to be located in different, non-centralized locations so that instruction and learning occur independent of time and place....The distributed learning model can be used in combination with traditional classroom-based courses, with traditional distance learning courses, or it can be used to create wholly virtual classrooms. (p. 10)

The Internet supports open learning because it is device, platform, time, and place independent. It is designers who take advantage of the openness of the Internet to create learning environments that are flexible for learners. Therefore, openness is a technical matter; flexibility is a design matter. The Internet, by its very nature, distributes resources and information, making it the tool of choice for those interested in delivering instruction using the distributed learning model (Saltzbert & Polyson, 1995). Thus, the Internet, supported by various digital technologies, is well-suited for open, flexible, and distributed learning (Figure 1).

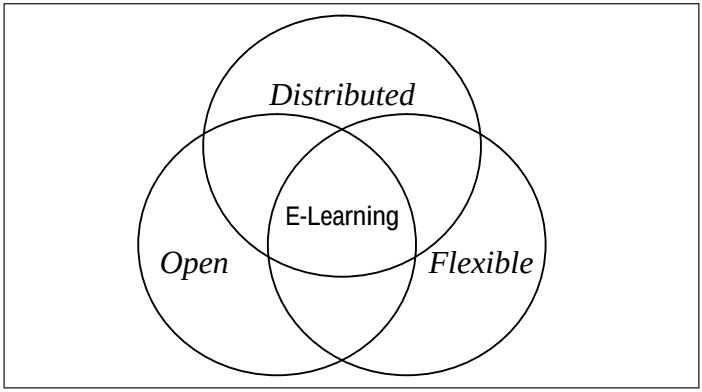

Figure 1. Open, flexible, and distributed e-learning

LEARNER-FOCUSED E-LEARNING SYSTEMS

A leading theorist of educational systems, Banathy (1991), made a strong case for learning-focused educational and training systems where "the learner is the key entity and occupies the nucleus of the systems complex of education" (p. 96). For Banathy, "*when learning is in focus*, arrangements are made in the environment of the learner that communicate the learning

task, and learning resources are made available to learners so that they can explore and master learning tasks" (p. 101). A distributed learning environment that can effectively support learning-on-demand must be designed by placing the learners at the center. In support of a learner-centered approach, Moore (1998) stated:

> Our aim as faculty should be to focus our attention on making courses and other learning experiences that will best empower our students to learn, to learn fully, effectively, efficiently, and with rewarding satisfaction. It is the responsibility of our profession to study ways of maximizing the potential of our environments to support their learning and to minimize those elements in their environments that may impede it. (p. 4).

Success in an e-learning system involves a systematic process of planning, designing, evaluating, and implementing online learning environments where learning is actively fostered and supported. An e-learning system should not only be meaningful to *learners*, but it should also be meaningful to all stakeholder groups including instructors, support services staff, and the institution. For example, an e-learning system is more likely to be meaningful to learners when it is easily accessible, clearly organized, well written, authoritatively presented, learner-centered, affordable, efficient, flexible, and has a facilitated learning environment. When learners display a high level of participation and success in meeting a course's goals and objectives, this can make e-learning meaningful to *instructors*. In turn, when learners enjoy all available support services provided in the course without any interruptions, it makes *support services staff* happy as they strive to provide easy-to-use, reliable services. Finally, an e-learning system is meaningful to *institutions* when it has a sound return-on-investment (ROI), a moderate to high level of learner satisfaction with both the quality of instruction and all support services, and a low drop-out rate (Morrison & Khan, 2003).

There is no doubt that the Internet and other digital technologies can support e-learning in an open, flexible, and distributed environment. But *how*? Technology alone is unable to create a meaningful learning environment unless we integrate pedagogy with technology. We need to examine the capabilities of various technologies and see how their attributes can be used for different types of learning for specific content types (Khan, 2005). In the next section, various attributes of the Internet and other digital

technologies are discussed in terms of how they can be used to create meaningful learning environments.

COMPONENTS AND FEATURES OF E-LEARNING

An e-learning program is discussed here in terms of various components and features that can be conducive to learning. *Components* are integral parts of an e-learning system. *Features* are characteristics of an e-learning program contributed by those components. Components, individually and jointly, can contribute to one or more features depicted in Figure 2 (Khan, 2001). For example, *e-mail* is an asynchronous communication tool (component) which can be used by both students and instructors to interact in learning activities. Therefore, with appropriate instructional design strategies, e-mail can be integrated into an e-learning program to create an *interactive* feature between students and the instructors. Think about it this way. While traveling on an airplane, passengers can use Airfone to communicate with others on the ground. In this case, *Airphone* is a component of the airplane system that allows passengers to establish a *synchronous communication* (feature). Likewise *e-mail, mailing lists, newsgroups, conferencing tools* (components) along with appropriate *instructional design principles and strategies* can contribute to a *collaborative* feature for students working on a group project. The website http://BooksToRead.com/wbt/component-feature.ppt hosts a PowerPoint slide presentation emphasizing this point.

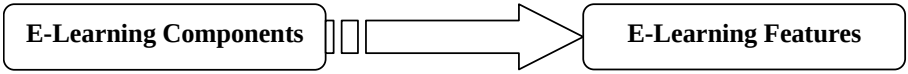

Figure 2. E-learning components and features

E-learning components

I have organized e-learning components into seven categories. As the e-learning methodologies and technologies continue to improve, components within the seven categories may need to be modified and new components may need to be added. Updates of component can be found at http://BooksToRead.com/elearning/components.htm). Please note that none of

these components can create meaningful e-learning features without the proper integration of *instructional design* which is included in the following list as one of the most important categories of e-learning components.

1. Instructional Design (ID)
   a) Learning and Instructional Theories
   b) Instructional Strategies and Techniques

2. Multimedia Component
   a) Text and Graphics
   b) Audio Streaming (e.g., Real Audio)
   c) Video Streaming (e.g., QuickTime)
   d) Links (e.g., Hypertext links, Hypermedia links, 3-D links, imagemaps, etc.)

3. Internet Tools
   a) Communications Tools
      i. Asynchronous: E-mail, Listservs, Newsgroups, and so forth
      ii. Synchronous: Text-based (e.g., Chat, IRC, MUDs, messaging, etc.) and audio-video conferencing tools.
   b) Remote Access Tools (Login to and transferring files from remote computers.)
      i. Telnet, File Transfer Protocol (ftp), and so forth.
   c) Internet Navigation Tools (Access to databases and Web documents.)
      i. Text-based browser, Graphical browser, VRML browser, and so forth
      ii. Plug-ins
   d) Search Tools
      i. Search Engines
   e.) Other Tools
      i. Counter Tool

4. Computers and Storage Devices
   a) Computer platforms running Graphical User Interface (GUI) based operating systems such as Unix, Windows, Macintosh, Linux and non-GUI based operating systems such as DOS. Mobile devices such as handheld personal digital assistants (PDAs) running Palm operating system, Pocket PC Windows and other platforms.
   b) Hard drives, CD ROMs, DVDs, and so forth.

5. Connections and Service Providers
   a) Modems
   b) Dial-in (e.g., standard telephone line, ISDN, etc.) and dedicated (e.g., 56kbps, DSL, digital cable modem, T1, E1 lines, etc.) services (http://whatis.com/dsl.htm)

c) Mobile technology (e.g., connected wireless, wireless LAN, wireless WAN, wireless PAN or personal area network)
d) Application Service Providers (ASPs), Hosting Services Providers (HSPs), Gateway Service Providers, Internet Service Providers (ISPs), and so forth

6. Authoring/Management Programs, Enterprise Resource Planning (ERP) Software, and Standards
   a) Scripting Languages (e.g., HTML - Hypertext Markup Language, VRML - Virtual Reality Modeling Language, XML – Extensible Markup Language, RSS - Rich Site Summary [RSS is a text-based format, a type of XML.], http://www.faganfinder.com/search/rss.shtml#what, XSL - Extensible Style Sheet language, XHTML – Extensible Hypertext Markup Language, CSS - Cascading Style Sheets, WML-Wireless Markup language, Java, Java scripting, etc.).
   b) Learning Management Systems (LMS) and Learning Content Management Systems (LCMS)
   c) HTML Converters and Editors, and so forth
   d) Authoring Tools and Systems (easier to use than programming languages)
   e) Enterprise Application or Enterprise Resource Planning (ERP) software in which e-learning solutions are integrated. (An article entitled "Integrating your Learning Management System with your Enterprise Resource Planning System" provides valuable information: http://www.thinq.com/pages/white_papers_pdf/ERP_%20Integration_0901.pdf)
   f) Interoperability, Accessibility and Reusability Standards (http://www.adlnet.org/)

7. Server and Related Applications
   a) HTTP servers, HTTPD software, and so forth
   b) Server Side Scripting Languages – JavaServer Pages (JSP), Active Server Pages (ASP), ColdFusion, Hypertext Preprocessor (PHP), Common Gateway Interface (CGI)—a way of interacting with the http or Web servers. CGI enables such things as image maps and fill-out forms to be run.
   c) Wireless Application Protocol (WAP) gateway—changes the binary coded request into an HTTP request and sends it to the Web server.

E-learning Features

A well-designed e-learning program can provide numerous features conducive to learning. However, these features should be meaningfully integrated

into an e-learning program to achieve its learning goals. The more components an e-learning program integrates, the more learning features it is able to offer. However, the effectiveness of e-learning features largely depends on how well they are incorporated into the design of the programs. The quality and effectiveness of an e-learning feature can be improved by addressing critical issues within the various categories of open, flexible, and distributed learning environment (discussed later in Table 3). The following are examples of some e-learning features: *Interactivity, authenticity, learner-control, convenience, self-containment, ease of use, online support, course security, cost effectiveness, collaborative learning, formal and informal environments, multiple expertise, online evaluation, online search, global accessibility, cross-cultural interaction, non-discriminatory, and so forth*. As components of e-learning improve as a result of the advent of the Internet and online learning methods and technologies, existing e-learning features will improve and new features may become available to us. Several features that are contributed by e-learning components are presented in Table 1.

In designing e-learning environments using the features described, we should explore their effectiveness through the lenses of critical issues of open, flexible, and distributed learning environments. Since 1997 I have been communicating with learners, instructors, trainers, administrators, and technical and other support services staff involved in e-learning in both academic (K12 and higher education) and corporate settings from all over the world. I have researched critical e-learning issues discussed in professional discussion forums, and designed and taught online courses. I have reviewed the literature on e-learning. As the editor of *Web-Based Instruction* (1997), *Web-Based Training* (2001), and *Flexible Learning* (in press), I have had the opportunity to work closely on e-learning issues with about 200 authors from all over the world who contributed chapters to these books.

Table 1

Features and Components Associated with E-Learning Environments

E-Learning Features	E-Learning Components	Relationship to Open, flexible, and Distributed Learning Environments
Ease of Use	A standard point and click navigation system. Common User Interface, Search Engines, Browsers, Hyperlinks, etc.	A well-designed e-learning course with intuitive interfaces can anticipate learners' needs and satisfy the learners' natural curiosity to explore the unknown. This capability can greatly reduce students' frustration levels and facilitate a user-friendly learning environment. However, delays between a learner's mouse click and the response of the system can contribute to the frustration level of users. The hypermedia environment in an e-learning course allows learners to explore and discover resources which best suit their individual needs. While this type of environment facilitates learning, it should be noted that learners may lose focus on a topic due to the wide variety of sources that may be available in an e-learning course. Also, information may not always be accessed because of common problems related to servers such as connection refusal, no DNS entry, etc. (Khan, 2001).
Interactivity	Internet tools, hyperlinks, browsers, servers, authoring programs, instructional design, etc.	Interactivity in e-learning is one of the most important instructional activities. Engagement theory based on online learning emphasizes that students must be meaningfully engaged in learning activities through interaction with others and worthwhile tasks (Kearsley & Shneiderman, 1999). E-learning students can interact with each other, with instructors, and online resources. Instructors and experts may act as facilitators. They can provide support, feedback and guidance via both synchronous and asynchronous communications. Asynchronous communication (i.e., e-mail. listservs, etc.) allows for time-independent interaction whereas synchronous communication (i.e., conferencing tools) allows for live interaction (Khan, 2001).
Multiple Expertise	Internet and WWW	E-learning courses can use outside experts as guest lecturers from various fields from all over the world. Experiences and instruction that come directly from the sources and experts represented on the Internet can tremendously benefit learners.
Collaborative Learning	Internet tools, instructional design, etc.	E-learning creates a medium of collaboration, conversation, discussions, and exchange and communication of ideas (Relan & Gillani, 1997). Collaboration allows learners to work and learn together to accomplish a common learning goal. In a collaborative environment, learners develop social, communication, critical thinking, leadership, negotiation, interpersonal and cooperative skills by experiencing multiple perspectives of members of collaborative groups on any problems or issues.
Authenticity	Internet and WWW, instructional design, etc.	The conferencing and collaboration technologies of the Web bring learners into contact with authentic learning and apprenticing situations (Bonk & Reynolds, 1997). E-learning courses can be designed to promote authentic learning environments by addressing real world problems and issues relevant to the learner. The most significant aspect of the Web for education at all levels is that it dissolves the artificial wall between the classroom and the "real world" (Kearsley, 1996).
Learner-Control	Internet tools, authoring programs, hyperlinks, instructional design, etc.	The filtered environment of the Web allows students the choice to actively participate in discussion or simply observe in the background. E-learning puts students in control so they have a choice of content, time, feedback and a wide range of media for expressing their understandings (Relan & Gillani, 1997). This facilitates student responsibility and initiative by promoting ownership of learning. The learner-control offered by e-learning is beneficial for the inquisitive student, but the risk of becoming lost in the Web and not fulfilling learner expectations can be a problem and will require strong instructional support (Duchastel, 1996).

I found that numerous factors help to create a meaningful learning environment, and many of these factors are systemically interrelated and interdependent. A systemic understanding of these factors can help designers create meaningful learning environments (Khan, 2004). I clustered these factors into eight *categories of issues*: institutional, management, technological, pedagogical, ethical, interface design, resource support, and evaluation (Table 2). Various issues within the eight categories were found to be useful in several studies that were conducted to review e-learning programs, resources and tools (Khan, in press; Khan & Smith, in press; Khan, Cataldo, Bennett & Paratore, in press; Romiszowski, 2004; Singh, 2003; Chin & Kon, 2003; Kuchi, Gardner, & Tipton, 2003; Mello, 2002; Barry, 2002; Goodear, 2001; Khan, Waddill, & McDonald, 2001; Dabbagh, Bannan-Ritland, & Silc, 2001; Khan & Ealy, 2001; El-Tigi & Khan, 2001; Zhang, Khan, Gibbons, & Ni, 2001; Gilbert, 2002 and Kao, Tousignant, & Wiebe, 2000).

Table 2

Eight Categories of Issues Related to E- Learning Environments

Categories of E-Learning Issues	**Descriptions**
Institutional	The institutional dimension is concerned with issues of administrative affairs, academic affairs, and student services related to e-learning.
Management	The management of e-learning refers to the maintenance of the learning environment and distribution of information.
Technological	The technological dimension of e-learning examines issues of technology infrastructure in e-learning environments. This includes infrastructure planning, hardware, and software.
Pedagogical	The pedagogical dimension of e-learning refers to teaching and learning. This dimension addresses issues concerning content analysis, audience analysis, goal analysis, media analysis, design approach, organization, and learning strategies.
Ethical	The ethical considerations of e-learning relate to social and political influence, cultural diversity, bias, geographical diversity, learner diversity, the digital divide, etiquette, and legal issues.
Interface design	The interface design refers to the overall look and feel of e-learning programs. The interface design dimension encompasses page and site design, content design, navigation, accessibility, and usability testing.
Resource support	The resource support dimension of e-learning examines the online support and resources required to foster meaningful learning.
Evaluation	The evaluation of e-learning includes both the assessment of learners and the evaluation of the instruction and learning environment.

Issues within the eight categories of e-learning environments can help us think through every aspect of designing e-learning features. Next, I review an e-learning feature for its effectiveness using issues within the eight categories of e-learning environments (see Table 3).

REVIEW OF E-LEARNING FEATURES WITH THE E-LEARNING ISSUES

As indicated earlier, all e-learning features must be designed to help students achieve their learning goals. An e-learning program consisting of well-designed instructional features can lead to its success. The eight categories of issues in e-learning environments can identify the critical issues of an e-learning environment and provide guidance in addressing them. We can improve the effectiveness of an e-learning feature by answering the questions raised within the eight categories. For example, *ease of use* is one of most important features in an e-learning environment. In Table 3, an e-learning feature (i.e., ease of use) is reviewed for its effectiveness in a course from the perspective of each of the eight categories.

Table 3

Review of an E-Learning Feature Using the Eight Categories of E-Learning Issues

E-Learning Feature	**E-Learning Dimensions**	**Issues/Concerns**
Ease of Use	*Institutional*	Are instructor/tutor and technical staff available during online orientation?
	Management	Does the course notify students about any changes in due dates or other course relevant matters such as server down?
	Technological	Are students taught how to join, participate in, and leave a mailing list?
	Pedagogical	Does the course provide clear directions and descriptions of what learners should do at every stage of the course?
	Ethical	Does the course provide any guidance to learners on how to behave and post messages in online discussions so that their postings do not hurt others' feelings?
	Interface design	How quickly can users find answers to the most frequently asked questions on the course site?
	Resource support	Does the course provide clear guidelines to the learners on what support can and cannot be expected from a help line?
	Evaluation	If learners are disconnected during an online test, can they log back in and start from where they left off?

There are questions similar to those in Table 3 that can be used to review how a learning feature such as ease of use can be made a part of an e-learning program. All these questions in Table 3 covering the eight e-learning categories point to one critical element, *is it really easy to use*? Therefore, for each learning feature we should explore as many issues as possible within the eight categories of the e-learning environment.

CONCLUSION

Designing open, flexible, and distributed e-learning systems for globally diverse learners is challenging; however, as more and more institutions offer e-learning to students worldwide, we will become more knowledgeable about what works and what does not work. E-learning design requires exploration of issues critical to various categories of e-learning environments and careful consideration of the Web's potential in relation to instructional design principles. An understanding of the capabilities of e-learning components and features can facilitate the design of meaningful e-learning environments. A well-designed e-learning program, therefore, has the ability to provide learner-centered, engaging, interactive, affordable, efficient, easily accessible, flexible, meaningful, distributed, and facilitated learning environments.

FUTURE WORK IN E-LEARNING

Implementation of e-learning is likely to increase. Academic institutions, corporations, and government agencies worldwide are increasingly using the Internet and digital technologies to deliver e-learning. We are still learning what works and what does not. There are a number of important areas which deserve further investigation. The following are my recommendations for further research to improve the design of e-learning environments:

- Examine the factors bearing on the success and failure of various e-learning features used in online courses.

- Examine the factors bearing on the success and failure of various e-learning components in contributing to the various e-learning features in online courses.

By examining research questions similar to these, I believe we can further develop our knowledge base in e-learning, both in terms of throwing out things not found to be helpful and adding things that are helpful. My research will continue to identify and discuss various critical factors related to e-learning (http://BooksToRead.com/elearning).

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