E-learning

E-learning comprises all forms of electronically supported learning and teaching. The information and communication systems, whether networked or not, serve as specific media to implement the learning process.[1] The term will still most likely be utilized to reference out-of-classroom and in-classroom educational experiences via technology, even as advances continue in regard to devices and curriculum.

E-learning is essentially the computer and network-enabled transfer of skills and knowledge. E-learning applications and processes include Web-based learning, computer-based learning, virtual classroom opportunities and digital collaboration. Content is delivered via the Internet, intranet/extranet, audio or video tape, satellite TV, and CD-ROM. It can be self-paced or instructor-led and includes media in the form of text, image, animation, streaming video and audio.

Abbreviations like CBT (Computer-Based Training), IBT (Internet-Based Training) or WBT (Web-Based Training) have been used as synonyms to e-learning. Today one can still find these terms being used, along with variations of e-learning such as elearning, Elearning, and eLearning. The terms will be utilized throughout this article to indicate their validity under the broader terminology of E-learning.

Market

The worldwide e-learning industry is estimated to be worth over $48 billion US according to conservative estimates.[2] Developments in internet and multimedia technologies are the basic enabler of e-learning, with consulting, content, technologies, services and support being identified as the five key sectors of the e-learning industry.[3]

Higher education

By 2006, 3.5 million students were participating in on-line learning at institutions of higher education in the United States.[4] According to the Sloan Foundation reports,[5] [6] there has been an increase of around 12–14 percent per year on average in enrollments for fully online learning over the five years 2004–2009 in the US post-secondary system, compared with an average of approximately 2 per cent increase per year in enrollments overall. Allen and Seamen (2009)[5] claim that almost a quarter of all students in post-secondary education were taking fully online courses in 2008, and a report by Ambient Insight Research[7] suggests that in 2009, 44 per cent of post-secondary students in the USA were taking some or all of their courses online, and projected that this figure would rise to 81 percent by 2014. Thus it can be seen that e-learning is moving rapidly from the margins to being a predominant form of post-secondary education, at least in the USA.

Many higher education, for-profit institutions, now offer on-line classes. By contrast, only about half of private, non-profit schools offer them. The Sloan report, based on a poll of academic leaders, indicated that students generally appear to be at least as satisfied with their on-line classes as they are with traditional ones. Private institutions may become more involved with on-line presentations as the cost of instituting such a system decreases. Properly trained staff must also be hired to work with students on-line. These staff members need to understand the content area, and also be highly trained in the use of the computer and Internet. Online education is rapidly increasing, and online doctoral programs have even developed at leading research universities.[8]
K-12 Learning

E-learning is also utilized by public K-12 schools in the United States. Some E-Learning environments take place in a traditional classroom others allow students to attend classes from home or other locations.

History

In the early 1960s, Stanford University psychology professors Patrick Suppes and Richard C. Atkinson experimented with using computers to teach math and reading to young children in elementary schools in East Palo Alto, California. Stanford's Education Program for Gifted Youth is descended from those early experiments.

Early e-learning systems, based on Computer-Based Learning/Training often attempted to replicate autocratic teaching styles whereby the role of the e-learning system was assumed to be for transferring knowledge, as opposed to systems developed later based on Computer Supported Collaborative Learning (CSCL), which encouraged the shared development of knowledge.

As early as 1993, William D. Graziadei described an online computer-delivered lecture, tutorial and assessment project using electronic mail. In 1997 he published an article which described developing an overall strategy for technology-based course development and management for an educational system. He said that products had to be easy to use and maintain, portable, replicable, scalable, and immediately affordable, and they had to have a high probability of success with long-term cost-effectiveness.

William D. Graziadei, Sharon Gallagher,Ronald N. Brown,Joseph Sasiadek Building Asynchronous and Synchronous Teaching-Learning Environments: Exploring a Course/Classroom Management System Solution \[9\] In 1997 Graziadei, W.D., et al., \[10\] published an article entitled "Building Asynchronous and Synchronous Teaching-Learning Environments: Exploring a Course/Classroom Management System Solution".\[10\] They described a process at the State University of New York (SUNY) of evaluating products and developing an overall strategy for technology-based course development and management in teaching-learning. The product(s) had to be easy to use and maintain, portable, replicable, scalable, and immediately affordable, and they had to have a high probability of success with long-term cost-effectiveness.

E-Learning 2.0

The term E-Learning 2.0\[11\] \[12\] is a neologism for CSCL systems that came about during the emergence of Web 2.0\[13\]. From an E-Learning 2.0 perspective, conventional e-learning systems were based on instructional packets, which were delivered to students using assignments. Assignments were evaluated by the teacher. In contrast, the new e-learning places increased emphasis on social learning and use of social software such as blogs, wikis, podcasts and virtual worlds such as Second Life.\[14\] This phenomenon has also been referred to as Long Tail Learning\[15\]. See also (Seely Brown & Adler 2008)\[16\]

E-Learning 2.0, by contrast to e-learning systems not based on CSCL, assumes that knowledge (as meaning and understanding) is socially constructed. Learning takes place through conversations about content and grounded interaction about problems and actions. Advocates of social learning claim that one of the best ways to learn something is to teach it to others.\[16\]

However, it should be noted that many early online courses, such as those developed by Murray Turoff and Starr Roxanne Hiltz in the 1970s and 80s at the New Jersey Institute of Technology,\[17\] courses at the University of Guelph in Canada,\[18\] the British Open University,\[18\] and the online distance courses at the University of British Columbia (where Web CT, now incorporated into Blackboard Inc. was first developed),\[19\] have always made heavy use of online discussion between students. Also, from the start, practitioners such as Harasim (1995)\[20\] have put heavy emphasis on the use of learning networks for knowledge construction, long before the term e-learning, let
alone e-learning 2.0, was even considered.

There is also an increased use of virtual classrooms (online presentations delivered live) as an online learning platform and classroom for a diverse set of education providers such as Minnesota State Colleges and Universities and Sachem School District.\[21\]

In addition to virtual classroom environments, social networks have become an important part of E-learning 2.0.\[22\] Social networks have been used to foster online learning communities around subjects as diverse as test preparation and language education. Mobile Assisted Language Learning (MALL) is a term used to describe using handheld computers or cell phones to assist in language learning.

**Approaches to e-learning services**

E-learning services have evolved since computers were first used in education. There is a trend to move towards blended learning services, where computer-based activities are integrated with practical or classroom-based situations.

Bates and Poole (2003)\[23\] and the OECD (2005)\[24\] suggest that different types or forms of e-learning can be considered as a continuum, from no e-learning, i.e. no use of computers and/or the Internet for teaching and learning, through classroom aids, such as making classroom lecture Powerpoint slides available to students through a course web site or learning management system, to laptop programs, where students are required to bring laptops to class and use them as part of a face-to-face class, to hybrid learning, where classroom time is reduced but not eliminated, with more time devoted to online learning, through to fully online learning, which is a form of distance education. This classification is somewhat similar to that of the Sloan Commission reports on the status of e-learning, which refer to web enhanced, web supplemented and web dependent to reflect increasing intensity of technology use. In the Bates and Poole continuum, 'blended learning' can cover classroom aids, laptops and hybrid learning, while 'distributed learning' can incorporate either hybrid or fully online learning.

It can be seen then that e-learning can describe a wide range of applications, and it is often by no means clear even in peer reviewed research publications which form of e-learning is being discussed.\[25\] However, Bates and Poole argue that when instructors say they are using e-learning, this most often refers to the use of technology as classroom aids, although over time, there has been a gradual increase in fully online learning (see Market above).

**Computer-based learning**

Computer-based learning, sometimes abbreviated to CBL, refers to the use of computers as a key component of the educational environment. While this can refer to the use of computers in a classroom, the term more broadly refers to a structured environment in which computers are used for teaching purposes.

Cassandra B. Whyte researched about the ever increasing role that computers would play in higher education. This evolution, to include computer-supported collaborative learning, in addition to data management, has been realized. The type of computers have changed over the years from cumbersome, slow devices taking up much space in the classroom, home, and office to laptops and handheld devices that are more portable in form and size and this minimalization of technology devices will continue.\[26\]

**Computer-based training**

Computer-Based Trainings (CBTs) are self-paced learning activities accessible via a computer or handheld device. CBTs typically present content in a linear fashion, much like reading an online book or manual. For this reason they are often used to teach static processes, such as using software or completing mathematical equations. The term Computer-Based Training is often used interchangeably with Web-based training (WBT) with the primary difference being the delivery method. Where CBTs are typically delivered via CD-ROM, WBTs are delivered via the Internet using a web browser. Assessing learning in a CBT usually comes in the form of multiple choice questions, or other
assessments that can be easily scored by a computer such as drag-and-drop, radial button, simulation or other interactive means. Assessments are easily scored and recorded via online software, providing immediate end-user feedback and completion status. Users are often able to print completion records in the form of certificates.

CBTs provide learning stimulus beyond traditional learning methodology from textbook, manual, or classroom-based instruction. For example, CBTs offer user-friendly solutions for satisfying continuing education requirements. Instead of limiting students to attending courses or reading printing manuals, students are able to acquire knowledge and skills through methods that are much more conducive to individual learning preferences. For example, CBTs offer visual learning benefits through animation or video, not typically offered by any other means.

CBTs can be a good alternative to printed learning materials since rich media, including videos or animations, can easily be embedded to enhance the learning. Another advantage to CBTs are that they can be easily distributed to a wide audience at a relatively low cost once the initial development is completed.

However, CBTs pose some learning challenges as well. Typically the creation of effective CBTs requires enormous resources. The software for developing CBTs (such as Flash or Adobe Director) is often more complex than a subject matter expert or teacher is able to use. In addition, the lack of human interaction can limit both the type of content that can be presented as well as the type of assessment that can be performed. Many learning organizations are beginning to use smaller CBT/WBT activities as part of a broader online learning program which may include online discussion or other interactive elements.

**Computer-supported collaborative learning (CSCL)**

Computer-supported collaborative learning (CSCL) is one of the most promising innovations to improve teaching and learning with the help of modern information and communication technology. Most recent developments in CSCL have been called E-Learning 2.0, but the concept of collaborative or group learning whereby instructional methods are designed to encourage or require students to work together on learning tasks has existed much longer. It is widely agreed to distinguish collaborative learning from the traditional 'direct transfer' model in which the instructor is assumed to be the distributor of knowledge and skills, which is often given the neologism E-Learning 1.0, even though this direct transfer method most accurately reflects Computer-Based Learning systems (CBL).

In *Datacloud: Toward a New Theory of Online Work*, Johndan Johnson-Eilola describes a specific computer-supported collaboration space: The Smart Board. According to Johnson-Eilola, a “Smart Board system provides a 72-inch, rear projection, touchscreen, intelligent whiteboard surface for work” (79). In *Datacloud*, Johnson-Eilola asserts that “[w]e are attempting to understand how users move within information spaces, how users can exist within information spaces rather than merely gaze at them, and how information spaces must be shared with others rather than being private, lived within rather than simply visited” (82). He explains how the Smart Board system offers an information space that allows his students to engage in active collaboration. He makes three distinct claims regarding the functionality of the technology: 1) The Smart Board allows users to work with large amounts of information, 2) It offers an information space that invites active collaboration, 3) The work produced is often "dynamic and contingent" (82).[27]

Johnson-Eilola further explains that with the Smart Board “…information work becom[es] a odied experience” (81). Users have the opportunity to engage with—at the technology by direct manipulation. Moreover, this space allows for more than one user; essentially, it invites multiple users.[27]

When using smart boards information is able to be introduced to students in a new, fun, and engaging way. Teachers and/or students are able to draw on the board using different colors. This can help focus ones attention on particular areas of the screen. The marks made on the smart board are able to be erased. This makes it easy to show the information in its original form. When using smart boards teaching and learning become a more active experience for both the student and the teacher.

Locus of Control remains an important consideration in successful engagement of E-learners whether using the Smart Board or another E-learning modality. According to the work of Cassandra B. Whyte, the continuing attention
to aspects of motivation and success in regard to E-learning should be kept in context and concert with other educational efforts. Information about motivational tendencies can help educators, psychologists, and technologists develop insights to help students perform better academically.[28]

**Technology-enhanced learning (TEL)**
Technology enhanced learning (TEL) has the goal to provide socio-technical innovations (also improving efficiency and cost effectiveness) for e-learning practices, regarding individuals and organizations, independent of time, place and pace. The field of TEL therefore applies to the support of any learning activity through technology.

**Technology issues**
Along with the terms *learning technology, instructional technology*, and Educational Technology, the term is generally used to refer to the use of technology in learning in a much broader sense than the computer-based training or *Computer Aided Instruction* of the 1980s. It is also broader than the terms *Online Learning* or *Online Education* which generally refer to purely web-based learning. In cases where mobile technologies are used, the term *M-learning* has become more common. E-learning, however, also has implications beyond just the technology and refers to the actual learning that takes place using these systems.

**E-learning** is naturally suited to distance learning and flexible learning, but can also be used in conjunction with face-to-face teaching, in which case the term Blended learning is commonly used. E-Learning pioneer Bernard Luskin argues that the "E" must be understood to have broad meaning if e-Learning is to be effective. Luskin says that the "e" should be interpreted to mean exciting, energetic, enthusiastic, emotional, extended, excellent, and educational in addition to "electronic" that is a traditional national interpretation. This broader interpretation allows for 21st century applications and brings learning and media psychology into the equation.

In higher education especially, the increasing tendency is to create a Virtual Learning Environment (VLE) (which is sometimes combined with a Management Information System (MIS) to create a Managed Learning Environment) in which all aspects of a course are handled through a consistent user interface standard throughout the institution. A growing number of physical universities, as well as newer online-only colleges, have begun to offer a select set of academic degree and certificate programs via the Internet at a wide range of levels and in a wide range of disciplines. While some programs require students to attend some campus classes or orientations, many are delivered completely online. In addition, several universities offer online student support services, such as online advising and registration, e-counseling, online textbook purchase, student governments and student newspapers.

E-Learning can also refer to educational web sites such as those offering learning scenarios, worksheets and interactive exercises for children. The term is also used extensively in the business sector where it generally refers to cost-effective online training.

The recent trend in the E-Learning sector is screencasting. There are many screencasting tools available but the latest buzz is all about the web based screencasting tools which allow the users to create screencasts directly from their browser and make the video available online so that the viewers can stream the video directly. The advantage of such tools is that it gives the presenter the ability to show his ideas and flow of thoughts rather than simply explain them, which may be more confusing when delivered via simple text instructions. With the combination of video and audio, the expert can mimic the one on one experience of the classroom and deliver clear, complete instructions. From the learner's point of view this provides the ability to pause and rewind and gives the learner the advantage of moving at their own pace, something a classroom cannot always offer.
Communication technologies used in E-learning

Communication technologies are generally categorized as asynchronous or synchronous. Asynchronous activities use technologies such as blogs, wikis, and discussion boards. The idea here is that participants may engage in the exchange of ideas or information without the dependency of other participants’ involvement at the same time. Electronic mail (Email) is also asynchronous in that mail can be sent or received without having both the participants’ involvement at the same time. Asynchronous learning also gives students the ability to work at their own pace. This is particularly beneficial for students who have health problems. They have the opportunity to complete their work in a low stress environment.

Synchronous activities involve the exchange of ideas and information with one or more participants during the same period of time. A face to face discussion is an example of synchronous communications. Synchronous activities occur with all participants joining in at once, as with an online chat session or a virtual classroom or meeting.

Virtual classrooms and meetings can often use a mix of communication technologies. Participants in a virtual classroom use icons called emoticons to communicate feelings and responses to questions or statements. Other communication technologies available in a virtual classroom include text notes, microphone rights, and breakout sessions. Breakout sessions allow the participants to work collaboratively in a small group setting to accomplish a task.

In asynchronous online courses, students proceed at their own pace. If they need to listen to a lecture a second time, or think about a question for awhile, they may do so without fearing that they will hold back the rest of the class. Through online courses, students can earn their diplomas more quickly, or repeat failed courses without the embarrassment of being in a class with younger students. Students also have access to an incredible variety of enrichment courses in online learning, and can participate in internships, sports, or work and still graduate with their class.

In many models, the writing community and the communication channels relate with the E-learning and the M-learning communities. Both the communities provide a general overview of the basic learning models and the activities required for the participants to join the learning sessions across the virtual classroom or even across standard classrooms enabled by technology. Many activities, essential for the learners in these environments, require frequent chat sessions in the form of virtual classrooms and/or blog meetings.

Learning management system (LMS) and Learning content management system (LCMS)

A learning management system (LMS) is software used for delivering, tracking and managing training/education. LMSs range from systems for managing training/educational records to software for distributing courses over the Internet and offering features for online collaboration.

A learning content management system (LCMS) is software for authoring, editing and indexing e-learning content (courses, reusable content objects). An LCMS may be solely dedicated to producing and publishing content that is hosted on an LMS, or it can host the content itself. The [Aviation Industry Computer-Based Training Committee (AICC) specification provides support for content that is hosted separately from the LMS.

A LMS allows for teachers and administrators to track attendance, time on task, and student progress. LMS also allows for not only teachers and administrators to track these variables but parents and students as well. Parents can log on to the LMS to track grades. Students log on to the LMS to submit homework and to access the course syllabus and lessons.
Computer-aided assessment

Computer-aided Assessment (also but less commonly referred to as E-assessment), ranging from automated multiple-choice tests to more sophisticated systems is becoming increasingly common. With some systems, feedback can be geared towards a student's specific mistakes or the computer can navigate the student through a series of questions adapting to what the student appears to have learned or not learned.

The best examples follow a Formative Assessment structure and are called "Online Formative Assessment". This involves making an initial formative assessment by sifting out the incorrect answers. The author/teacher will then explain what the pupil should have done with each question. It will then give the pupil at least one practice at each slight variation of sifted out questions. This is the formative learning stage. The next stage is to make a Summative Assessment by a new set of questions only covering the topics previously taught. Some will take this even further and repeat the cycle such as BOFA[29] which is aimed at the Eleven plus exam set in the UK.

The term learning design has sometimes come to refer to the type of activity enabled by software such as the open-source system LAMS[30] which supports sequences of activities that can be both adaptive and collaborative. The IMS Learning Design specification is intended as a standard format for learning designs, and IMS LD Level A is supported in LAMS V2.elearning has been replacing the traditional settings due to its cost effectiveness.

Electronic performance support systems (EPSS)

Electronic performance support systems (EPSS) is a "computer-based system that improves worker productivity by providing on-the-job access to integrated information, advice, and learning experiences". 1991, Barry Raybould

Content issues

Content is a core component of E-learning and includes issues such as pedagogy and learning object re-use.

Pedagogical elements

Pedagogical elements are an attempt to define structures or units of educational material. For example, this could be a lesson, an assignment, a multiple choice question, a quiz, a discussion group or a case study. These units should be format independent, so although it may be in any of the following methods, pedagogical structures would not include a textbook, a web page, a video conference or Podcast.

When beginning to create E-Learning content, the pedagogical approaches need to be evaluated. Simple pedagogical approaches make it easy to create content, but lack flexibility, richness and downstream functionality. On the other hand, complex pedagogical approaches can be difficult to set up and slow to develop, though they have the potential to provide more engaging learning experiences for students. Somewhere between these extremes is an ideal pedagogy that allows a particular educator to effectively create educational materials while simultaneously providing the most engaging educational experiences for students.

Pedagogical approaches or perspectives

It is possible to use various pedagogical approaches for eLearning which include:

- **instructional design** – the traditional pedagogy of instruction which is curriculum focused, and is developed by a centralized educating group or a single teacher.
- **social-constructivist** – this pedagogy is particularly well afforded by the use of discussion forums, blogs, wiki and on-line collaborative activities. It is a collaborative approach that opens educational content creation to a wider group including the students themselves. The One Laptop Per Child Foundation attempted to use a constructivist approach in its project[31]
• Laurillard's Conversational Model\textsuperscript{[32]} is also particularly relevant to eLearning, and Gilly Salmon's Five-Stage Model is a pedagogical approach to the use of discussion boards.\textsuperscript{[33]}

• Cognitive perspective focuses on the cognitive processes involved in learning as well as how the brain works.\textsuperscript{[34]}

• Emotional perspective focuses on the emotional aspects of learning, like motivation, engagement, fun, etc.\textsuperscript{[35]}

• Behavioural perspective focuses on the skills and behavioural outcomes of the learning process. Role-playing and application to on-the-job settings.\textsuperscript{[36]}

• Contextual perspective focuses on the environmental and social aspects which can stimulate learning. Interaction with other people, collaborative discovery and the importance of peer support as well as pressure.\textsuperscript{[37]}

• Mode Neutral Convergence or promotion of 'transmodal' learning where online and classroom learners can coexist within one learning environment thus encouraging interconnectivity and the harnessing of collective intelligence.\textsuperscript{[38]}

**Reusability, standards and learning objects**

Much effort has been put into the technical reuse of electronically-based teaching materials and in particular creating or re-using *Learning Objects*. These are self contained units that are properly tagged with keywords, or other metadata, and often stored in an XML file format. Creating a course requires putting together a sequence of learning objects. There are both proprietary and open, non-commercial and commercial, peer-reviewed repositories of learning objects such as the Merlot repository.

A common standard format for e-learning content is SCORM whilst other specifications allow for the transporting of "learning objects" (Schools Framework) or categorizing metadata (LOM).

These standards themselves are early in the maturity process with the oldest being 8 years old. They are also relatively vertical specific: SIF is primarily pK-12, LOM is primarily Corp, Military and Higher Ed, and SCORM is primarily Military and Corp with some Higher Ed. PESC- the Post-Secondary Education Standards Council- is also making headway in developing standards and learning objects for the Higher Ed space, while SIF is beginning to seriously turn towards Instructional and Curriculum learning objects.

In the US pK12 space there are a host of content standards that are critical as well- the NCES data standards are a prime example. Each state government's content standards and achievement benchmarks are critical metadata for linking e-learning objects in that space.

An excellent example of e-learning that relates to knowledge management and reusability is Navy E-Learning, which is available to Active Duty, Retired, or Disable Military members. This on-line tool provides certificate courses to enrich the user in various subjects related to military training and civilian skill sets. The e-learning system not only provides learning objectives, but also evaluates the progress of the student and credit can be earned toward higher learning institutions. This reuse is an excellent example of knowledge retention and the cyclical process of knowledge transfer and use of data and records.
References

[29] PlanetBofa.com (http://planetbofa.com/)
[32] Informal description of Laurillard's Model (http://www.macs.hw.ac.uk/~rj/tolweb/docs/laurillardsmoddoc.htm)
External links

- European Foundation for Quality in eLearning (EFQUEL) (http://www.efquel.org/)