

ODL Techniques

(E-learning Technologies; Instruments for e-learning)

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1. Definition the *E-learning* Concept (What Is E-learning?)

There is no official definition of e-Learning, but it can be introduced a common one: *Electronic learning (e-Learning or eLearning)* is a type of Technology supported education / learning (TSL) where the medium of instruction is through computer technology, particularly involving digital technologies. E-learning has been defined as *pedagogy empowered by digital technology*.

In some instances, no face-to-face interaction takes place. *E-learning* is used interchangeably in a wide variety of contexts. In companies, it refers to the strategies that use the company network to deliver training courses to employees. In the United States, it is defined as a planned teaching / learning experience that uses a wide spectrum of technologies, mainly Internet or computer-based, to reach learners. Lately in most Universities, e-learning is used to define a specific mode to attend a course or programmes of study where the students rarely, if ever, attend face-to-face for on-campus access to educational facilities, because they study online.

There are many different varieties of and approaches to e-Learning, and the e-Learning world is changing rapidly.

Computer, information, and communication technologies certainly play a major role and are a basic requirement for e-Learning, but the focus should not be on technology. Generally, this is focusing on the learner. The role of *education, methodology, and didactics* is considered more and more crucial in e-Learning.

2. Short History of E-learning (E-learning – Short History)

Information and Communications Technologies (ICT) have rapidly entered the educational sector and, as a result, more and more new learning tools are appearing. These change the way the teachers and students work and interact thus enabling a more effective learning process.

Historically, educational and corporate training managers have always looked for ways to reduce the cost and improve the effectiveness of training programs and processes through the use of technological advances. In the 1960s and 1980s, organizations used mainframe and interactive video approaches. In the 1980s and 1990s, PC-based CD-ROM content was the preferred approach. Since 1998 or so, however, Internet-based approaches (e.g. e-learning) clearly have become the dominant delivery method for creating fast, scalable, low cost learning and corporate training.

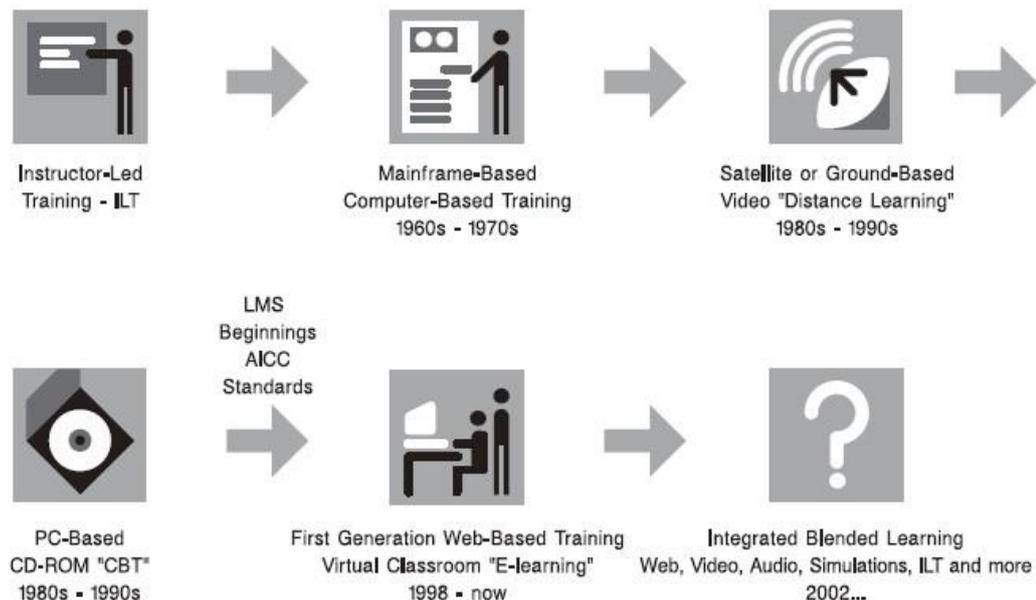


Figure1. Evolution of Technology-Based Training

E-learning as we know it has been around for fifteen years or so. During that time, it has evolved from being a radical idea - the effectiveness of which was yet to be proven - to something that is now widely regarded as mainstream. It is the core of numerous business plans and a service offered by most colleges and universities today.

Up until now, the implementation of ICT into education has been usually in the form of desktop or laptop/notebook computers, local area networks (LANs) and Internet connections and with learning content in different electronic formats, but still accompanied by traditional paper books/textbooks. But all those cases usually follow the "classic" form of class-based learning, moving only the content from the paper book pages on to the computer screen. The participants in the process (teachers and students) still remain "tied" to the school LAN, which connects them to the learning content and the school Learning

Management System (LMS). The "classical" pen has been replaced by the keyboard and mouse. But, in most cases, these changes do not give the freedom that teacher's and student's "hands" may need, especially teaching and studying some specific subjects, such as art, drawing, design, architecture, etc. There is no need to mention cases where field study is needed. In any open space, it is difficult to operate easily via a computer even for a notebook owners. Obviously new tools are needed in all those cases.

Corporate e-Learning is a powerful technology, but it has strayed from its inspired beginnings. Poised to become a driver of business performance, e-Learning lost its way as vendors reached for quick economic gains at the expense of long-term strategic position. E-Learning devolved into quick-to-sell IT-only content libraries, bland Web course designs, and unfocused, minimally tailored portal solutions. This was a boon to the training department, but not the business as a whole, and the value of hassle-free turnkey campuses and trainer-empowering LMSs became the low-hanging fruit in the marketplace [3, 4].

The era of custom CBT (1990-1999)

E-Learning began as computer-based training (CBT), meaning standalone CD-ROM training courses (and before, videodisc courses) playing on end-user computers, standalone training stations, and sometimes across client / server LANs.

The *technology players* of this era were well defined - a handful of companies selling desktop-based multimedia authoring systems that could be used by modestly skilled programmers or *very* technically savvy instructional designers to assemble CBT. *Macromedia* led the market with a good tool for the "everyman" developer of CBT, *Authorware*, as well as its more powerful cousin *Director*, which however was not optimized specifically for CBT as opposed to other multimedia applications. *Asymetrix* (now *Click2learn*) placed a strong second with its *Toolbook* authoring program, followed by *Allen Communication* (now part of *Mentergy*) with *Quest* and *Aimtech* (acquired by *Asymetrix* in 1997) with *IconAuthor*.

Digital media tended to be a rich and expensive mixture of video, narrative audio as well as music and sound effects, graphics and animations, and formatted text - although desktop video in the leading AVI, MOV (QuickTime), and MPEG-1 standard formats remained problematic until the Pentium chip. Interactive instructional quality using these tools and media developed to a relatively high degree - albeit sometimes more for entertainment than instructional value.

The *content side* of CBT was approached in one of a couple of ways. The big wave was a large number of high-quality "boutique" developers of custom courseware using the above authoring tools. Some of the "big names" of this generation - some now gone, most acquired, a few surviving - were *Allen Communication*, *Creative Media Development*, *HyperMedia Group*, *Institute for Advanced Technology*, *Interactive Media Corporation*, *Internal & External Communication (IEC)*, *International Learning Systems*, *Leadingway*, *Learning Sciences*, *Learning Systems Sciences*, *Learning-Edge*, *Micromentor*, *Midi*, *Multimedia Learning* and *Strategic Interactive*.

The resulting courses were often innovative, highly participatory, engaging, and instructionally effective, often

featuring conditionally branching simulations, opportunities for learner exploration and discovery, extensive feedback and remediation, user-controlled videos, animations, audiovisual slideshows, and so on - but they also were very expensive, very slow to develop, and monolithic:

- *Very expensive* - Priced at from \$50,000 at the low end to \$100,000 or more per “finished hour” of “CBT seat time”;
- *Very slow to develop* - An intricate multi-step development process in which each step - needs analysis, design, scriptwriting, media production, programming, QA - was itself a multiple-month project unto itself;
- *Monolithic* - Essentially too difficult and expensive to modify once they were finished and deployed—the authoring tools were programming languages, and the resulting courses were unique software programs, making re-development for an update as intricate as the release of a new version of software. In addition, the replacement of CD-ROMs in the field was too cumbersome.

Moreover, the actual technology of implementation - the authoring tools, which truly were high-level programming languages optimized to create typical instructional interactions - was buggy, often crashing and not migrating from one platform to the next, e.g. not from 16-bit to 32-bit Windows, from Windows 95 to 98, even from desktops to laptops, etc. These dynamics led corporate customers to understand CBT as something that is done to a limited degree and only for targeted high-impact training needs, and that has a short shelf life and a very real degree of risk. The mindset was, “If you want to do CBT, you can only do so much of it, it may not work, and it won’t have a long life – but the impact in that time period can be tangible.”

Vendors of custom courseware solutions could not scale operations because their cost structure to support the labor-intensive, complex process of high-quality CBT creation was as great or greater than their revenue. The largest custom CBT vendors grew to \$20 million in this milieu - but had over 200 employees - while most “name” CBT boutiques hovered in the \$4 to \$10 million range.

The dawn of economic sense in packaged CBT (1994-1999)

The notion of pre-packaging CBT training courses and selling them on a mass scale was a clearly better model, where the vendor could create margin and scale its business.

The CBT companies that made something of themselves in the mid-90s adopted this model exclusively, became the early leaders in CBT, and grew to approach and even exceed \$100 million revenue levels - led by *CBT Systems* (now *SmartForce*) and *NETg*. Typically, these companies did not want to provide customization to their off-the-shelf courses - a low-margin business comparable to the boutiques’ custom courseware services.

Typically, they almost uniformly provided IT skills training and some desktop-computing skills training, and for good reasons - audiences for IT / computing were the obvious “early adopters” for using the computer to train. Just as importantly, the need for industry - and customer - specific customization was virtually nonexistent in IT / computing, making it a doubly ripe fruit to pick.

Some vendors did attempt to package CBT courses in business soft skills, professional skills, and vertical markets - but with limited success. Three primary reasons held them back:

- These areas more often than IT (and even necessarily) require significant industry - and customer-specific customization, dissipating the economic advantage gained by the vendor through pre-packaging.
- The business / professional and vertical-market training need is often unique enough to each customer company to be fully custom anyway – a time-intensive, energy-consuming, costly effort that simply cannot be satisfied with a pre-packaged course even as a starting-point for customization.
- Success in one business / professional / vertical market involves a degree of market dedication, content specialization, and brand identity not transferable to entering new markets—limiting the potential market opportunity of any packaged content vendor that would seek to grow outside IT / computing skills training.

The practicality of closed content-and-technology training systems (2000 to present)

In the aftermath of the stock market bloodbath and the eradication of unprofitable, unfocused portals and bland mass-quantity content, a handful of the content providers - notably *SmartForce*, to a lesser degree *DigitalThink* and *NETg*, and to a much lesser degree *SkillSoft* - emerged as winners. Each of these companies offered packaged content, but provided sufficient focus and an aura of quality to it that made the content appear “ready to fit into” a customer organization’s training plans.

They tended to deliver their Web courseware to customers via a hosted learning portal built from their own technology - although they may or may not have used the phrase “learning portal” to describe their platform.

They provided customization services, even in the most rudimentary form of customer logos on portal interfaces as an argument that they personalize the experience for users. Moreover, they clearly presented themselves as providers of *training*, as opposed to the more glamorous but ambiguous and risk-threatening messages from other e-Learning vendors about “innovative technology,” “learning communities,” “learning is more than training” and the like.

Since early 2000, these four companies have taken their packaged content models - *SmartForce* and *DigitalThink* with IT / computer skills, *NETg* with the same but adding simulation-based business skills, and *SkillSoft* concentrated in management and sales skills -and broadened them into *total sole-source eLearning solutions*.

These are “closed systems” employing their proprietary technologies running their own, generally un-customized, content, typically or even religiously unmixed with other eLearning technologies and other content. *SmartForce* standardized on an ASP model, while *DigitalThink*, *NETg*, and

SkillSoft offered a similar ASP solution but also an option to implement on a customer’s Intranet.

SmartForce, *NETg*, and *SkillSoft* offered customers access to their libraries (offering but not emphasizing the option to customize the content), while *DigitalThink* added extensive custom courseware services as a complementary service to its content library.

Such “closed” sole-source solutions have worked for the customers who opted for them:

- Multiple vendors weren't coming together to step over each other and create chaos.
- Their topical coverage blanketed certain important elements of a company's total training need with a comprehensive solution, and so "took care of" that area of training, without touching upon (or troubling) more sensitive, business-critical, core-skills areas of most customers.
- The vendors could provide a modest, generally acceptable degree of focus in designing a customer-specific online campus that revolved around the customer's business requirements, as opposed to a one-size-fits-all portal.
- An adequate level of instructional quality could be achieved for the basic, non-business-specific skills they taught within the well-defined – if somewhat uninspired - bounds of the closed systems.

These companies each saw healthy growth in the last two years and have succeeded at becoming true brands in corporate eLearning. Yet they have not convinced the market that eLearning has crossed the chasm into mainstream value and so have experienced solid, but not explosive, growth.

Until the recession hit with full force in 2002, they retained some of the healthiest stock prices and market valuations in corporate e-Learning, and were establishing brands that communicated, "We know how to do on-line training." Since then, NETg has been swallowed by Thompson Publishing, Digital Think has downsized severely, and SmartForce and SkillSoft are merging into one as-yet unnamed company.

Do-it-in-house eLearning / LMS infrastructure (2000 – 2001)

As the collapse of the stock market was mirrored by a slowdown in e-Learning's momentum, the "closed" total-solution vendors became a strong choice for corporate customers simply because they could actually provide somewhat need-targeted solutions without significant flaws. But their offerings revolved around IT skills and in the case of *SkillSoft* around one-size-fits-all management skills. None of these solutions addressed the specific business-and-professional skills training for jobs and tasks more directly pertinent and central to companies' operations. Consequently, the strongest momentum began to gather for Global 2000 corporations to start or restart eLearning initiatives with the intent of providing more mission-critical training online, and with the strategy to "do it themselves" – control their own e-Learning destiny and drive their e-Learning activities from within, drawing organically from the context of their own unique business requirements and performance-driving infrastructures.

The content of in-house eLearning was assumed to be a combination of a small amount of off-the-shelf courseware *specific* to the organization's vertical market and its specific business-critical training needs; and a large amount of custom-developed courseware that was 100% specific to the company - indeed, often existing in-house workshops, videotapes, and print-based training materials *converted* to on-line format.

Do-it-yourself initiatives typically started with an important first step – the piping upon which to build an enterprise-scale eLearning community for employees, supply chains, distribution channels, and customers. And so the learning management system (LMS) players became the front-and-center darlings of the corporate training department - not as ends in themselves, but as a technology platform upon which to build in-house initiatives. Many of the Global 2000 installed one or another of these LMSs and launched corporate universities on top of them, although in fact only a handful did so on a truly across-the-enterprise basis.

Saba Software did an excellent job of delivering the message that the first step to a do-it-in-house eLearning plan was to install an LMS, and became the clear and established

brand leader. *Docent* followed on *Saba's* coattails, and the corporate choice suddenly became, "Do we start our eLearning initiative with *Saba* or *Docent*?"

Saba grew its revenues impressively in 2000 and early 2001, while *Docent* experienced explosive on-your-coattails growth in early 2001. A handful of other LMS vendors became competitive second-tier players, notably *KnowledgePlanet* (the union of *KnowledgeSoft* and *Knowledge Universe*), *THINQ Learning Solutions* (the union of *TrainingNet* and *TrainingServer*), *Click2Learn* (formerly *Asymetrix*), and *IBM Mind span Solutions* (absorbing the *Lotus Learning Space* product), while many others carved out niches - in some cases attractive niches such as regulatory and compliance training by *Plateau Systems*.

Latter half of 2001: e-Learning situation

The emphasis on LMS acquisition through 2000 and 2001 yielded a violent customer reaction in Q2/Q3/Q4 2001, namely that LMSs either fall short delivering on their promise, or simply don't work as advertised. "Falling short" is spelled in at least five ways:

- Implementation time has often proven long and expensive, yet the result is often less powerful than had originally been imagined.
- The realization that LMSs only address the *administrative* aspects of eLearning has often only sunk in after implementation. LMSs do not address what is generally found to be a more fundamental requirement, viz. high-quality eLearning content authoring on a large scale, flexible deployment using logic that adapts learning to individuals' skill needs, and updating and reusing content over time to create new learning experiences for new audiences from a previous investment.
- The expectation that learning content from multiple sources will "plug and play" on the LMS platform has not been met, as the so-called industry standards (AICC, SCORM) have proven too loose to be truly "plug and play," and too restrictive to the internal logical operation of content systems to be favored by many content vendors.
- Validation of the ROI associated with LMS implementation and the migration of training materials online has proven elusive.
- Perhaps most damningly, the administrative processes that LMSs do provide - registration processes, course assignments, prerequisites and learning-path logic, skill definitions to drive gap analysis and consequent learning paths, assembly of learning paths from discrete learning objects, e-mail notifications, etc. have often proven too one-size-fits-all, not adaptable to the unique purposes and processes to which customer organizations want to fit them.

Many customers concluded that LMS vendors do not appreciate, focus on, or take seriously *how* learning is optimally conducted in their business contexts, or what capabilities are really required.

The general market conclusion reached by the end of 2001 has been that e-Learning technologies - as platforms for business-critical training needs - simply don't do what companies need or envision them to do. The fact of the matter is that different companies need them to do different things. And lacking the ability to purchase an effective e-Learning technology platform, companies certainly cannot be convinced to purchase third-party on-line learning content to play on these platforms.

What is left? One avenue is the “closed” total solutions from *DigitalThink*, *NETg*, and *SkillSoft/SmartForce* that generally fall outside the domain of business-critical training (*THINQ Learning Solutions* attempted in 2001 to re-cast itself as a comparable sole source, but has had to retrench itself into a simple LMS strategy by early 2002.)

A second avenue is to create a *fully homegrown* e-Learning solution of combined technology and content oneself - a choice made by several of the largest Fortune 200 companies. A third avenue is to “rent” an LMS on a short-term basis via a hosted ASP service to try it out, rather than invest in and implement an LMS as a long-term commitment.

3. Specific Pedagogical Elements for E-learning

Benefits of E-learning

Almost all the governments in our world have e-Learning on the agenda. The European Commission has also eLearning as a transversal objective in all its funding programmes related to education and training. This means that e-Learning becomes very important.

The world is changing rapidly. Knowledge we acquire in school today may become obsolete very soon. Governments expect that information and communication technologies will make learning more efficient and promote economic growth and wealth.

From the nineties, there have been huge investments in the e-Learning industry and the market is now beginning to get return on investment, since many large organizations have implemented e-Learning. So it is becoming a profitable market.

There are already many situations in which people that have their roots in remote and rural places suddenly gain access to high-quality lifelong learning, can develop themselves, can be part of a larger (regional, national, global) learning community, and can improve their quality of life. And neither complex nor expensive technologies are needed to learn via the Internet or to offer e-Learning courses. A wide selection of open-source software is now available free of charge - as *Moodle*, a *Learning Management System* -, forum software, wikis as part of wikipedia, which can all be used to deliver and share knowledge, and organize circles where issues can be discussed and solved. Experience has shown that people in all age groups, who didn't have any computer skills, very soon learn to study via the networks, if they can find out what interests and suites them and if there is a group and a tutor to facilitate the learning process.

e-Learning exploits interactive technologies and communication systems to improve the learning experience. It has the potential to transform the way we teach and learn across the board. It can raise standards and widen the participation in lifelong learning. It cannot replace teachers and lecturers, but, alongside existing methods, it can enhance the quality and reach of their teaching.

e-Learning has excited educationalists and trainers with the promise of the potential of technology to revolutionize learning.

Further dimensions of eLearning are:

- *Accessibility* - access to information is available on a global scale;
- *Flexibility* and *mobility* - learning can take place any time, any place;
- *Interactivity* - assessment of learning can be immediate and autonomous;
- *Collaboration* - use of discussion tools can support collaborative learning beyond the classroom;
- *Extended opportunities* - e-content can reinforce and extend classroom-based learning;
- *Motivation* - multimedia resources can make learning fun.

Obstacles in the development of E-learning

There are some potential drawbacks to e-Learning which should be considered. These include:

- a) The learners and teachers may not be confident in using the technologies, and thus soon be discouraged from learning online.
- b) Learning technologies can be too complex and may not always work as they are intended to. As a matter of fact there are many bugs, the technologies are still too bad.
- c) Off-the-shelf courses may not meet the particular learning needs and custom produced learning materials can be expensive.
- d) The learners may feel isolated when working on their own on a computer.
- e) The learners and teachers may not have access to the infrastructure needed for eLearning.
- f) There is not always sufficient support for e-Learning courses.
- g) There is not sufficient access to suitable hardware (computer, headset, etc.).
- h) Internet access is not appropriate.
- i) There are anxieties to communicate in a group, to share knowledge. There is a lack of appropriate writing skills.
- j) Self-motivation and discipline is lacking.
- k) Time management is not appropriate.
- l) Critical thinking is not developed.
- m) The market is changing too rapidly and the organizations, learners and trainers cannot keep up with the development.
- n) The e-Learning market is too complex.
- o) The people are flooded with information and spam, and become more and more stressed.
- p) Many learning programs and environments control learning and thoughts and do not enhance or contribute to deep and complex knowledge construction.

Many teachers and learners get started with e-Learning, but very soon drop out again, if the organization or teachers do not consider basic organizational and pedagogical requirements.

If e-Learning is considered to be a tool to save costs by automatically filling the brains of many, it does not work. Teaching and facilitating on-line courses requires in fact as much time, at the beginning maybe even more time, than traditional classroom teaching. And if done correctly involving and carefully coaching the learners and reducing the anxieties, e-Learning can be more powerful and more efficient than traditional education, reaching out to more people.

The three major factors that are slowing the uptake of e-learning in European Further Education and Life-long Learning are

- (1) The inertia to organisational changes required to implement it effectively and efficiently
- (2) The lack of exemplary quality learning resources in digital format,
- (3) The lack of a unified integrated framework within which to evaluate its pedagogical and didactical benefits.

European trainers are not accustomed to producing e-learning materials but sometimes commission external software engineers to translate traditional teaching materials into e-learning format.

The creation of high quality content for learning environments is essential for the successful use of novel ways of learning. The main aim of the project is to train trainers to create content for new learning environments. This will establish a culture of innovation in the educational organisations involved and will directly contribute to achieve the aim "to

support the development of innovative ICT-based content, services, pedagogies and practice for lifelong learning” set out in the aims of the LLP programme.

Solutions in the development of E-learning

In the e-Learning process, a *Learner* will not be permanently fed with knowledge and materials by a teacher / trainer. The learner must take initiatives him/herself, search for information, and organize the learning process.

e-Learning means changes for the *Teacher/Trainer* as well. In traditional training, his/her skills and abilities as experts and knowledge suppliers were demanded, whereas in e-Learning he/she becomes more and more learning coach and facilitator.

The *Organisers of education and training* also need to become familiar with the new ways of learning. In order to take advantage of the new learning opportunities, to evaluate what the market offers, and to implement e-Learning they need to get to know the new tools for learning and teaching.

A new innovative learning culture is emerging.

All the participants need to learn the new forms and methods of learning.

Existing digital content must be demonstrated to trainers showing the pedagogical and didactical benefits of e-learning.

It must be shown that the multimedia and interactive elements may be produced simply by non-software engineers,

Trainers must be trained in the innovative didactical techniques offered by e-learning: e.g. multimedia edutainment, interactive presentations, DHTML simulations, interactive Exelet simulations, rapid-access graphical databases, interactive tests and electronic marking and scoring.

The Trainers should be helped to produce E-learning materials.

4. Teaching and Learning online – A Real Art? (The Art of Teaching and Learning On-line)

Specific Pedagogical Elements for E-Learning

E-Learning provides an opportunity to access exciting learning opportunities. But it has nothing to do with electronics or technologies. It just use a computer connected to the Internet as well as some software, which helps to collaborate and communicate like in the classroom. It takes a short time to get used to these new instruments, but then the most important task is to communicate, to stimulate, and to facilitate the learning process.

The learning processes still take place in our heads. And human learning does not become more intensive by using high-tech and multimedia.

There are basically three learning concepts, which influenced the development of e-Learning: *behaviourism*, *cognitivism* and *constructivism* [2].

Behaviourism

Behaviourism was very dominant in the 1950s and 60s. The behaviourists tried to explain learning without referring to mental processes. The focus was on observable behaviour and the way an organism adapts to the environment. The famous “Dog Salivation Experiment” by Pavlov where he makes dogs salivate at the sound of a bell, and later experiments by Skinner with pigeons in the so called “Skinner Box” are very famous examples of behaviouristic learning experiments. Despite these very “low-level” learning experiments focusing largely on reflexes, the behaviouristic theories have been generalized to many higher level functions as well.

The important aspect of behaviouristic theories is that the learner is viewed as adapting to the environment and learning is seen largely as a passive process in that there is no explicit treatment of interest in mental processes. The learner merely responds to the “demands” of the environment. Knowledge is viewed as given and absolute (objective knowledge).

Many learning programs are built on behaviouristic theory. They are constructed as learning machines. Most of the authoring tools on the market allow the trainers to easily make e-Learning modules.

Background information with the objectives is provided, then the content is presented followed by a set of simple questions, usually yes and no or multiple-choice questions. Thus, the learning success can be “objectively” measured; the learners get feedback and are “conditioned”. Then come the next cycle.

These learning programs are popular, especially with many Training Managers in enterprises. A lot of people can be filled with knowledge, and they have an “objective” measurement tool on how well or badly employees perform.

Even the learners like those programs. They pretend a kind of security, which is important for weak learners to gain confidence. For some learners it is maybe more fun to do the quizzes.

The problem with the behaviouristic learning materials is that learning is not sustainable. The facts are usually forgotten after the first test, there is no transfer process, no problem

solving, which enables deeper learning. The learners do not learn to communicate. The learning needs of the individual are not taken into consideration.

Cognitivism

The cognitivist school goes inside the head of the learner in that they make mental processes the primary object of study and try to discover and model the mental processes on the part of the learner during the learning process. In cognitive theories, knowledge is viewed as symbolic, mental constructions in the minds of individuals, and learning becomes the process of committing these symbolic representations to memory, where they may be processed. The development of computers with a strict “input - processing - output architecture” from the 1960s and up to today certainly has inspired these “information-processing” views of learning.

The cognitive approach and cognitive theories emerged as a new perspective employing “information-processing ideas” rather than the behaviourist assumptions that the learner is determined by his environments and so passively adapts to the circumstances. This cognitivist view emphasizes the active mental processing on the part of the learner. However, knowledge is still viewed as given and absolute just like in the behaviourist school.

Learning programs influenced by cognitive theory provide an introduction and show the learner contexts and processes. There is often a tutor who guides through the learning materials. The learners gain knowledge by working with authentic situations and contexts.

The architecture of the learning management systems on the market has been influenced by cognitivist theory. The LMS tools make it easy to organize the contents, following a certain path. The systems are now popular with many universities and larger enterprises. For the tutors it is easy to assemble a course with a set of materials, to develop questionnaires, and set-up a virtual classroom.

However, the problem of cognitive learning programs is that usually only one learning path can be taken. The learner does not have the opportunity to learn by association, break out and acquire skills by researching other paths.

It might be easy to design a learning scenario with a set of texts, a set of questions and tasks and provide a forum for discussion. But still, this system is appropriate to learn facts - for learners not used to e-Learning, it is hard to learn this way, and it is difficult to initiate deep learning and critical thinking skills.

Constructivism

Constructivism is the third pedagogical school, which influenced e-Learning. It is actually not one theory; it is a collection of theories based on cognitivism, neurology, and social sciences. While the behaviourists view knowledge as nothing more than passive, largely automatic responses to external factors in the environment and the cognitivists see knowledge as abstract symbolic representations in the head of individuals, the constructivist school views knowledge as a constructed entity made by each and every learner through a learning process. Knowledge can thus not be transmitted from one person to the other, it will have to be (re)constructed by each person. This means that the view of knowledge differs from the “knowledge as given and absolute” views of behaviourism and cognitivism.

In constructivism, knowledge is seen as relativistic - nothing is absolute, but varies according to time and space. There are different varieties of constructivist theories, basically the "Cognitive oriented constructivist theories" and "Socially oriented constructivist theories".

Cognitive-oriented constructivist theories emphasize the exploration and discovery on the part of each learner as explaining the learning process. In this view, knowledge is still very much a symbolic, mental representation in the mind of the individual. The socially oriented constructivist theories stress the collaboratory efforts of groups of learners as sources of learning.

Constructivist learning programs do not have the role to guide through knowledge; they provide prompts, stimuli, coaching, and support. The learners are taken into complex environments, where they gain experience, construct knowledge, and acquire skills. Authentic experiences and situations are provided.

The learners have a high degree of freedom and responsibility for their learning progress and gain a greater satisfaction.

5. Hardware interfaces for e-Learning (mobile phones with keyboard, PDAs with touch screens, notebooks and netbooks with KB/touch screens, Microsoft TabletPCs, gesture interpretation)

Trends in e-Learning Technologies

The e-Learning market is rapidly changing and so are the terms. New terms are coined, changed or get another meaning nearly every day. The terms and concepts defined below have emerged in the last few years and are relatively standard in the e-Learning world [5, 6].

Here is an overview of new technologies that are used in e-Learning and some related links:

Mobile technologies

a) *Podcasting*: <http://www.webopedia.com/TERM/p/podcasting.html>

This is a relatively new term for the online publishing of files in a way that allows for subscription-like syndication and distribution as they become available. Podcasts are generally audio in MP3 format but other formats and other types of files, such as video can also be podcasted. A podcast is often described as 'an audio magazine subscription', in that a subscriber receives programs without having to get them, and can listen to them at leisure.

b) *RSS*: <http://www.webopedia.com/TERM/R/RSS.html>

Short for Rich Site Summary, an XML format for syndicating Web content. A Web site that wants to allow other sites to publish some of its content creates an RSS document and registers the document with an RSS publisher. A user that can read RSS-distributed content can use the content on a different site. Syndicated content includes such data as news feeds, events listings, news stories, headlines, project updates, excerpts from discussion forums etc.

Blogs (text, audio, photo) - a frequent, chronological publication of personal thoughts, like an online diary.

a) *Blogger.com*: <http://www.blogger.com/start>

b) *Audio*: <http://instantaudio.com>

c) *Photos*: <http://www.buzznet.com/>

In the future learning solutions and services will be integrated into mobile technologies as mobile phones, PDAs, digital pen and paper, and in the long term, mobile devices that are not yet on the market. In the long term, learning solutions and services are also likely to be integrated into electronic appliances, machines and information interfaces.

For mobile learning there are two distinct potential markets which are evolving:

a. The first one is the market of learning services for people that are without infrastructure (accessibility to internet and e-learning may not be as wide spread in rural or remote areas) and learners in developing economies;

b. The second one is the market of learning services for people who's jobs require them to continuously move, people learning and receiving information while visiting various sites and locations, certain types of students needing individualized learning education, on the move and while on external projects.

In the United States the PDAs have already been used in schools and for workers on the move and this thing had significant results in terms of improved learning effectiveness. In Europe, mobile learning is beginning to develop, and telecommunications companies such as Nokia and Vodafone have already integrated these technologies into their training and development systems.

However, the real growth across this sector remains to be seen. Any growth in this market is likely to happen in the medium to long term.

6. E-learning Technologies (E-learning Platforms and Tools, Learning Management Systems, Collaborative Instruments, Examples)

The rise of the Learning Management System (1997-1999)

In this milieu, customers realized they had significant numbers of high-cost, high-promise CD-ROM courses going out to all sorts of locations, and who knew whether they were being used or having an impact. This problem was especially acute when a big-ticket custom project was being deployed – the large-scale implementation was expensive and associated with much fanfare, and had to be managed centrally and cost-justified.

Suddenly a supplementary feature found in many custom courses – a desktop - or LAN-based student administration and data reporting system - augured a solution to the problem, namely a more expansive and powerful WAN-based or Intranet / Web-based version of these systems that would work across the extended enterprise. Such a system would:

- Automate the administration of CD-ROM-based and even Web-based training deployed across many locations;
- Launch and track CBT courses;
- Work both intra- and inter-departmentally;
- Report on the results of everything, and stratify reporting by location, department, group etc.
- “Surround” and enrich CBT experiences with online collaboration among groups of learners and between instructors and learners, such as threaded discussions, chat rooms, news and document postings, and so on...

Thus was born the CMI or *Computer-Managed Instruction* system, also known as *Course Management System* or CMS.

The first vendors with WAN-based CMI/CMS solutions for CBT were the same companies that sold the authoring tools: *Macromedia*, *Asymetrix* and *Allen Communication*. Soon, however, the purpose of these CMI/CMS systems became blended with *Training Management Systems* or TMSs. Several TMS brands existed - *KnowledgeSoft* (now *KnowledgePlanet*), *Syscom* (later *TrainingServer* and now *THINQ Learning Solutions*), *DKSystems*, *Silton-Bookman Systems* (with its *Registrar* product, later absorbed into *Pathlore*), and several others.

TMSs tended to emphasize:

- Modeling of employee skills and measurement of skill gaps through on-line testing;
- Correlation of skill-deficient learners with matching training solutions;
- Administration of classroom training resources and logistics;
- Automation of the registration process;
- Reporting on the results of everything.

As the CMI/CMS and TMS concepts merged, a new breed of *Learning Management System* or LMS vendor appeared on the scene, featuring more robust enterprise technologies based on an Oracle foundation and a comprehensive attempt to administer, manage, track, and report on skills, classroom training, and CBT across the enterprise: *Saba Software*, *Docent*, *Plateau Systems*, *Pinnacle* (later *Learnframe*), *Oracle*, *IBM/Lotus*,

and many more very small companies. Only a handful was doing more than a few million dollars selling these systems yet, but all were jockeying for future market position.

The need to differentiate between these offerings and select one suddenly became a big deal among corporate training buyers, catalyzing the success of 3rd-party consultants such as Brandon Hall who could help companies choose from among these systems, all of which were lumped into the same LMS product category but which in fact tended to highlight different features to achieve different purposes.

More importantly, strict standards needed to be put into place to make sure the CBT tracking portion of an LMS “talked to” CBT content from multiple sources, including both multiple packaged content vendors and custom-developed content using any of the commercial authoring packages. Thus the AICC (“Airline Industry CBT Committee”) standard for interoperability between computer-based training and an LMS - the only standard then in existence and ready for adoption – became fundamental.

More recently, “better” Web-centric standards have arisen that extend but otherwise closely resemble AICC to serve the same purpose - IMS, IEEE LOM, ARIADNE, and the “unification” of all these standards - ADL’s SCORM.

7. Development of online learning materials (e-content)

Design issues

Design principles of effective e-learning

Unlike classroom training, e-learning is very visible. While much of the classroom experience is packaged in the instructor and in fact varies from class to class, one can easily see and hear all elements of e-learning. Everything from screen color to content accuracy to the types of practices is readily available for scrutiny. The learning professionals believe that this high visibility will prove to be a good thing. With this much more accessible instructional environment, the trainers are able to more readily identify effective and ineffective training. But to do so, they have to move beyond a reliance on end-user (or even expert) opinions.

Decisions about e-Learning courseware begin with an understanding of how the mind works during learning and of what research data tell us about what factors lead to learning. Naturally factors other than psychological effectiveness come into play in all multimedia learning decisions. For example, instructional strategies will be shaped by parameters of the technology like bandwidth and hardware, and by environmental factors such as budget, time, and organizational culture.

Since the term e-learning is still used inconsistently, let's start with a basic definition. For the purposes of this course, e-learning is content and instructional methods delivered on a computer (whether on CD-ROM, the Internet, or an intranet), and designed to build knowledge and skills related to individual or organizational goals. This definition addresses:

The what: learning/training delivered in digital form,

The how: content and instructional methods to help learn the content, and

The why: to improve personal and organizational performance by building relevant knowledge and skills in the final users (students, employees, workers, etc.).

Important elements of an e-lesson/course

There is a distinction among three important elements of an e-lesson/course: ***the instructional methods, the instructional media, and media elements***. In spite of optimistic projections of the positive impact of technology on learning, the reality has not lived up to expectations. From film to the Internet, each new wave of technology has stimulated prospects of revolutions in learning. But research comparing learning from one medium such as the classroom with another medium such as the Internet generally fails to demonstrate significant advantages for any particular technology. These repeated failures lead the learning professionals to abandon a technology-centered approach to learning in favor of a learner-centered approach. Having participated in many poor training sessions in the classroom and on the computer, we recognize that it's not the medium that causes learning.

Rather it is the design of the lesson itself and the best use of instructional methods that make the difference. A learner-centered approach suggests that we design lessons that accommodate human learning processes regardless of the media involved.

Instructional methods are the techniques used to help learners process new information in ways that lead to learning. Instructional methods include the use of techniques such as examples, practice exercises, simulations, and analogies.

Instructional media are the delivery agents that contain the content and the instructional methods including computers, e-workbooks, and even online instructors. Not all media can carry all instructional methods with equal effectiveness. For each new technology that appears on the scene, we typically start by treating it like older media with which the instructors are familiar. For example, much early web-based training looked a lot like books — mostly using text on a screen to communicate content. As the technology behind a given medium matures, the professionals get better at exploiting the features unique to that medium for learning.

A third component of multimedia learning is the **media elements**. The media elements refer to the text, graphics (incl. video and animation), and audio used to present content and instructional methods.

Media element principles

Six media element principles can be defined as guidelines regarding the benefits of graphics, the placement of text and graphics on the screen, and the best way to present words that describe graphics among others:

1. The multimedia principle: adding graphics to words can improve learning

By graphics we refer to a variety of illustrations including still graphics such as line drawings, charts, and photographs and motion graphics such as animation and video. Research has shown that graphics can improve learning. The trick is to use illustrations that are congruent with the instructional message. Images added for entertainment or dramatic value not only don't improve learning but they can actually depress learning.

2. The contiguity principle: placing text near graphics improves learning

Contiguity refers to the alignment of graphics and text on the screen. Often in e-learning when a scrolling screen is used, the words are placed at the top and the illustration is placed under the words so that when you see the text you can't see the graphic and vice versa. This is a common violation of the contiguity principle that states that graphics and text related to the graphics should be placed close to each other on the screen.

3. The modality principle: explaining graphics with audio improves learning

If the trainers have the technical capabilities to use other modalities like audio, it can substantially improve learning outcomes. This is especially true of audio narration of an animation or a complex visual in a topic that is relatively complex and unfamiliar to the learner.

4. The redundancy principle: explaining graphics with audio and redundant text can hurt learning

Some e-lessons provide words in text and in audio that reads the text. This might seem like a good way to present information in several formats and thus improve learning. The research however, indicates that learning is actually depressed when a graphic is explained by a combination of text and narration that reads the text.

5. The coherence principle: using gratuitous visuals, text, and sounds can hurt learning

It's common knowledge that e-learning attrition can be a problem. In well-intended efforts to spice up e-learning, some designers use the entertainment approach. They add glitz and games to make the experience more engaging. The glitz can take a variety of forms such as dramatic vignettes (in video or text) inserted to add interest, background music to add appeal, or popular movie characters or themes to add entertainment value.

6. The personalization principle: using conversational tone and pedagogical agents to increase learning

A series of interesting experiments showed that people responded to computers following social conventions that apply when responding to other people. For example, the researchers found that when evaluating a computer program on the same computer that presented the program, the ratings were higher than if the evaluation was made on a different computer. People were unconsciously avoiding giving negative evaluations directly to the source. Of course individuals know that the computer is not a person. However, deeply ingrained conventions of social interaction tend to exert themselves unconsciously in human-computer interactions. These findings prompted a series of experiments that show that learning is better when the learner is socially engaged in a lesson either via conversational language or by an informal learning agent.

These six media element principles should give the instructional designers the basics since all e-learning programs and courses must rely on some combination of graphics, text, and audio to deliver their content.

Additional information and examples of common design/layout mistakes can be found in the white paper "[Knowledge presenter®: Seven Common Layout Mistakes](#)". In this white paper, the authors consider seven of the major design mistakes instructional designers make when laying out e-learning objects and lessons/courses.

Online Resources

1. <http://icdl.open.ac.uk/> - The International Centre for Distance Learning (ICDL)
2. <http://www.cisnet.com/~cattales/Deducation.html> - The World Wide Web Virtual Library's list of resources on distance education
3. <http://www.gwu.edu/~etl/programs.html> - Lists of links on distance education.
4. <http://ccism.pc.athabascau.ca/html/ccism/deresrce/de.htm> - Resources in distance education from Athabasca University
5. <http://www.distance-educator.com/portals/o4designers.html> - The designers' section of a US-based web site dedicated to distance education.
6. <http://www.usqonline.com.au/> - The University of Southern Queensland
7. <http://www.bookstoread.com/e/et/top10id.htm> - This site provides the top ten books on instructional design
8. <http://www.col.org/irc> - The Commonwealth of Learning Information Resource Centre at the COL web site
9. http://www.futureu.com/cmscomp/cms_comp.html - Comparative Features Analysis of Leading Course Management Software
10. http://www.seas.gwu.edu/~sbraxton/ISD/isd_homepage.html - Instructional Design Methodologies and Techniques from the George Washington University
11. <http://www.atl.ualberta.ca/articles/idesign/activel.cfm> - The Web: Design for Active Learning from the University of Alberta
12. <http://www.irrodl.org/> - Online journal, International Review of Research in Open and Distance Learning, from Athabasca University
13. <http://www.slis.indiana.edu/CSI/wp00-01.html> - Articles on the frustrations experienced by a group of distance learners

Multimedia in education

Multimedia combines five basic types of media into the learning environment: text, graphics, animation, video and sound, thus providing a powerful new tool for learning.

The growth in use of multimedia within the education sector has accelerated in recent years, and looks set for continued expansion in the future.

The development of multimedia technologies for learning offers new ways in which learning can take place in schools and the home. Enabling teachers to have access to multimedia learning resources, which support constructive concept development, allows the teacher to focus more on being a facilitator of learning while working with individual students. Extending the use of multimedia learning resources to the home represents an educational opportunity with the potential to improve student learning.

The elements used in multimedia have all existed before. Multimedia simply combines these elements into a powerful new digital tool, especially in the hands of teachers and students. Interactive multimedia integrates five basic types of media into the learning environment: text, video, sound, graphics and animation. Since the mode of learning is interactive and not linear, a student or teacher can choose what to investigate/study next. For example, one does not start on the first page of a linear document and read to the end. Interactive multimedia learning mode is more like constructing a “knowledge” web, with one idea linked to another, allowing choices in the learner’s path.

The multimedia technologies that have had the greatest impact in education are those that augment the existing curriculum, allowing both immediate enhancement and encouraging further curriculum development. For example, the WWW serves as a storehouse of information that individual learners can search for subject matter content that specifically fits their learning agendas. Multimedia applications for computers have been developed for single computing platforms as well for networks.

Multimedia components in e-learning

While multimedia learning materials are not a direct replacement for traditional teaching methods, they are a powerful tool if used wisely and correctly. They have a number of advantages over traditional delivery methodologies and are becoming increasingly sophisticated. Their potential needs to be understood by all involved in education and training.

A Multimedia Learning Environment (MLE) involves a number of components or elements in order to enable learning to take place. Hardware and software are only part of the requirement. As mentioned earlier, multimedia learning integrates five types of media to provide flexibility in expressing the creativity of a student and in exchanging ideas.

Text

Out of all of the elements, text has the most impact on the quality of the multimedia interaction. Generally, text provides the important information. Text acts as the keystone

tying all of the other media elements together. It is well written text that makes a multimedia communication wonderful.

Graphics

Graphics provide the most creative possibilities for a learning session. They can be photographs, drawings, graphs from a spreadsheet, pictures from CD/DVD-ROMs, or something downloaded from the Internet. With a scanner, hand-drawn artworks can be included. Standing commented that, "the capacity of recognition memory for pictures is almost limitless". The reason for this is that images make use of a massive range of cortical skills: color, form, line, dimension, texture, visual rhythm, patterns and especially imagination.

Video

The representation of information by using the visualization capabilities of video can be immediate and powerful. While this is not in doubt, it is the ability to choose how we view, and interact, with the content of digital video that provides new and exciting possibilities for the use of digital video in education. There are many instances where students, studying particular processes, may find themselves faced with a scenario that seems highly complex when conveyed in purely text form, or by the use of diagrams and images. In such situations the representational qualities of video helps in placing a theoretical concept into context.

Video can stimulate interest if it is relevant to the rest of the information on the page, and is not 'overdone'. Video can be used to give examples of phenomena or issues referred to in the text. For example, while students are reading notes about a particular issue, a video showing a short clip of the author/teacher emphasizing the key points can be inserted at a key moment; alternatively, the video clips can be used to tell readers what to do next. On the other hand, it is unlikely that video can completely replace the face-to-face lecture: rather, video needs to be used to supplement textual information.

One of the most compelling justifications for video may be its dramatic ability to elicit an emotional response from an individual. Such a reaction can provide a strong motivational incentive to choose and persist in a task.

The use of video is appropriate to convey information about environments that can be either dangerous or too costly to consider, or recreate, in real life. For example: video images used to demonstrate particular chemical reactions without exposing students to highly volatile chemicals, or medical education, where real-life situations can be better understood via video.

Animation

Animation is used to show changes in state over time, or to present information slowly to students so they have time to assimilate it in smaller chunks. Animations, when combined with user input, enable students to view different versions of change over time depending on different variables.

Animations are primarily used to demonstrate an idea or illustrate a concept. Video is usually taken from life, whereas animations are based on drawings. There are two types of animation: Cell based and Object based. Cell based animation consists of multiple drawings, each one a little different from the others. When shown in rapid sequence, for example, the operation of an engine's elements, the drawings appear to move. Object based animation (also called slide or path animation) simply moves an object across a screen. The object itself does not change. Students can use object animation to illustrate a point – imagine a map of city where cars movement is represented by sliding arrows.

Sounds/Audio

Sound is used to provide emphasis or highlight a transition from one page to another. Sound synchronized to screen display, enables teachers to present lots of information at once. This approach is used in a variety of ways, all based on visual display of a complex image paired with a spoken explanation (for example, art – pictures are 'glossed' by the voiceover; or math – a proof fills the screen while the spoken explanation plays in the background). Sound used creatively, becomes a stimulus to the imagination; used inappropriately it becomes a hindrance or an annoyance. For instance, a script, some still images and a sound track, allow students to utilize their own power of imagination without being biased and influenced by the inappropriate use of video footage. A great advantage is that the sound file can be stopped and started very easily.

When defining the appropriate medium to use it is vital to 'know' the audience and the technical specification of users' machines. There may be technical reasons for choosing which multimedia element will best communicate certain concepts. Whatever medium is chosen, to apply a principle mentioned above to all digital media elements, visuals must be congruent, relevant, and consistent with other information presented in order to be effective. Whatever the latest technological advance, instructional design principles apply. For example, care needs to be taken when using visuals for aesthetic reasons. The misuse of a single visual element can cause misrepresentation of information and become a barrier to content and impede learning, even if the program overall may, in all other aspects, follow the principles of instructional design. It is important to bear in mind the nature of the audience, especially their age group and culture mix.

Human – Computer Interface

Multimedia applications like any other application, appliance or tool, benefit from being easy to use, with minimal training or self-learning. The need for a well designed human – computer interface, which may be screen or audio based is well accepted. The standards

for computer-based publications are set by the publishers of books, music, Walt Disney cartoons and television producers. With the development of High Definition TV and beyond, it is likely that there will be a continual increase in the demands placed on computer based multimedia systems.

Interactivity

Computer based multimedia needs the same degree of interactivity that a school exercise book, or a laboratory experiment has in order to remain credible as a learning medium. Educationists have shown that certain forms of learning becomes easier, and is retained more permanently if the learner participates in some way with the learning material. The generation of computer based virtual reality is an extension of this process. The incorporation of interactivity is really the job of the application designer. The incorporation of interactivity is assisted if the network is capable of two-way communication, and for some applications the sense of interactivity is aided by the ability to deliver a moving picture, or a sound very quickly, so that a sense of two-way human participation can be generated. Real time video conferencing is an example.

Access, Delivery, Scheduling and Recording

On demand access times to computer information need to be below one second to be usable in real time. Alternatively the delivery of information at a later time is acceptable if it can be scheduled, as in a TV broadcast schedule. Scheduling can have advantages for users over on demand delivery. In open learning situations learners can control their program by requesting a multimedia unit at a convenient time. Computer users will wish to record a film, session, or learning experience for future reference.

Multimedia and the World-Wide Web

The World-Wide Web (WWW) was created to support remote collaborative research, but it has developed primarily as a means of providing information that is linked to other information sources. It is an essential medium for accessing, delivering and exchanging information. The WWW provides a number of opportunities for teachers and students. Resources can be accessed which might otherwise have been unavailable. These include virtual libraries and museums. Other resources can be built up and used by students, for example questions and answers that can be searched or routed through to an expert if it is a new query and then the answer logged for future use. Teaching programs can be accessed and used by students as part of their modules.

The Web can be thought of as a digital global multimedia library. With the steadily increasing classroom use of multimedia resources, students are required to develop the skills needed to locate information contained in this format. Developing skills for locating and evaluating information requires learning to distinguish good multimedia from poor multimedia materials.

Multimedia in 3D Virtual Environments (VE)

Multimedia in education has the potential to go beyond the boundaries of interaction and explorative learning. The actors in the education community could establish 3D Virtual Learning Environments (VLE) where simulations and “serious” games can be very effective teaching/learning tools. A student can create artifacts that reflect his/her understanding of concepts by combining text, 3D objects, voice and animation utilities. A teacher could customize lesson plans that can be individualized. Literally it is setting up an online virtual lab to innovate and create.

Online Resources

1. [Journal of Interactive Media in Education](#)
2. [Mayer, R. & Moreno, R. \(1998\). "A Cognitive Theory of Multimedia Learning: Implications for Design Principles."](#)
3. [Distance Education, an international journal of the University of Southern Queensland](#)
4. [Open and Distance Learning Association of Australia \(ODDLA\)](#)
5. [University of Illinois online report on a survey of online and distance learning journals and professional communities](#)
6. [International Centre for Distance Learning \(ICDL\) literature database](#)
7. [Journals and newsletters for distance education](#)
8. [Distance education clearinghouse, the University of Wisconsin](#)
9. [Athabasca University's Resources in Distance Education \(RIDE\) database](#)
10. [Ohio State University - Distance learning online resources](#)
11. [National Centre for Vocational Education Research \(NCVER\)](#)
12. [The Commonwealth of Learning Information Resource Centre](#)

Authoring tools

Why authoring tools?

Electronic content (e-content) is the new frontier of e-learning. Instructional designers and trainers are trying to identify ways to create and publish digital content for use on the Internet, intranets, or CD/DVD-ROMs. Some trainers seek high-speed deployment of critical information throughout an organization, while others want control of courseware and independence from programmers. Many organizations are attempting to reduce their training costs by developing e-learning materials in-house. Whatever the reason, many instructional designers and trainers are researching the features, benefits, and cost of authoring tools.

What is an authoring tool/system?

Authoring tools/systems or e-learning course (e-course) creation tools are software applications/packages that enable instructional designers and trainers to integrate an array of media to create professional, engaging, interactive e-learning/training content, and some make it possible to repurpose digitized elements or learning objects from an existing course for reuse in a new one.

What features do you need in the authoring system?

The essential components of an authoring system are:

- facilities that allow developers, who may not be computer experts, to enter the training content onto screens in an attractive way
- support for linking screens of training material together into modules
- support for a range of question types so that the course designers can choose the most appropriate for a particular situation and provide variety for the student
- response analysis that takes the student's answers to questions and provides feedback and makes branching decisions based on the student responses.

Other features that will usually be provided with differing levels of sophistication are multimedia support, recording of student and course details and support for the Internet and intranets.

Some authoring systems are designed to be easy to use by people with limited computer skills. Others can support users with different levels of computer expertise by having, for example, a programming or scripting language that the less technically skilled developer may never need to see. The complete authoring system may be very comprehensive or quite simple.

How well does a authoring system support commonly available features of technology based training and interactive multimedia? Features to be considered here include:

- Support for a variety of question types (multiple-choice, open ended, true/false, form-filling, drag and drop, etc.), the matching of student responses and subsequent branching. This is crucial if you are to write training that is responsive to the individual needs of learners.
- Interactions using the mouse as a pointing device and for dragging objects.
- Graphics and color. Wherever possible, anyone starting on the e-learning path today should specify 1024 x 768 screen resolution and 16 million colors as the minimum standard.
- The variety of different font styles and more fonts available.
- Multimedia support. If sound is needed check that the desktop PCs can deliver sound. Many organizations either exclude sound from the desktop PCs or don't permit the use of sound. If sound is essential it may mean the e-learning has to be delivered in a learning centre.
- Support for special devices such as a touch-sensitive screen, light-pen and other equipment which may, for example, be a slide projector or a piece of apparatus.
- The ability to interface with programming languages. This may allow the trainer to do non-standard functions by getting a computer programmer to write a special program that can be linked into the courseware. This is an advanced feature but one rule with authoring systems is that, as an author gets familiar with the authoring system, he or she will want to do some things that the system does not do as standard. The answer, if the authoring system is basically suitable, is usually to find another way of doing them and using a programming language, such as C++, Adobe/Macromedia Flash or HTML for web delivery, is a common solution.
- The productivity of the system. Many authoring systems are provided with more than one level of use as discussed earlier. This means that the novice or occasional author can use the system in a simple fashion and follow a basic sequence dictated by the authoring system. More experienced authors can access the system at a different level and use the features much more flexibly but they are then more on their own with less hand-holding from the authoring system. Another aspect of productivity is covered in the next paragraph on performance of the system.
- The performance of the system. This is largely dictated by the power and configuration of the computer equipment used for development and presentation. Considering development first, authoring systems tend to use quite a lot of computer power so it is sensible to provide the development team with high performance systems.
- The above is important, but having adequate performance when the training is run by students is more so. The training must be tested by the authors on the minimum

configuration that trainees will use to see how it performs and take remedial action if necessary.

- The Internet/intranet can be used in two ways. It can be used to download interactive training to local computers so that it can be stored and delivered locally or it can be used to deliver online training. The speed of transfer of data may have important implications for the overall performance of the training and, therefore, the student's satisfaction with the overall delivery method. This can be far more important than the performance of the PCs that are used by the students to study the course.

Other important features may include:

- Automated programming - by automating programming for online delivery, authoring tools liberate course developers from their dependence on programmers. A few authoring tools have the ability to write such programming languages as HTML, XML, or DHML. The types of programming code or output formats vary significantly among tools. When evaluating candidates, compare the output formats for each tool. If you select an authoring tool that doesn't write programming code, you'll need to learn how to program or rely on someone who can. Otherwise, you won't be able to publish your courses.
- Interoperability and standards - The ability of an authoring tool to work with other e-learning software and systems is referred to as interoperability. Successful interoperability is the result of software compliance to technology standards.

The e-learning community has several sets of technology standards and is currently developing additional standards. The ultimate vision is to have interoperability throughout the entire e-learning market. Until then, the e-learning community is fragmented into different systems adhering to various standards. The four most common standards are Aviation Industry Computer-based Training Committee (AICC), Sharable Content Object Reference Model (SCORM), IMS Global Learning Consortium, and Microsoft LRN.

How to find the best authoring tool?

Although selecting the best authoring tool requires close attention to detail, the process should be painless. Currently available tools offer a variety of features. For example, some tools are designed to develop extensive assessments, software simulations, or content for hand-held computers. Some of the authoring systems include learning management features and some of the learning management systems include some authoring systems features. Some suppliers provide packages both for developing e-courses and for managing learning.

Most tools are designed to create basic e-learning courses for desktop or laptop computers. The software programs support a variety of media and file types, such as text, graphics, video, and audio. Most include assessment and test creation features.

To find the authoring tool that works best for you, conduct a needs assessment. Regardless of how much (or how little) you know about authoring tools, determine the functionality that's most important to your organization and create a shopping checklist.

Some organizations publish in dept reports on authoring tools/systems regularly. Among them are:

1. [Training Media Review - Trainers Guide to Authoring Tools](#)
2. [The British Association for Open Learning](#)
3. [ASTD Learning Circuits Media Reviews](#)
4. [ASTD T + M Magazine](#)
5. [Brandon Hall's Authoring Tool Reports](#)

More Online Resources on Authoring Tools

1. Learning tools directory - <http://www.c4lpt.co.uk/Directory/Tools/instructional.html>
2. Web authoring tools - <http://htmlhelp.com/tools/>
3. Authoring tools –
http://academics.smcvt.edu/cbauer-ramazani/Links/authoring_tools.htm
4. Web authoring tools and HTML editors -
http://webdesign.about.com/od/htmleditors/HTML_Editors_Web_Page_Authoring_Tools.htm

Collaborative Authoring

Collaborative authoring involves the use of a web-based tool to create a document (word processing file, wiki page, presentation, spreadsheet, etc), which can be edited by the multiple members of a group. It allows you to avoid emailing documents back and forth and keeping up with many different versions. You can easily publish the document online. Take advantage of many of the word processing features that you are familiar with - formatting options, spellchecking, etc - without being tied to a single computer.

Working with a group on a learning content project can be both - a pleasant and a hard task: responsibilities are equitably divided, the tedium of work is punctuated by conviviality and commiseration, and large problems dissolve under scrutiny from a variety of

perspectives. Working with a group can also be frustrating, the seemingly indirect and digressive, as well as anxiety-ridden and inconvenient.

But still, the product of group work has better odds for success than does the product of an individual. While we give lip service to the value of the rugged individual, admiring ground breaking geniuses like Newton, Woolf, Einstein, and McClintock, or yearning for the self-sufficiency of the early settlers, the social reality is that, for most of us the bulk of our professional lives will be spent working in cooperation and collaboration with others within authoring teams, committees, research teams, boards, departments, professional societies, or corporations.

Collaborative Authoring Tools:

[Google Docs](#): allows you to author and share documents, spreadsheets, and presentations online (Free, web-based)

[MediaWiki](#): wiki software originally used with Wikipedia (Open source, requires web server such as Apache or IIS)

[NoodleTools](#): teams work collaboratively in real-time on an interactive tabletop to take notes, cite and annotate sources, then outline and write a paper. Multiple instructors can monitor an individual's contributions to the project and give in-context feedback that is visible on students' dashboards. (commercial, web-based)

[PB Wiki](#): wiki supporting multimedia plugins, tagging, access controls, etc. (Free, web-based)

[TiddlyWiki](#): "a complete wiki in a single HTML file. It contains the entire text of the wiki, and all the JavaScript, CSS and HTML goodness to be able to display it, and let you edit it or search it -- without needing a server" (Free, cross-platform)

[TitanPad](#): collaborators write and edit a document simultaneously ; EtherPad re-born (Free, web-based)

[TypeWith.me](#): simple online collaborative writing tool powered by [EtherPad](#); edits by each co-author are assigned a color; can revert to previous versions of document (Free, web-based; via [LifeHacker](#))

[Wiggio](#): web-based collaboration platform that supports messaging, web meetings, shared calendars, polls, project management, and shared files. (Free, web-based)

[Wikidot](#): wiki-building site: "Users can edit content, upload files, communicate and collaborate" (Free, with Pro accounts available; web-based)

[Writeboard](#): "shareable, web-based text documents that let you save every edit, roll back to any version, and easily compare changes." (Free, web-based)

[Zoho](#): suite of online applications including email, document authoring, notetaking, presentations, spreadsheets, etc (Free, web-based)

[Etherpad](#): "A Realtime Multiplayer Notepad in your Browser...lets people collaborate on text in really real-time" (Free beta and pending commercial version, web-based)

Collaborative Authoring Online Resources

1. [Collaborative Authoring Resources](#)
2. [Collaborative Writing Tools And Technology: A Mini-Guide](#)
3. [WikiMatrix](#)

8. Measuring learning results – Design of online assessments and tests

Creating fair and valid assessments

Introduction

The traditional model of assessment utilizes end-of-learning assessments provided to learners in the context in which they learned. This model is seriously flawed, especially in failing to give us an idea of how well our learning interventions are doing in preparing our learners to retrieve information in future situations—the ultimate goal of training and education. By failing to measure our performance in this regard, we are missing opportunities to provide ourselves with valid feedback. We are also likely failing our institutions and our learners because we are not able to create a practice of continuous improvement to maximize our learning outcomes.

Using Assessments to Gauge Future Performance

Most learning assessments look backward. They are designed to tell us how much someone has previously learned. In other words, they tell us how much someone has learned to-date. This backward-only approach makes it virtually impossible for us to collect valid feedback on the effectiveness of our learning designs. With our current assessment practices, we often fool ourselves about our own performance as designers and facilitators of instruction. This might not be so bad if our assessment outcomes were balanced, but the biases seem heavily weighted in favor of making us look good.

This paper will describe how to design learning assessments that better predict the future—that tell us how well our learners will be able to retrieve the information that they have already learned. The paper will also describe how to avoid the all-too-common biases in our current learning-assessment practices. To put it another way, the ideas in this paper will help you create more valid learning assessments, providing you with better feedback about how you're really doing as a learning professional.

The Benefits of Looking Backward

Before moving forward, let me put my criticism of current assessment practices in perspective. While I don't think the backward-looking approach to assessments is sufficient, it does have some benefits. First, backward-looking assessments can motivate learners to pay attention and to study. This approach is not perfect—as exemplified by the cramming behavior that leads to inadequate memory retention—but it can motivate learners beyond the lower thresholds of learning behavior. Second, backward-looking assessments can be somewhat predictive of future retrieval performance, though the metrics tend to fail to account for the vagaries of forgetting. In other words, backward-looking assessments may be good at evaluating the learning intervention's ability to enable immediate retrieval, but they are poor at evaluating the learning intervention's ability to minimize forgetting.

In summary, backward-looking assessments provide some value, but that value comes at significant cost, including the cost of promoting inadequate learning behaviors and ineffective learning designs.

What do Assessments Measure?

Human memory is not like computer memory. With computers, inputs become outputs—items that go into computer memory are retrieved in an identical form. The human memory system doesn't work that way. Information that can be retrieved today may not be retrieved tomorrow. It may not be fully retrieved. It may not be accurately retrieved. It may be retrieved in some situations but not others. It may be retrieved in the presence of some cues, but not others. Human memory—especially the process of retrieval—depends on many factors.

Let's look at an example. Suppose we are running a seminar on the history of e-learning.

The seminar takes place on April 1st, running for six hours in our organization's blue seminar room (from 9 o'clock in the morning until 3 o'clock in the afternoon). We develop an extensive assessment to measure the results of the learning. The assessment is delivered between 3 o'clock and 4 o'clock. It asks our learners to retrieve specific information about the history of buggy whips.

What, then, does our assessment measure? Does it measure the learners' knowledge of buggy whips? Does it measure their ability to retrieve information about e-learning history? It probably provides some measure of each of these constructs. However, when we fully consider the workings of human memory, we can utilize a more precise metric. So, to be precise, our one-hour assessment measures the ability of our learners to retrieve specific information about buggy whips as they sit with their fellow learners in the blue seminar room on April 1st between three and four in the afternoon.

While this wordy description may seem gratuitous, it is not. Each of the contextual elements described (for example, "in the blue seminar room") will affect our learners' ability to retrieve.

Here's a short list:

- If they sat in a different room during the assessment, they would probably retrieve less of what they had learned.
- If they sat with different learners, they may retrieve less of what they had learned.
- If they took the assessment two hours later, a day later, or a month later, they would probably retrieve less of what they had learned.
- If they were asked questions that differed from the questions presented on the beginning-of-the-day pretest, they would probably retrieve less of what they had learned.
- If they were asked questions that used words that differed from the words used in the seminar—even if those words were synonymous with the words used—they would probably retrieve less of what they had learned.
- If they were asked questions that raised or lowered their state of anxiety in comparison to the level of anxiety during the seminar, they would probably retrieve less of what they had learned.

Even without any changes to our buggy-whip assessment, our learners' scores will be positively correlated with their ability to retrieve information about buggy whips in other situations and at other times. However—and this is a key point—when we take human learning and memory into account, we can build assessments that are significantly better in being predictive of the situations that our learning interventions are designed to support. By having more-predictive assessments, we can get better feedback on our own performance as creators of instruction.

So, for example:

- If we develop a workshop designed to help people administer CPR over the coming year if faced with a stopped-heart emergency, we can build a more predictive assessment of their ability to remember what to do by delaying the assessment one week instead of providing the assessment immediately at the end of the workshop.
- If we develop a history course to help our learners be better citizens in a democracy, we can build a more predictive assessment by getting rid of questions that ask about past events and instead use questions that ask the learners to decide how to apply what they've learned to current policy debates.
- If we develop a course to teach Microsoft Excel, we can build a more predictive assessment if we provide the assessment on the computer instead of on paper.
- If we develop a course to teach statistics concepts to 10th graders to help them perform well in subsequent classes and real-world situations, we can build a more predictive assessment if we avoid hinting about the types of problems asked. To be specific, a more predictive assessment will not label the problem types as t-test, ANOVA, or regression problems, as such hints will not always be available in future courses or real-world uses.

What influences retrieval? Here's a short list:

- The passage of time makes it less likely that learners will be able to retrieve the information they learned.
- The more the retrieval context mirrors the learning context, the better the retrieval.
- The more learners receive retrieval practice during learning, the better the subsequent retrieval.
- The more learners focus on the relevant aspects of the learning material, the better the subsequent retrieval of critical information.
- The more the learners practice making decisions and taking actions in realistic situations, the better their retrieval in real-world situations.
- The longer the duration between learning events that reinforce the same learning points, the better the subsequent long-term retrieval.

For our assessments to capture these characteristics of the human learning system, they must be designed in appropriate ways. Unfortunately, a fair percentage of the assessments we currently use in education and training fail to account for these fundamental human learning factors. Here's a short list of the potential issues:

- Assessments are provided to learners only at the end of learning, not after a delay.
- Assessments don't capture our learning interventions' ability to minimize forgetting and enable future retrieval.
- Assessments are provided to learners in the same context in which learning took place.
- Assessments include items that are of secondary relevance or importance.
- Assessment items measure memorization, not decision making or performance.
- Assessment items do not mirror the learners' future retrieval contexts.
- Assessment items inadvertently hint at correct answers through the surface characteristics included in the items.

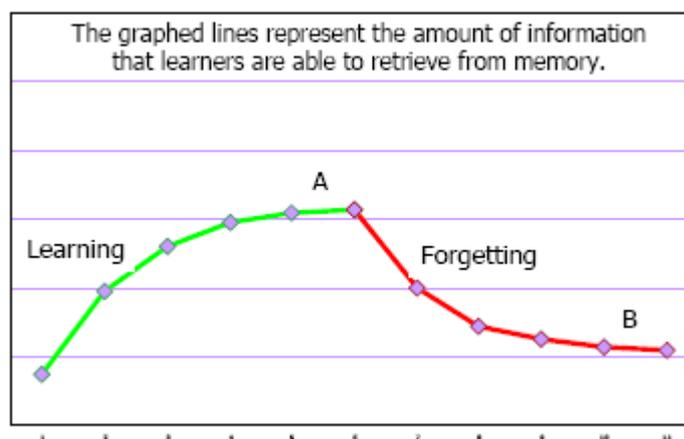
Our current assessment designs often only measure our learners' ability to retrieve in the assessment situation—at that specific time and place, and in response to specific assessment-item cues. While such designs may be adequate as a way to motivate a modest level of learner intensity and to enable us to assign grades, they are not sufficient

in giving us valid feedback about how well our learning designs are preparing our learners to retrieve information in important future situations. To get feedback on our ability to produce this future retrieval, we have to build assessments that can better measure future retrieval.

Measuring the Potential for Long-Term Remembering

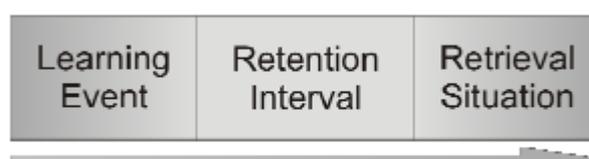
Why is it so critical that assessments measure the potential for future retrieval? Look at the graph below, representing the typical learning and forgetting curves. As our learners learn a body of knowledge, they gradually improve in their ability to retrieve information. However, if the information is not utilized after a learning event, learners gradually lose their ability to retrieve the information.

When the Learning is Not Utilized



Looking at the graph above, if we measure retrieval immediately at the end of learning (Point A), the results will not accurately reflect retrieval performance at the lower ends of the forgetting curve (Point B). In situations like these—in which the learners don't immediately utilize what they've learned—measuring retrieval at the end of learning (Point A) produces an inflated prediction of future retrieval. When we measure retrieval at the end of learning, we lie to ourselves about our performance. We also forgo the opportunity to get valid feedback so that we can improve our instructional designs.

Not all of our learning interventions will suffer the learning-forgetting curves illustrated above, but most will. The problem is this: almost all learning activities are followed by significant “retention intervals” in which forgetting occurs. Retention intervals begin at the end of a learning event and continue until retrieval is required. Look at the following diagram.



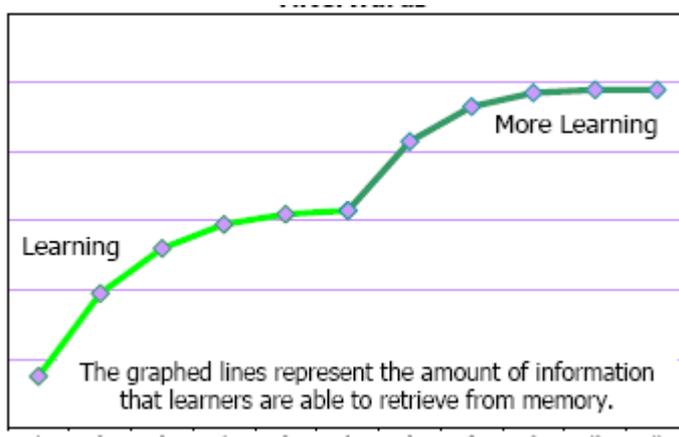
Retention intervals can range from five minutes to fifty years or more. The longer the retention interval, the more forgetting will occur. Even relatively short retention intervals enable forgetting. So, for example, if our learners participate in a day-long workshop on Monday—even if they learn something that they’ll be able to apply the next morning, their retention interval will still be about 16 hours or so (from 5 in the afternoon on Monday until 9 on Tuesday morning). A lot of forgetting can occur in that period.

Typical training and education scenarios tax learners’ memories even further. Our learners learn a lot of information, but only utilize some of that information soon after learning. For example, employees who learn how to handle emergencies will only face some of those emergencies in the first month after the training. Students who learn statistics may run 20 t-tests soon after their course ends, but may use few regressions, and zero factor-analyses. Programmers who take an online course may use some of what they learned later on the same day, but other information they learned may not be required for six months. Managers who practice interviewing techniques may not use what they have learned for two months, or may use it right away and then not for six months.

Even so-called just-in-time learning can suffer from the retention-interval problem. Suppose an employee can’t figure out how to accomplish a task, so he accesses his company’s knowledge management system to get help. It takes him 15 minutes to find the right information. Immediately after seeing a video on how to do the task, he implements the solution. So far so good: there are no retention-interval problems in this just-in-time scenario. However, eight months later the employee has to accomplish the same task again—and try as he might, he can’t remember what to do. Those eight months represent a debilitating retention interval, especially if every eight months the employee has to spend 15 minutes searching for the correct information—even supposing he remembers that it was the system that helped him solve the problem previously.

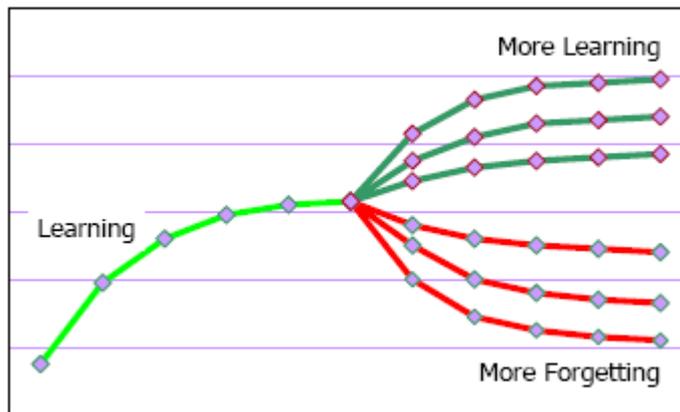
Ideally, we hope that our learning interventions create something like the graph below, where the learners utilize what they’ve learned soon after the learning event:

When the Learning is Utilized Afterwards



However, the best we can typically hope for is the following more realistic set of curves, where some of the learned information is utilized soon after learning and some is not:

When Some is Utilized & Some Is Not

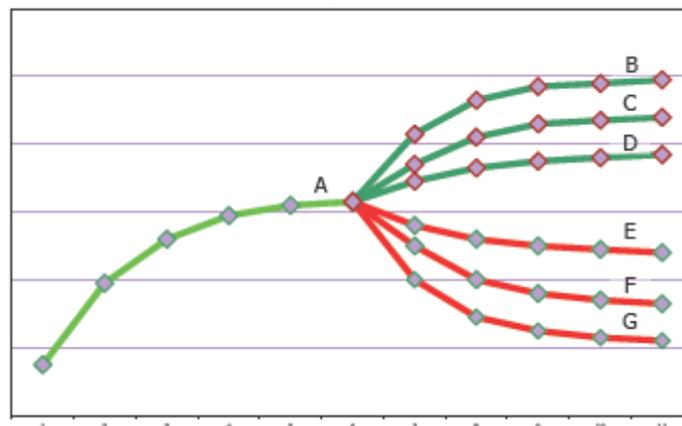


As we discussed much of what we

learning, because so

The graphs depicted on the previous pages show how complicated learning assessment can be. Retrieval performance can rise, fall, or stay the same after the learning events end. One thing is certain: measuring retrieval at the end of the learning event is not necessarily a reliable predictor of future retrieval.

Which Retrieval Future is Predicted by Assessment A?



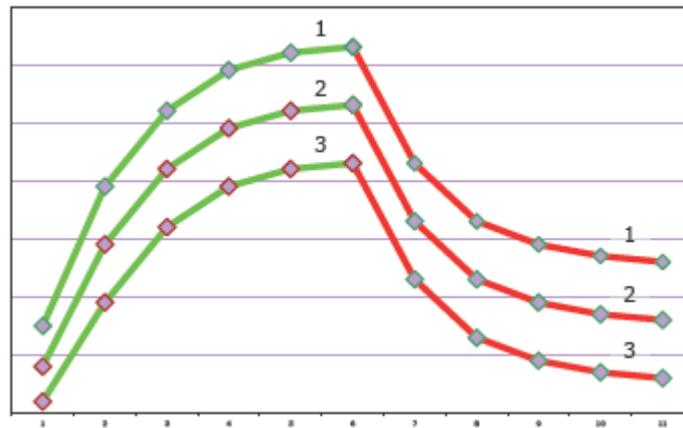
If we design an assessment and deliver it at Point A in the graph above—at the end of the learning event—we may be misleading ourselves about our learners' future ability to retrieve what they have learned.

Since one of our primary goals in developing learning events is to enable long-term retrieval, shouldn't our assessments be reasonably predictive of long-term retrieval?

Learning Methods Differ in their Ability to Minimize Forgetting

If learning methods didn't differ in their ability to minimize forgetting, the above worries would melt away. We could simply measure retrieval at the end of learning and we'd have the best correlate available with which to predict future retrieval. By knowing the top point of the forgetting curve, we could predict any future point. For example, in the graph below, the top forgetting curve is 10 points higher than the middle forgetting curve, and the middle curve is 10 points higher than the bottom forgetting curve. The ten-point difference is true at each and every point on the curves.

If Learning Methods Did NOT Differ in Minimizing Forgetting

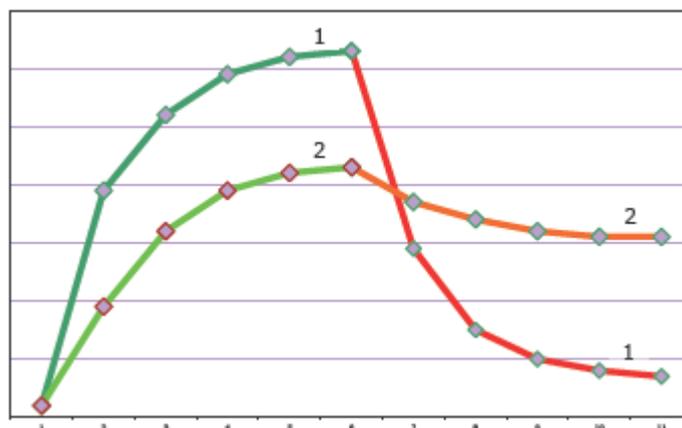


Suppose further that Learning Method 1 produced the top curve and Learning Method 3 produced the bottom curve. If we measured them both at the end of learning, we would find that Learning Method 1 produced an assessment score 20 points higher than Learning Method 3. Based on this end-of-learning assessment, we would know that Learning Method 1 would produce higher levels of retrieval at every point in the future.

Such simplicity would make decision-making easy. It would also make end-of-learning assessments a reliable tool for predicting future retrieval. Unfortunately, human learning is not so simple. Different learning methods produce different forgetting profiles, as you can see in the following graphs.

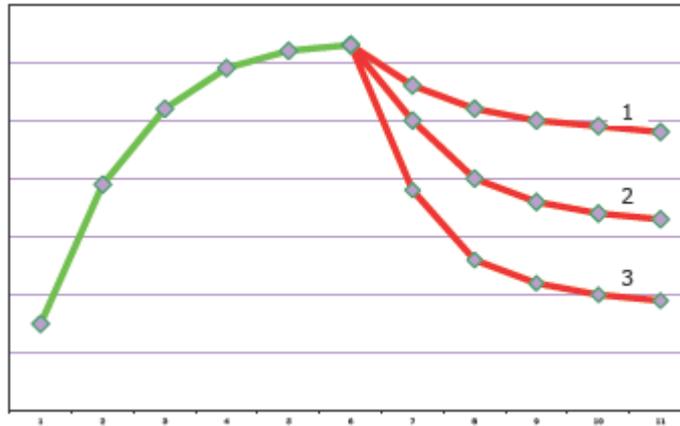
The following graph depicts learning and forgetting curves for two distinct learning methods. Note how Learning Method 1 would produce better end-of-learning assessment scores than Learning Method 2, but would produce much poorer retrieval performance in the long run.

Which is the Better Learning Intervention?



In the graph above, Learning Method 1 prompts massive forgetting, while Learning Method 2 does a nice job in minimizing forgetting. As may be obvious, an end-of-learning assessment would give us very poor information about future retrieval performance. The following graph shows similar difficulties.

Differences in Forgetting for Three Different Learning Methods



Do Learning Methods Really Produce Different Forgetting Curves?

Yes, learning methods do produce different forgetting curves. The most obvious example may be the *cramming effect*. If you have ever crammed for a test, you probably remember the differential effects it had in the short and long terms. Cramming produces good short-term retrieval and poor long-term retrieval, creating a very steep forgetting curve. Cramming's opposite, *spaced learning*, is particularly good at minimizing the forgetting curve, and is backed up by loads of research (for example, see Ebbinghaus, 1885/1913; Bahrack & Hall, 2005; Bruce and Bahrack, 1992; Donovan & Radosevich, 1999; Lee & Genovese, 1988; Ruch, 1928; Cain & Willey, 1939; Melton, 1970; Crowder, 1976; Hintzman, 1974; Glenberg, 1979; Rea & Modigliani, 1988; Dempster, 1988, 1989; 1996). To read an overview of the spacing effect, see my research report, *Spacing Learning Events Over Time*, available at www.work-learning.com/catalog/.

But the spacing effect is not the only learning method that produces different forgetting curves. Delaying feedback can produce similar improvements in forgetting (see for example, Kulhavy & Stock, 1989; Sassenrath & Yonge, 1968, 1969; English & Kinzer, 1966; More, 1969; Sturges, 1969, 1972; Phye & Andre, 1989; Kulhavy & Anderson, 1972). Aligning the learning context and the future retrieval context can also produce long-term benefits (for reviews, see Bjork & Richardson-Klavehn, 1989; Smith, 1988; Smith & Vela, 2001; Eich, 1980; Roediger & Guynn, 1996; Davies, 1986). By providing learners with experience in realistic situations—for example, simulations and scenario-based decision exercises—we increase the likelihood that they will be able to retrieve information from memory when they encounter analogous situations on the job or in future learning events. Aligning contexts in this way can have differential effects on short-term and long-term retrieval processes because, in the short term, the information stored in memory is relatively easy to retrieve; thus, retrieval is less likely to require the support of specific contextual cues. In the long term—after forgetting processes have made retrieval more difficult—contextual cues are particularly important in enabling successful retrieval.

Providing learners with variable practice during learning—as opposed to consistent practice—also produces very good long-term retrieval, while it often depresses short-term retrieval (for reviews, see Lee, Magill, & Weeks, 1985; Van Rossum, 1990). When we provide learners with a variety of retrieval cues in this way, they become more prepared to notice relevant cues in future retrieval situations.

To summarize this section, learning methods can produce different retrieval effects in the short term and in the long term. Because end-of-learning assessments only measure short-term effects, using them to predict long-term retrieval is of dubious merit (Ghodsian, Bjork, & Benjamin, 1997).

There is No Perfect Assessment Design

Unfortunately, there is no one-size-fits-all, always-appropriate assessment design—even in specific well-traveled situations. Tradeoffs would still be required even if we had limitless time and resources. In the real world, where binding constraints can severely limit what is possible, we often have to make difficult decisions that reduce the validity and reliability of our assessments.

While we can't build perfect assessments, we can build better ones. This report is designed to help you think deeply about the tradeoffs involved in assessment design. Only by understanding how the fundamentals of learning and memory relate to assessments will you be able to make intelligent choices about which tradeoffs will allow you to reach your assessment goals.

The rest of this document will describe specific methods that can help us avoid the most obvious difficulties presented by the inherent characteristics of human learning.

Avoiding End-of-Learning Assessments

One way to avoid the problems inherent with end-of-learning assessments is to avoid using them. Instead of giving learners an assessment immediately at the end of learning, we could simply give them an assessment a week or two later. In theory, this might give us a more accurate picture of our learners' future ability to retrieve what they have learned. The closer in time an assessment is to the actual retrieval situation, the more closely the assessment results will mirror the actual real-world results.

On the other hand, there are complications. For example, if our learners study for the delayed assessments, then we are not really measuring the potency of the original learning events. We are measuring the effects of the original learning events plus the effects of the additional studying. Surprising our learners with delayed assessments might also make us rather unpopular, especially if those assessments are onerous.

Finally, waiting until later to assess retrieval can make it difficult, if not impossible, for us to diagnose later performance problems (Coscarelli, 2007). For example, suppose we (a) give our learners training on May 1st, (b) assess retrieval on May 15th, and then (c) find that the training is having no effect on May 30th. If retrieval is okay on May 15th, we can rule out retrieval problems. However, if retrieval on May 15th is inadequate, we can't know whether the training program was insufficient in creating understanding or whether it was insufficient in supporting long-term retrieval, or both.

Augmenting End-of-Learning Assessments

We could augment end-of-learning assessments by providing a second assessment after a delay. This would (a) provide us with two data points, (b) indicate whether retrieval is improving or falling and by how much, and (c) provide at least one delayed assessment to capture information about the effects of our learning intervention on forgetting.

Although using an end-of-learning assessment and an additional delayed assessment has a lot of appeal, we may still have difficulty ruling out the effects of additional study. We may still create learner frustration by compelling the additional effort. Finally, doubling the number of posttests we utilize requires additional effort.

Avoiding the Problems of Context

Retrieval is the process of bringing information from long-term memory into working memory. In some sense, our primary goal as learning professionals is to enable our learners to retrieve information in the future—or more specifically, to retrieve the right information in the right situation at the right time.

The retrieval process doesn't happen in a vacuum. Retrieval is prompted by the contextual cues that people face. For example, the question, "What is the capital of Massachusetts?" is a retrieval cue for "Boston." Being presented with a realistic decision scenario on a management issue could be a retrieval cue for what was learned in a recent supervisory-skills workshop. Being presented with a geometry problem can be a retrieval cue for a whole host of skills and knowledge learned in a recent geometry class, including metacognitive problem-solving skills and specific geometry rules and theorems. Hearing a political leader defend a vote may act as a retrieval cue for what was learned in school about government. Seeing a fallen coworker could be a retrieval cue for what was learned in a recent CPR course.

As may be obvious, this process of contextually-cued retrieval doesn't relate only to formal learning. It happens every minute of every waking hour. When we are in a particular situation, the stimuli in that context remind us of what we've learned and experienced.

Research has shown very clearly that learners will retrieve more information from memory if they try to retrieve that information in the same room in which their learning took place (e.g., Smith, Glenberg, & Bjork, 1978). Similarly, when scuba divers learn underwater, they recall more underwater than nearby on land (e.g., Godden & Baddeley, 1975). When people learn during a time when they are sad, they'll remember more when they're sad, and vice versa (e.g., Bower, Monteiro, & Gilligan, 1978; Eich, 1995; Smith, 1995). When college students learn with loud noise as a background, they do better on tests when those tests are accompanied by loud noise; silent studying improves performance during silent test-taking as well (Grant, Bredahl, Clay, Ferrie, Groves, McDorman, & Dark, 1998). For reviews, see Bjork & Richardson-Klavehn, 1989; Smith, 1988; Smith & Vela, 2001; Eich, 1980; Roediger & Guynn, 1996; Davies, 1986.

These varied results demonstrate that context—whether environmental, emotional, or physiological—can provide cues that aid retrieval of learned information. The research also suggests clear recommendations to designers of learning and learning assessments:

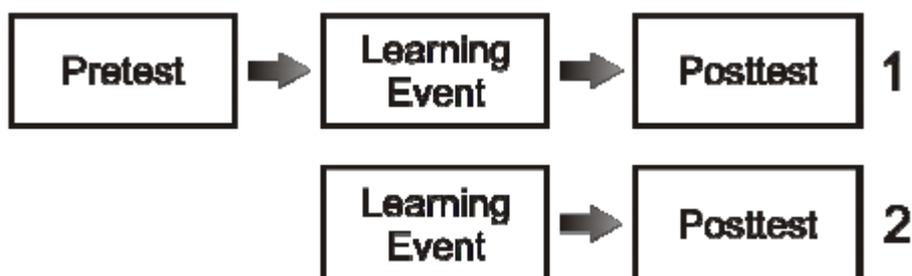
1. To maximize future retrievability of learned information, the learning context should mirror or simulate the future retrieval context.

2. To maximize the validity of our assessments to predict future retrieval, the items given in our assessments should utilize contexts that mirror or simulate the future retrieval contexts.
3. Because the context of learning affects future retrievability, some learning methods will be better than others in producing future context-generated retrieval.
4. Because the context utilized by assessment items can be more or less aligned with future retrieval contexts, some assessment items will be better than others at predicting future retrieval.

I may be straying away from the central theme of this document by including recommendations for learning design, not just assessment design. I include these recommendations because they are useful on their own, and, once again, to highlight that different learning methods produce different long-term outcomes—requiring us to go beyond end-of-learning assessments. The bottom line for assessment design is to ensure that the questions are relevant to your learners' future retrieval situations.

Avoiding the Problems of Prequestions

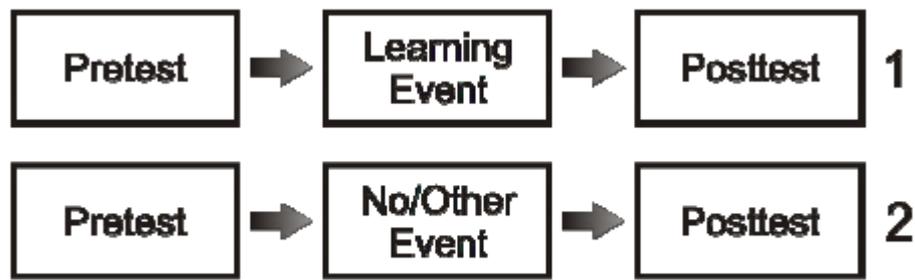
Prequestions can produce powerful learning benefits, helping learners know where to focus their attention as they encounter learning material. Unfortunately, this same potency can bias assessment results. If we give learners a pretest and then a posttest, the posttest results will reflect the benefits of the learning AND the benefits of the pretest. Certainly, the following assessment design will be unfairly biased against Group 2—the group that doesn't get a pretest. This is true whether the learners get feedback on the pretest or not. There are significant benefits to simply asking learners questions.



One simple solution to this is to include a pretest in the design of our learning intervention. In other words, the pretest becomes part of the learning intervention, so any benefits of the pretest are benefits inherent in the learning design.

Another way to limit bias due to prequestions is to avoid using them. This, of course, will make it difficult—if not impossible—for us to show that our learning intervention improved learning results.

We can also ameliorate the attention-focusing effects of prequestions by providing them well in advance of our learning events. For example, if you give learners prequestions a month before they begin their learning, the prequestions are unlikely to bias the results. We can also compare our learning event to a situation where learners get no learning event or where they get another learning event. As illustrated below, this will get rid of bias associated with a pretest. Of course, this design is valuable to the extent that the two learning events are meaningfully comparable.



9. E-learning and The Web

The Web explosion (1999)

As companies completed installation of their intranets, and 56k or better bandwidth became more commonplace, it suddenly made good sense to migrate from CD-ROM-based training to Web-based training. There were five basic drivers of this transition:

- Web-based training helped to justify the cost of the Intranet.
- Implementation of eLearning (as the phrase became born in 1999) to the field became far easier when CD-ROMs weren't being distributed and maintained at endless numbers of locations.
- Learning could be taken "anywhere, anytime," so long as a browser-based Web connection could be made to the host server.
- The shelf life of courseware could more easily be extended, as course updates needed to be implemented only once, on a server, rather than endlessly on each training workstation at each training location.
- Central LMS management and control via easy-to-establish Web connections allowed the promise of the enterprise LMS to reach fruition in pragmatic terms, and catalyzed a true empowerment of the central Training / HR Department to manage training across the enterprise.

However, the "move to the Web" came with considerable downsides:

- Limited engineering technologies for Web server-based courseware shot down much of the interactive and instructional richness of Web courses as compared to the CD-ROM courses they were replacing.
- Bandwidth continued to be a limitation and prohibited media richness by shooting down much of the use of digital media. Even today, server latency and network congestion present barriers to seamless inclusion of streaming video in eLearning despite healthy gains in bandwidth.
- Ponderous wait times drastically interrupted and denigrated the learning experience.

The end result was a proliferation of dumbed-down courseware, even a preponderance of "page-turners" that learners tended to abandon before completion. Customers realized that eLearning held a lot of promise but not until something along the lines of the interactive, instructional, and media richness of CD-ROMs could be duplicated, albeit reinvented in the world of Web standards.

All species of e-Learning company - custom courseware developers, packaged content providers, and LMS vendors - moved to Web technologies as quickly as possible. Interestingly, the authoring tool vendors failed to do so with the exception of *Macromedia*, which saw its share of a booming market skyrocket as a result, while non-training-specific Web server language vendors such as *Allaire* with its *Cold Fusion* product and *Microsoft* with *Active Server Pages* or *ASP* picked up the slack as typical eLearning development environments.

The Internet land grab is on (1999-2000)

Now enterprise deployment of Web courseware with central administrative management became where it's at, but neither high-quality nor customizable and manageable content was anywhere to be seen.

Many eLearning vendors - some that had been around and many that were now started up for this purpose - offered "shopping marts" of centrally managed Web content accessible

across the enterprise, anywhere and anytime. Quantity of content was intended to make up for a lack of quality, industry focus, and customizability. The technology was the *learning portal*, and the content philosophy was to *offer mass quantities*.

Many portals were one-stop-shop e-commerce Internet sites offering a wide array of other vendors' courseware (both online and offline) such as *Hungry Minds*, *TrainingNet* (now *THINQ*), *Headlight*, *FatBrain*, *UOL Publishing* (now *VCampus*), and *GeoLearning*.

Some were vertically focused portals ("vortals") such as *eMind* in accounting, *Princeton Learning Systems* in financial services, and *Payback Training Systems* in supermarkets, hospitality, and foodservice. However, the vortals were better described as "hubs" because the only content they offered was their own.

Some vendors got into the business of setting up private label, inside- or outside-your-firewall corporate universities. *Click2Learn* became *Click2Learn* to advertise its novel approach of a learning portal where anyone could create content and make it available to anyone else, something of an *eBay* bazaar concept for e-Learning. *Pensare* invented the "community" learning portal, which deemphasized pre-built learning content in favor of collaborative experiences.

LMSs became the data-management backbone of all these learning portals, solidifying the perceived foundational importance of an LMS to "making eLearning happens."

Companies that could pump out mass quantities of course content to deploy on portals suddenly became the rage as well. *SkillSoft*, *McGraw-Hill Lifetime Learning*, *DigitalThink*, and many others were born or able to catalyze their businesses. The earlier generation of content vendors such as *CBT Systems* (which at this point became *SmartForce*) were able to jumpstart their business growth.

Interestingly, the majority of the original high-quality custom CD-ROM courseware developers didn't make the jump to the Web successfully, just as most didn't become packaged content vendors. Reasons included their unwillingness to lower quality standards to what was current on the Web, their lack of aptitude for large-scale production of mass quantities of content, and their general dearth of sufficient technological sophistication to create enterprise-strength solutions for Web-server delivery.

The March 2000 downturn in the stock market brought these trends to a halt. Most learning portal companies had scant near-term means to make money selling other people content, and the generally low quality of content meant few people were even interested in buying it anyway. Most companies went under, others were quickly sold, while the survivors won the right to play another round by reinventing themselves.

Another important aspect is the creation of learning communities. Learning in groups, in virtual classrooms, plays an essential role in e-Learning.

Collaborative learning

Education and training concepts

There are specific concepts which have to be presented here in strong relation with e-Learning:

- *Face-to-face education*: traditional classroom teaching, seminars, workshops, lectures.
- *Distance education*: traditional correspondence courses.

- *Online education*: courses via the computer, knowledge supply and coaching via Internet / Intranet applications.

There are differences and similarities between the different education and training concepts [2]:

	Forms of Communication	Interactivity	Media used	Dependent on place	Dependent on time
<i>Face-to-face education</i>	many-to-many, one-to-many, one-to-one	yes: synchronous	blackboard, books, paper, overhead / video projector	yes	yes
<i>Distance education</i>	one-to-many, one-to-one	yes: asynchronous (snail mail)	letters, audio- / video-cassettes	no	no
<i>On-line Education</i>	many-to-many, one-to-many, one-to-one	yes: synchronous / asynchronous	WBT/ CBT texts, whiteboard, multimedia video-conferencing	no	synchronous: yes asynchronous: no

Blended learning or *hybrid learning* is an integration of face-to-face and on-line education concepts.

Forms of eLearning

Synchronous learning

Learners and trainers are at different places. The participants communicate directly, e.g. via the virtual classroom, a chat room, business TV, videoconferencing, whiteboard.

Asynchronous learning

Learners and trainers are at different places. Communication and knowledge transfer are independent of time and space, e.g. via CBT (computer-based training, e.g. via CD-ROM, DVD), WBT (Web-based training) or most recently podcasting (lectures delivered via MP3 / MP4 players), a discussion forum, a virtual classroom, mail.

e-Learning scenarios

The following forms have emerged: Open Distance Learning, On-line Tutoring (Tele-Tutoring), On-line Teaching (Tele-Teaching). The difference is in the way of communication and interaction between the participants in the learning process.

Open distance learning

This is a very flexible form of learning. There is no fixed curriculum. The learner selects courses based on his / her individual interests and organizes his / her own learning sequences and process. There is an expert or a team of experts who support the learners. Materials are supplied in media-libraries and databases. The expert only responds to

specific questions and helps to solve problems, and does not actively coach the learning process.

The idea behind this scenario is to provide open learning. The learner has access to knowledge whenever he or she needs it or has time to learn. It is also known as *learning on demand or just-in-time learning*. The learner is responsible to select the contents, the objectives and time to learn, the duration and the methods. The course provider can offer synchronous and / or asynchronous coaching as option, which can be booked on demand.

This form of learning requires a high learner motivation in order to be successful. He / She is alone responsible and active. Information and support must be requested.

There are different varieties of open distance learning:

- *Self-paced learning via CBT (Computer-based training)*: The learner selects a CD-ROM and processes the learning contents on his / her own;
- *Self-paced learning via WBT (Web-based training)*: The learner works with interactive contents on the Internet;
- *Self-paced learning via access to an information and knowledge database*: The learner selects contents from a database and processes those.

On-line tutoring (Tele-tutoring)

In this model, an expert *on-line tutor (tele-tutor)* organizes the learning processes, selects the contents and coaches the learner throughout the course. The tutor has the role of a moderator and supports groups of learners. The learners work with the materials, provided as texts files or as multimedia and can communicate with the tutor via different tools, and vice versa group learning can be initiated. The distributed of materials will follow a fixed schedule.

The term online tutoring emerged in connection with mainly asynchronous forms of communication. The tutor can be extremely passive, just answering learners' questions or he / she can actively take the role of a learning facilitator, to initiate, coach, and evaluate the learning processes.

On-line teaching (Tele-teaching)

The trainer and the learners are synchronously in contact, mainly via a virtual seminar room with video conferencing, mainly to teach specific contents, to lecture. The participants and the trainer communicate via voice (voice-transfer via Internet), slides can be presented and students can work simultaneously on computer applications.

Learning strategies

There are three different learning strategies which influence the methodological / didactical design of a learning environment.

Learning strategies	Controlled learning	Self-controlled learning	Collaborative learning
Learning methods	teacher-focused	learner-focused	team focused

Learning situation	simple - all information is mediated via the teacher	more complex -within the information provided	complex and realistic - beyond the information provided
Role of the teacher	leads directly	coaches, supports	coaches, moderates, facilitates
Role of the learner	passive	active	active and reflective

Controlled learning

Within the framework of controlled learning, the role of the teacher / trainer is very active. He / She leads and controls the approach and structure of thought the learning process is based on, e.g. procedures for problem solving are provided. He / She determines the types and quantities of information, which is provided in the learning situation.

This model is often used to teach basic knowledge. The learner's role is passive, absorbing/consuming knowledge.

Self-controlled learning (self-paced learning)

The responsibility for the learning process shifts from the teacher to the learner. The learner learns on his / her own. Learning activities such as planning, control, assessment are controlled by the learner him- / herself. The teacher is in the background and just provides support.

Knowledge is actively acquired; the learner works process-oriented. This method can be used to stimulate highly cognitive skills.

Collaborative learning

This method is an extension of self-paced learning. Learning in a group, interaction between the learners is in focus. The tutor's role is to negotiate with the learners learning strategies and group processes, to reflect, to mediate, to inject risk, and to facilitate the learning process. This method is well-suited for solving realistic problems on the job / in life with high complexity.

Apart from product oriented knowledge (problem solution), process oriented knowledge (the path to the solution) is developed.

10. The Future of E-learning

Trends in the development of e-Learning markets

Some of the main evolution features in the e-Learning markets are presented below:

Schools - Although many schools have introduced platforms for sharing information and supporting the pupils in their learning, it is likely to take years before the teaching staff and culture is ready to adopt comprehensively pedagogical approaches that take full advantage of e-Learning. In the medium term, learning material publishers will continue to introduce text-based curricula resources supplemented by e-learning elements, but these will typically require access to different external platforms and will be linked directly to specific textbooks. On the platform side, if in-house developments and the open source tools succeed in overcoming problems of reliability, interoperability, documentation, continuous development and standards integration, commercial offerings will have a very tough time trying to achieve market shares in the school market. As teachers become more ICT literate, they will be developing more of their own learning materials and sharing these with each other and pupils, making these suitable to individual learners.

Higher Education - Open Source e-Learning platforms are likely to gain a foothold in this sector. The universities will increase in the number of courses offered in e-Learning format (as stated in the study "Virtual Models of European Universities", European Commission 2004).

Vocational Education and Training (VET) - Open source e-learning platforms will offer a serious competitive alternative for users in the VET market and this is based on the fact that there is already a solid base of in-house developed learning platforms at VET institutions.

Workplace Learning - Strong e-learning sectors in the workplace market will continue to be the ICT, business services, financial and pharmaceutical sectors.

Consumer market - The consumer e-learning segment will consist of Internet and CD-ROM based edutainment products primarily for children and young people and in the long term, also mobile, location independent edutainment to handheld devices. It will also include standard and individualized language learning products for the same media, and educational products that allow parents to supplement their children's education with online or CD-ROM based learning opportunities. In future, more and more guidelines and manuals associated with complex domestic appliances and small machines will be multimedia based with simulations of the assembly process, maintenance, cleaning and/or usage. It will be possible to access the simulations from various devices (PDA, Mobile phone, TV connected to Internet or a PC).

Lifelong learning - Although it is an obvious market for e-learning products and services, it is unlikely to show much growth in the future because the motivation of learners to choose lifelong learning via e-Learning is limited unless it is part of a formal postgraduate education financed by employers or required education in order to change or advance in careers while still in employment.

Blended learning - Another trend in our days involves blended learning programs. The term "blended learning" has come to describe a well thought-out combination of e-learning and other traditional training methods. The combination that we speak about is meant to

increase effectiveness in the process of learning, due to the fact that a single delivery method is no longer sufficient to handle all training needs. Blended learning has the advantage that preserves the necessary consideration of how people learn, but in the same time offers options for

The future of university teaching is envisaged as being heavily involved in distance-learning using multimedia, CD-ROMS, the internet and intranets incorporating video-conferencing and computer-assisted learning.

The use of this new Teaching and Learning Technology (TLT) throughout the university system will bring about a major revolution in teaching world-wide. It is now possible to transmit files throughout the internet containing all the elements of multimedia: video, animation, text, graphics, stereo sound and computer software.

Presentations, containing active diagrams, pictures, animations, videos *and voice-overs* may be viewed anywhere in the world at any time. Multimedia lecture material may thus be produced and presented *exactly as in a lecture room situation, but viewed by millions.*

The telephone, internet, email and videoconferencing can be used for two-way communication between lecturers and students. It is highly likely that international courses will grow like wild fire on the internet or via exclusive intranets.

Mega-courses will be offered by consortia of Universities and perhaps companies. This is already beginning to happen in the United States, where the University of California at Berkeley offer a microbiology course for 123 students on <http://www.sciencemag.org>. and the Executive MBA programme at Queen's University, Kingston, Ontario serves fully interactive sites in 22 Canadian cities using videoconferencing. Our own Open University (<http://www.open.ac.uk>) has 15000 students on-line.

Whilst it is hugely more cost-effective to deliver courses to thousands of students via multimedia distance-learning, great care must be taken to ensure the effectiveness and maintain the quality of the teaching and learning processes involved. The British Council will also recognise the benefits of students throughout the Commonwealth having access to courses in their own countries at regional centres. Enquiries from prospective students all over the world as to the possibility of undertaking MSc courses and PhD schemes are being received via the internet.

There is therefore the opportunity for huge revenue streams arising from the delivery of university courses world-wide.

The immediate challenges facing university teachers are as follows:

- To set up multidisciplinary multimedia studios.
- To convert existing courses to multimedia format.
- To convert lecture rooms to electronic classrooms with stereo sound, computer-assisted learning and internet connection to in-class projection systems.
- To present lectures in interactive multimedia formats.
- To construct CD-ROMS of lectures for distance-learning purposes.
- To place lectures on the internet for delivery world-wide.
- To establish exclusive world-wide intranets.
- To set up international videoconferencing facilities in the lecture rooms.
- To network with key universities and organisations world-wide.

- To offer international courses via this facility to in-house students.
- To offer international courses via the established network from the multimedia studios to individuals and groups of students world-wide.

Annexes:

Glossary of Terms

E-Learning Glossary of Terms

[A](#) [B](#) [C](#) [D](#) [E](#) [F](#) [G](#) [H](#) [I](#) [J](#) [K](#) [L](#) [M](#) [N](#) [O](#) [P](#) [Q](#) [R](#) [S](#) [T](#) [U](#) [V](#) [W](#) [X](#) [Y](#) [Z](#)

A

Active Server Pages (ASP)

A programming language that extends standard HTML-based web sites to include database content management. *The Microsoft standard as opposed to CGI/Unix programming languages and environment.*

Adaptive

Adaptive training programs adapt themselves to the skill level or preferences of the learner. *Haven't seen one in over ten years. At best, some programs use the pre-test to enable students to "test out" of certain lessons.*

ADDIE Model

Classic model of an instructional system design process that includes the steps Analysis, Design, Development, Implementation, and Evaluation from which the acronym is taken. *Most corporate trainers drop the "A". Who needs analysis lets just start building stuff!*

Adult Learning Theory

Principles and practices of providing instruction to the adult learner. Primarily concerned with an adult's well-defined learning goals, wealth of experience and ability/desire to direct his or her own learning. See andragogy. *Hmmm, the more you learn about andragogy, the more you start wondering if kids don't actually learn the same way.*

AI

See Artificial intelligence. *Why is this term here? No e-learning program uses AI -- except in the marketing literature.*

AICC

Acronym for Aviation Industry CBT Committee. An emerging set of standards The AICC sets guidelines in the development, delivery, and evaluation of e-learning programs. These guidelines are developed specifically for the aviation industry, but are being widely adopted in a variety of other industries. See www.aicc.org for more details. *Already becoming old-school -- SCORM is the new kid on the block.*

Alpha Version

An alpha version of a program is also known as a "pilot" version, which can be tested for overall usability and training effectiveness. *You know, the pilot version, where the program is actually tested by a real sample population and then refined before final roll-out. What? You've never done that?*

Analysis

The first step in the classic A-D-D-I-E model of Instructional System Design. In the analysis phase the audience is defined and performance improvement needs are identified. *Often the phase that discovers that the performance problem really isn't a training problem at all, but what the heck, we have budget to build something for it...*

Andragogy

The opposite of pedagogy. A European term introduced into the English vocabulary by Malcom Knowles, it is the art and science of helping adults learn. A prime contributor to most theories of adult learning, andragogy as set out by Knowles emphasizes an adults'

capabilities to direct and motivate themselves, utilize past knowledge to assist learning and evaluate the contents of training for relevance and quality.

Animation

The rapid sequential presentation of slightly differing graphics to create the illusion of motion. Animation can have greater purpose in illustrating a process than a static visual, but it requires more information to be processed by the computer and thus higher bandwidth. Compare to audio, video, text, and graphic.

Applet

A small program, that runs on the Internet or an Intranet, written in the programming language known as Java. *Also known as a rarely used program that keeps getting stopped by your corporate firewall and causing all kinds of end user complaints. (Come on Java fans, where's your sense of humor? Don't send me any hate emails!)*

Application

Any stand alone computer program.

Application Service Provider (ASP)

Internet hosting service provider. A company that hosts a program on behalf of its clients. Many training programs and learning management systems are now offered on an ASP platform. *The ASP model is under heavy scrutiny right now as e-learning vendors are folding up with little notice in the dot-bomb crash. Many customers have found that they are losing access and student data with very little notice.*

ARCS Model

A theory about the best way to instill learner motivation, developed by John Keller, PhD. The four steps in the model are: gain learner Attention, describe the training's Relevance, instill Confidence in the learner that the training can be successfully completed, and leave the learner Satisfied after a learning goal has been achieved. *Invaluable in practice and easy to implement, but sadly it is seldom used.*

Artificial Intelligence

Artificial intelligence. The range of technologies that allow computer systems to perform complex functions mirroring the workings of the human mind. Gathering and structuring knowledge, problem solving, and processing a natural language are activities possible by an artificially intelligent system. *Why's this word in the glossary? AI in e-learning programs? Yea, right -- only in the marketing spin.*

Assessment Item

A question or exercise on a test, quiz, or other evaluation. *Well why don't we just say it's a "question"? Who invented the word "item" for "question" anyway?*

ASP

See Active Server Pages or Application Service Provider.

Asynchronous Training/Learning

A learning program that does not require the student and instructor to participate at the same time. Typically self-paced, online tutorials.

Attitude

A disposition toward a certain behavior. Psychological theories hold that attitudes are revealed by examining behaviors and shaping attitudes can in turn influence behaviors. *Training to change attitude is bunk. As the old saying goes, hire attitude and train skills.*

Audience

The intended end user population of a training product. Careful consideration of audience factors such as learning styles, level of education, preferences, background, and job responsibilities helps create more successful e-learning.

Audio

The medium of delivering information to be processed by a learner's ears. Compare to text, video, graphics, and animations.

Authoring

Similar to "programming", developers assemble discrete media components using a tool called an authoring system.

Authoring System or Authoring Tool

A program, like Macromedia Authorware, designed for use by a non-computer expert to create training products. An authoring system does not require programming knowledge or skill to operate. Enables non-programmers to create e-learning programs. *Although there are over 100 authoring systems on the market, Authorware, Director, Toolbook, and DreamWeaver are among the most common (yes, I know, DreamWeaver isn't technically an authoring system).*

B

Bandwidth

The measure of amount of information that can flow through an information channel. Commonly measured in bits per second. Modem connection to an internet server is a typical example of a low-bandwidth connection; an Ethernet connection within a LAN is an example of a high-bandwidth connection.

Baud

A measure of the quantity of information transmitted on a communication line; largely replaced by the use of bits-per-second.

BBS

See Bulletin Board System.

Behavior

An action or set of actions performed by a person under specified circumstances that reveal some skill, knowledge or attitude. Training seeks to increase desirable behaviors or introduce new behaviors and/or eliminate undesirable ones.

Benchmark

A standard of reference used for comparison. The performance of a learner is measured against a benchmark such as the performance of an expert. The performance of a technology-based training product is measured against a benchmark such as the training procedures it replaces.

Beta Test

An important function of quality control and one of the last steps before release of a software product. Beta testing involves the use of a product by selected users to create a formal documentation of content errors, software bugs, usability, level of engagement, and other factors. *Also the term used by your vendor when you call them to report errors in your review copy ("What, you found 10 errors? Uh, well, that was just the beta copy, we know it has errors.")*

Bit

The elementary constituent of digital information, the value of which can take only the forms 0 or 1. Bits are often measured by adding prefixes to signify a value. One kilobit contains approximately 1,000 bits; one megabit contains approximately a million bits; one gigabit contains approximately one billion bits.

Bits-per-second (bps)

A measure of the speed of the information transmission over a communication line; often confused with baud.

Blended Learning

A training curriculum that combines multiple types of media. Typically, blended learning refers to a combination of classroom-based training with self-paced e-learning. *The defacto buzzword of 2001 and 2002 -- will this jargon creep ever stop?! Why didn't we call it "blended" learning when workbooks came with audio tapes?*

Blog / Weblog

"Blog" is short for "Web Log" and refers to short messages that are posted onto a web site by an author. Blogs are typically informal and personal messages, almost like daily diary entries. Blogging has caught on as a cheap form of knowledge sharing and expert communication. See www.blogger.com for more information.

Bloom's Taxonomy

A hierarchical ordering of affective and cognitive learning outcomes developed by Benjamin Bloom. *Hello, out there, anyone ever hear of Bloom?*

Branching

A tutorial structure that progresses through material in a path that depends on the learner's response to questions.

Broadband

Digital signals delivered (along with analog signals) over copper medium to businesses and households. Typically refers to an internet connection via a cable modem or DSL line with speeds 1 Mb/s to 10 Mb/s.

Browser

Also called a Web Browser. A program used to access the text, graphic, audio, video and animation elements of the Internet and Intranets. Netscape Navigator and Microsoft Internet Explorer are the most commonly used browsers. *If your student audience uses both IE and Netscape, and your e-learning program uses Javascript code, look out; subtle differences in browsers will bite you in the butt.*

Bulletin Board System

Also known as BBS. The computer equivalent of a public note board, messages can be posted to a BBS for viewing by other users and other computers. A BBS is often called a threaded discussion.

Byte

A word made up of eight bits of information. One byte is the amount of information required to represent one character.

C

Cable Modem

A device that connects a computer to the Internet through a Cable TV coaxial cable. Cable modems are considered to be a high bandwidth, or high speed connection.

CBE

See Computer-based Education. *Ignore this term, nobody uses it anymore.*

CBL

See Computer-based Learning. *Ignore this term, nobody uses it anymore.*

CBT

See Computer-based Training.

CD-ROM

Compact Disc Read Only Memory. An optical disc, recorded on and read by a laser, used to store large quantities of information. One CD-ROM has 650 Mb of storage capacity. *Due to our current state of "bandwidth blues" CD-ROM delivery as a subset of e-learning will be around for long time.*

Certification

A formal evaluation process conducted by a neutral third party on a fee-basis, typically using a rigorous, accurate, reliable, validated software test suite and evaluation methodology. Certification is for a specific version only of the product being tested. Certification may lapse after a specific duration. Certification can be lost or revoked. Certifying body stands behind its evaluation of the product or service.

Chat or Chat Room

Text-based group communication on the Internet. Multiple users can type their questions

and answers for everyone to see. This form of group communication occurs in real-time. *Sounds great but fairly messy for e-learning. Synchronous web-casts or threaded discussions better.*

Chunking

The process of separating learning materials into brief sections in order to improve learner comprehension and retention.

Classroom Training

Any training conducted where the students and facilitator interact in a real, physical classroom. Unlike "Instructor-led Training (ILT)" which, although there is an instructor, could still take place over an Internet connection. *Also, known as the preferred method of learning by many students because of the perks (e.g., day out of the office, meet new friends, and most importantly, free donuts).*

Clip Media

Pre-existing pictures, audio files, videos clips that can be "clipped" out and pasted directly into a computer program. Also known as "stock media".

CMI

See Computer Managed Instruction.

Cognitive Loading

The process of placing elements into a person's short-term memory. *Great term for impressing colleagues and prospective clients (e.g., "Although this looks like a boring, passive text screen, we are actually cognitively loading the word items into the learners STM. STM? Oh yes, short-term memory...")*

Collaborative Learning

Learning through the exchange and sharing of information and opinions among a peer group. Computers excel in mediating collaborative learning for geographically dispersed groups.

Competencies / Competency Model

A structured list of knowledge, skills and attitudes that are required for job performance. Competencies are used as the foundation to guide needs analyses and evaluations. Unfortunately most competencies end up in a filing cabinet to be referenced only when updating job descriptions. Used properly, they are powerful drivers of assessment and training.

Compliance

A 'self-test' software test suite is available to both implementer and user. Software test suite usually designed to rigorously test inputs, processes, and outputs of a guideline, recommendation, specification, or standard: Know the source. Provider of test suite may or may not allow users of test suite to claim more than conformance (no formal Endorsement).

Compression

A technique used to encode information so that it fits in a smaller package for easy storage or transmission. *In other words, "we have to compress this audio or video file so it will download faster on a low bandwidth connection. Yes, the quality will be terrible but we have no choice."*

Computer Based Education

A generic term for a computer program used by a learner to acquire knowledge or skills. See e-learning.

Computer Based Learning

A generic term for a computer program used by a learner to acquire knowledge or skills. See e-learning.

Computer Based Training

A generic term for a computer program used by a learner to acquire knowledge or skills. See e-learning.

Computer Managed Instruction

The components of e-learning that provide assessment, student tracking and personalized lesson plans.

Computer Supported Learning Resources (CSLR)

The parts of a e-learning product other than those that instruct, test, or track progress. These include glossaries, bulletin boards and chats, bibliographies, databases, etc.

Nobody really uses terms like these, ignore it!

Condition

One of the three required parts of a properly composed learning objective, as defined by Robert Mager. Circumstances under which the performance will be tested and materials that will be provided to the student are described in the condition statement. *This is one of the parts of Mager's learning objective guidelines that is always ignored, and with good reason.*

Conformance

The implementer asserts adherence to guidelines, recommendation, specification or standard. User tests assertion by inspecting results. No form of testing is used other than evaluating actual results against expected results.

Cookie

A small file placed on a user's computer by a visited web page. Many e-learning programs will store the student's name, history, and score information in a cookie file. *Also, the sweet bakery items given to classroom students right before they complete their workshop evaluations so they won't bash the instructor.*

Cost Avoidance

Component of analyzing competing business alternatives based on reducing or eliminating costs, such as student travel and instructor fees. Return-on-investment studies take account of cost avoidance in calculating final returns. *Also, the term to describe corporations refusal to spend any real money on e-learning (and then wondering why they have a bunch of boring page turners).*

Cost-benefit Analysis

Method of analyzing competing business alternatives based on comparing total costs to total benefits. A proper cost-benefit analysis takes into account all benefits, including productivity, savings, and motivation, and weighs them against all costs, including expenditures, overheads, and lost opportunities.

Course

Term used to describe the collection of elements that make up training on a given subject. Usually a course is broken up into lessons, sections, or modules but course is sometimes used interchangeably with these terms.

Course Map

Usually a flow-chart or other illustration, a course map details all of the component elements of a course. Course maps often illustrate the recommended order that students should complete the training.

Courseware

Software designed specifically for use in a classroom or other educational setting, containing instructional material, educational software, or audiovisual materials. "Courseware" is a term used to describe software resources which are used for Computer-Assisted Learning (CAL). to mediate or support a course or module.

Criterion

One of the three required parts of a properly composed learning objective. The performance level that must be achieved by the student along with a concrete measurement for the performance level are described in the criterion statement.

Criterion Referenced Instruction

A system of instruction developed by Bob Mager. Synonym for performance based

instruction; instruction whose value is measured by the ability of the end-user to meet specified criterion after completion. *Another classic and effective system that seems to be forgotten or ignored too often in the world of e-learning.*

Curriculum

A series of related courses.

Cyberspace

Jargon referring to the Internet, or the World Wide Web.

D

Delivery Method

Term describing the way in which training is distributed to learners. Print-based workbooks, classroom, video, audio tapes, CD-ROM, and Internet are all sample delivery methods. *See also the term "blended solution" which is the in vogue jargon describing using a mix of media elements to deliver a course or curriculum.*

Design

The second step in the classic A-D-D-I-E model of Instructional System Design. The design phase builds on the analysis information and includes the formulation of a detailed plan for the instruction, known as the Design Document. Sometimes Design is broken into "high level design" for the design doc and "low level design" which culminates in a script or storyboard.

Designer

Used to describe any member of a training project team, usually referring to creators such as writers, graphic artists, and programmers. Technically, this term should refer only to *instructional* designers, but it is often used synonymously with the term *developer*.

Developer

Used to describe a member of a training project team involved in development activities or the project team as a whole. Could refer to an instructional designer, graphic designer, writer, etc.

Development

The third step in the classic A-D-D-I-E model of Instructional System Design. The development phase follows the plans created in the design phase to create materials ready for several iterations of testing and refinement.

Digital

Opposite of analog. Computer signals, the information manipulated by a computer and transferred on the Internet, are digital. A digital signal varies by discrete values only; that is any point defined within a digital signal will have the value of either 1 or 0.

Digital Subscriber Line (DSL)

Refers to high speed Internet connections obtained through a special service of the phone company, using their standard telephone line.

Domains of Learning

Three divisions used to classify types of learning: psychomotor (physical), cognitive (mental), and affective (emotional).

Drill and Practice

An interactive exercise used to develop basic skills like keyboard operation. Involves the repetition of short sequences of practice, chained together to make up more complex processes. *Although extremely effective, this method is usually now avoided as an instructional technique because it is considered boring, simple, and unglamorous. Isn't it amazing how so many care about style over results?*

DSL

See Digital Subscriber Line.

Digital Versatile Disc (DVD)

Digital Versatile Disc Read Only Memory. Like a CD-ROM, an optical disc recorded on and

read by a laser, but used to store even larger quantities of information, specifically 8.5 gigabytes

DVD or DVD-ROM

See Digital Versatile Disc.

E

E-Learning

Broad definition of the field of using technology to deliver learning and training programs. Typically used to describe media such as CD-ROM, Internet, Intranet, wireless and mobile learning. Some include Knowledge Management as a form of e-learning. *Took awhile for the right term to come about, circa 1995 it was all called "Internet based Training", then "Web-based Training" (to clarify that delivery could be on the Inter- or Intra-net), then "Online Learning" and finally e-learning, adopting the in vogue use of "e-" during the dot com boom. The "e-" breakthrough enabled the industry to raise hundreds of millions from venture capitalists who would invest in any industry that started with this magic letter.*

Electronic Performance Support System

A program that provides on demand assistance on a discrete task. Considered to be a support tool or job aid. A good example of an EPSS is the built in help functions of many software programs. *Term coined by Gloria Gery one of the greats in the business.*

E-mail

Short for electronic mail. The process of one user employing a computer to send a text message to an electronic mailbox to be retrieved and viewed by another user. Also, the message itself. *Also, the most popular form of Knowledge Management. Many will blast an entire distribution group with a question, and receive a dozen excellent e-mails offering answers or help. While helpful, this unstructured form of KM doesn't leverage or store experts and their answers.*

End-to-end Solution

Term used by e-Learning companies to describe a complete set of products and services, typically including learning management systems, off-the-shelf content, and custom services. Don't believe the hype. *Most companies that off everything, don't excel at anything.*

Entry Behavior

The prior knowledge, skill or attitude that is a pre-requisite to a given course, or that is assumed to be present by course designers.

EPSS

See Electronic Performance Support System.

Ethernet

A means of connecting computers in a local area network with high-bandwidth coaxial or optical cable connections. Sometimes called 10baseT. *This is most common network in your corporate office -- considered to be high bandwidth and capable of great e-learning experiences (rich video and audio, etc.).*

Evaluation

The final step in the classic A-D-D-I-E model of Instructional System Design. The evaluation phase involves formative evaluations, evaluations of the product during development, and a summative evaluation, the final evaluation of the effectiveness of the training in solving the instructional problem.

Events of Instruction

The nine steps outlined by Robert Gagne that correlate to and address the conditions for effective adult learning. In brief, each lesson should (1) capture attention, (2) inform the learner of the objective, (3) stimulate recall of prior learning, (4) present material, (5) provide guidance, (6) elicit performance, (7) provide feedback, (8) assess performance, (9) enhance retention and transfer. *A great model for instruction, again often ignored in the*

world of e-learning. Also, we should be wondering what happens when we create reusable content objects launched independently from a LCMS -- will students still learn from isolated chunks, or do we need a 9-step "lesson" to be the smallest chunk for best learning results? Time will tell.

Expert System

An artificial intelligence program in which a decision tree is created based on an experts decision criteria. *Huge potential for KM and e-learning but unfortunately provider companies are pouring all their money into sales and marketing instead of R&D.*

Extranet

An internal, private website that has restricted access to certain outside users as well. For example, an organization may create a parts Inventory web site to support their internal manufacturing efforts, while giving read-only access to their outside vendors who need to know when to re-supply their parts.

F

F2F

Face-to-Face. Example: We're going to do some initial training F2F and then distribute CD-ROMs for post-work.

Facilitator

The politically correct term for "instructor", "trainer", "teacher" or "class leader". Assuming adult learners actually obtain knowledge from their peers, in a classroom the instructor "facilitates" the learning experience.

FAQ

See Frequently Asked Questions.

Feedback

Can be positive or negative, is used to shape behaviors, and should closely follow an action for maximum result.

File Transfer Protocol (FTP)

Generally called FTP. One method of transferring files over intranets or the Internet.

Firewall

An application that isolates part of a network, like a company's private intranet, from access to or by other parts of the network, like the public Internet.

Formative Evaluation

An evaluation performed at a late development stage, used to revise and improve an training program before launch. *Single most important step to insuring effectiveness and bug-free programs -- seldom done.*

Frequently Asked Questions

Also known as FAQ. A web document made up of questions commonly asked about a particular subject or in a particular forum and the associated answers.

FTP

See File Transfer Protocol.

G

Generic (off-the-shelf) Courseware

e-Learning products developed for a broad audience, not for a specific organization. Most generic courseware is complete junk. *But hey, it's a lot cheaper than building quality stuff that really works, and I get to cross off another course off my quarterly to do list! That will help my performance review!*

Graphic

The medium of delivering static images to be interpreted by the learner visually. Compare to audio, video, text, and animation.

GIF

A file format, and filename extension, for graphics files for display on web pages. Popular format as it provides the best picture quality to file size tradeoff.

Graphical User Interface

A way of representing the functions, features and contents of a program to a user by way of visual elements, such as icons, as opposed to textual elements, such as words and character strings. The Microsoft Windows operating system is the classic example of a program with a GUI.

GUI

Pronounced "goeey". See Graphical User Interface.

H

Hard Skills

As opposed to "soft skills", this term relates to technical or IT related skills.

Hardware

Physical equipment like computers, printers, and scanners. Compare to software.

HCI

HCI (Human-Computer Interaction) is the study of how people interact with computers and to what extent computers are or are not developed for successful interaction with human beings. A significant number of major corporations and academic institutions now study HCI.

Help Desk

A team that can be contacted by end-users for assistance with hardware and software problems. *Launching any e-learning initiative should give some thought to end user support. Even well designed programs will get 1 - 2% of the target audience needing help (e.g., "Do I really need to complete this training?")*

High-bandwidth

A high-bandwidth connection, like a cable modem, will allow transmission rates in the range of Gigabits per second and allow the use of data intensive information like video, audio and complex animation. *e-learning will always be somewhat limited in quality until we all have high-bandwidth access everywhere -- see Cable Modems!*

Hosting

The verb describing the physical storage of a Web page or other Internet content. As in, "we are hosting our program on our in-house computers."

HTML

See Hypertext Markup Language.

Hypermedia

Hypermedia links text, graphics, video, audio, and animation and leaves the control of navigation through its elements in the hands of the user.

Hypertext

Text elements within multimedia documents, classically underlined and in colored font, that can be clicked on by the user to follow a path to a new location in a document, supplemental material like a graphic or another page on the net. *Many so-called e-learning programs are just former word documents that have been converted into HTML with some cross links put in. Hypertext is a nice feature, but is a poor substitute for task analysis, instructional design, practice and feedback.*

Hypertext Markup Language

More commonly referred to as HTML. The standard programming language for web documents meant to be accessed by browsers.

I

Icon

A simple symbol representing a complex object, process, or function. Icon-based user interfaces have the user click on onscreen buttons instead of typing commands.

ILT

See Instructor Led Training.

Implementation

The fourth step in the classic A-D-D-I-E model of Instructional System Design. The implementation phase involves the delivery of the training to the intended audience and the use by that audience.

Information Architecture

The organization and categorization of online content. The rules and structure of where and how to store content. Especially relevant for knowledge management programs and corporate intranets where users must be able to quickly find desired information.

Instructional Designer

The person who applies instructional learning theory to the organization and design of learning programs. *Many graduate programs produce these in droves, but some of the best are routinely self-taught (not to be confused with SME's though!)*

Instructional Systems Design

Term describing the systematic use of principles of instruction to ensure that learners acquire the skills and knowledge essential for successful completion of overtly specified performance goals.

Instructor Led Training (ILT)

Training mediated by a live instructor, such as classroom training or live classes delivered over an web-based conference system.

Interactivity

An program feature that requires the learner to do something. Should help to maintain learner interest, provide a means of practice and reinforcement. *Poor quality interactivity = clicking the right arrow to continue and challenging true/false questions. Good interactivity = open questions, simulations, instructional games, tools and calculators. Remember, engage the mind not the mouse finger!*

Internet

The modern network of tens of thousands of interlinked computers, evolved from the US government's ARPANET project of the 1960's. The public Internet encompasses the world wide web, the popular multimedia portion, as well as the e-mail, FTP, gopher, and other services.

Internet-based Training

The term most commonly used in the mid 1990's to describe web-based learning programs. *Unless you're being intentionally retro as a fashion statement, "e-learning" is the hip term today.*

Internet Explorer (IE)

The Internet Web browser developed by Microsoft, which is also the most commonly used browser today. Typically called just "IE". For example, "Do your students use IE or Netscape to access the web?"

Internet Service Provider (ISP)

A company that provides Internet access and hosting services.

Intranet

A network owned by an organization that functions like the public Internet but is secure from outsider access and regulated by representatives of the organization often called system administrators.

ISD

See Instructional Systems Design.

ISP

See Internet Service Provider.

J

Java

A programming language invented by Sun Microsystems that is intended to be operational on any hardware/software system. *Also, the stimulating beverage consumed in large quantities by the development team that is working late at night before the final deliverable.*

Java Applet

A small program (i.e., application) written in Java. Java applets are sent from the host computer to the end user's computer (known as the client) and is then run (or "executed"). *Warning: many organizations have a network security system known as a "firewall" that blocks Java Applets from running.*

Job Aid

A tool which can exist in paper form or on the computer which provides on-the-job instruction for a specific task.

JPEG

A popular file format for photographs intended for display on web pages. The file extension is JPG.

Just In Time

Popular term to describe the benefit of e-learning's accessibility. As in, "Our sales force can access our online, just-in-time training whenever they have a question about a product; no longer do they have to enroll in, and wait for, a classroom training program."

K

KIRKPATRICK

Kirkpatrick Evaluation Model refers to the four step training evaluation methodology developed by Donald Kirkpatrick in 1975. Level 1 refers to the students' reaction to the training (derisively called "smile sheets"). Level 2 refers to the measurement of actual learning (ie, knowledge transfer). Level 3 measures behavior change. Level four measures business results.

L

LAN

See Local Area Network.

LCMS

See Learning Content Management System.

Learning Content Management System (LCMS)

A web-based administration program that facilitates the creation, storage and delivery of unique learning objects, as well the management of students, rosters, and assessments. *Hey, everybody finally figured out what LMS' are for so we had to come up with something else complicated for the marketplace.*

LMS

See Learning Management System

Learning Management System

A program that manages the administration of training. Typically includes functionality for course catalogs, launching courses, registering students, tracking student progress and assessments.

Learning Objective

The clear and measurable statement of the behavior that must be observed after training is concluded in order to consider the training a success. According to Robert Mager's

work, a learning objective contains a condition statement, a performance statement, and a criterion statement.

Learning Service Provider (LSP)

A third party company that hosts e-learning programs/content on its own servers. Clients pay to access, or to "lease", these programs.

Learning Style

An individual's unique approach to learning based on strengths, weaknesses, and preferences. Though experts do not agree how to categorize learning styles, an example of a categorization system is one that separates learners into auditory learners, visual learners, and kinesthetic learners. *Though spoken as gospel, where's the current research that this isn't all bunk?*

Lesson

A unit of learning concerned with a specific skill. This term is sometimes interchanged with the terms section or module.

Local Area Network

A network of computers in a confined area, such as a room or a building. A LAN accessed with internet technologies can be considered an intranet. Typically LAN's operate at what is considered to be a high bandwidth speed.

Localization

The process in which a program is converted for delivery in a different country. Unlike "translation" which connotes a simple re-writing of words, localization includes re-writing for cultural and social differences as well. *Can we say McTraining?*

Log-in

Procedure performed by a user to declare that a specific system or application is going to be used. Log-in information is used by the computer to mark and track information specific to the user. It can also be used to declare to other users that an individual is presently active on a network.

Low-bandwidth

A low-bandwidth connection, like a telephone line, will allow transmission rates in the range of kilobits per second and restrict the use of data intensive information like video and photo quality graphics. *If you've got a low bandwidth connection, don't even try to do audio and video -- the marketing hype outpaces the R&D reality for now.*

LRN

Microsoft's commercial implementation of e-learning standards to identify, catalog, launch, and track course objects. Based on the IMS standards. *Even though Microsoft typically dominates anything they get involved in, they're currently asleep behind the wheel of this one. SCORM is where it's at.*

LSP

See Learning Service Provider.

M

m-Learning

Stands for "mobile learning" and refers to the usage of training programs on wireless devices like cell phones, PDAs, or other such devices. *As if we've already figured out how to effectively use our normal computer devices for learning. m-learning will happen, but not for awhile.*

Mastery Learning

Also known as criterion referenced instruction, in which students are evaluated as having "mastered" or "not mastered" specific criteria or learning objectives.

Meta Data

Information that provides macro-level details about a course object, such as author, title,

subject, date created, etc. Typically meta data is recorded in XML files and are read by LMS and LCMS systems.

Mixed-media

The combination of different delivery media like books, audiotapes, videotapes and computer programs in one curriculum. Not to be confused with multimedia, where different media are integrated into one product. See blended learning.

Model

A representation of an object, process, behavior or attitude used by a learner for comparison/contrast and duplication/avoidance. Both positive and negative examples can serve as models.

Modeling

The activity of recreating the functions and aspects of a model. When a novice sales person watches an expert make a sales call, and then mimics the expert's tone and wording, he or she is exhibiting a modeling process.

Modem

A piece of hardware used by computers to transfer and receive information. The term is taken from the full title MOdulator-DEModulator.

MPEG

A file format digitized video. Largely being replaced "RealVideo" and the Microsoft Media Player.

Multimedia

The integration of different media, including text, graphics, audio, video and animation, in one program. Also referred to as newmedia.

N

Negative Reinforcement

Encouraging a correct behavior by punishing any behaviors other than it. An example is putting a child into "time out" after she throws a tantrum. According to most adult learning research negative reinforcement is not recommended for most adult learning situations.

Why not? A set of electrodes plugged into the serial port of my computer would have me trying extra hard at test time!

Netiquette

Stands for "Internet etiquette". Refers to the commonly accepted rules of behavior and communication in e-mails, chat rooms, bulletin boards, etc. For example, proper netiquette is to not use ALL CAPITAL LETTERS in messages because this is the equivalent of shouting. *GOT IT?!*

Netscape Navigator

The brand of Internet browser developed by Netscape. The second most popular browser after Microsoft's Internet Explorer. *(and fading fast)*

Network

A collection of computers that can exchange information and share resources.

Newsgroup

An electronic bulletin board reserved for discussion of a specific topic.

O

Offline

Operation of a computer while not connected to a network.

Online

Operation of a computer while connected to a network.

Online Learning

Synonym for e-learning.

Operating System

A computer program that controls the components of a computer system and facilitates the operation of applications. Windows Me, Windows XP, Linux, and MacOS are common operating systems.

P

PDA

See Personal Digital Assistant.

PDF

Refers to the Adobe Acrobat file format for online documents.

Pedagogy

Opposite of andragogy. The art and science of how children learn.

Performance

One of the three required parts of a properly composed learning objective. Observable and measurable actions that should be demonstrated by the learner after the completion of training are detailed in the performance statement.

Performance Objective

The performance capability the learner should acquire by completing a given training course. Synonymous with learning objective.

Performance-based Instruction

Learning activities centered on the acquisition of skills more fundamentally than knowledge. Performance-based instruction, also called criterion-referenced instruction, relies on learning objectives to communicate what is expected to be achieved and evaluation of task completion to determine success.

Personal Digital Assistant (PDA)

A small, handheld computer currently limited in functionality (e.g., calendar, rolodex, to do list). PDA's are expanding in their capabilities to include wireless e-mail and Internet access, thus opening opportunities for mobile learning and support (m-learning).

Pilot Test

Also known as an Alpha test or formative evaluation. A version of the training program is delivered to a sub-set of the target audience for an evaluation of its instructional effectiveness. *Also known as a very simple step to help avoid disaster, which is forgotten on the majority of projects.*

Pixel

Term created by joining the words picture and cell, a pixel is the basic unit of measurement for picture displays. Computer screen size is often measured in pixels, with 640x480 and 800x600 being common measurements.

Plug-in

A small piece of software that works in conjunction with a web browsers to add additional functionality, like streaming audio or video.

Positive Reinforcement

Encouraging a behavior by rewarding that behavior after it is exhibited. An example is buying a child a toy after they do well on a test. An example in adult education is congratulating a learner after a question is answered correctly, or providing a completion diploma upon course completion. *As my Dad used to say, "I ain't going to give you a reward for doing something you should be doing anyway!"*

Prerequisite

A basic requirement or step in a process that must be fulfilled before moving on to an advanced step. Being able to stand is a prerequisite to being able to walk. In computer training, using the mouse is a prerequisite to using a graphical user interface.

PRM

See Programmer Ready Materials.

Processor

The chip or chip set that performs the operations central to a computer's functioning.

Program

A detailed set of instructions that make a computer able to perform some function. A program can be written by the user but the term is commonly used to refer to a specific pre-created software package, such as a word processor or spreadsheet.

Programmer Ready Materials

The individual components that are ready for assembly by a programmer or multimedia developer. Typically, PRMs include scripts, graphics, audio and video files. *This is geek-speak, nobody uses this term anymore.*

Prototype

A working model created to demonstrate crucial aspects of a program without creating a fully detailed program. Adding details and content incrementally to advancing stages of prototypes is one process for creating successful applications.

R

Real-time

Instantaneous response to external events. A real time simulation, like a driving simulator, follows the pace of events in reality.

Request for Proposal (RFP)

The official document produced by an organization that requests vendor bids for specific products and services. *Also, the tool that many power-wielding, sadistic training managers use to inflict needless pain on naive, desperate vendors.*

Repurpose

To revise pre-existing training material for a different delivery format. For example, instructor guides and student manuals are often repurposed into web-based training.

Reusable Learning Object (RLO)

A specific chunk of content and code that represents an assessment, exercise, instructional content, etc. In theory, RLO's can be used in many different courses. *Like the tooth fairy, Santa Claus and the famed jackalope, RLO's are frequently discussed and seldom ever seen.*

RFP

See Request for Proposal.

RLO

See Reusable Learning Object.

S

SCORM

Acronym for Sharable Content Object Reference Model. SCORM is a series of e-learning standards that specify ways to catalog, launch and track course objects. *The latest standards fad, but this time it might actually stick.*

Search Engine

The two types of search engines, the catalog and the crawler, both locate requested information on a web site or on the whole of the World Wide Web. A catalog engine compares the user request with a collection of data that it contains concerning web sites. A crawler engine scours the contents of sites themselves to find a match to a word or string of words.

Section

A division of training concerned with one topic. Several sections commonly make up a lesson, but the term is sometimes used interchangeably with the term lesson or module.

Self-paced Instruction Any instruction where the learner dictates the speed of progress through content.

Self-paced instruction

Training that enables learners to complete instructional segments on their own, without the guidance of an instructor.

Server

A networked computer that is shared by many other computers on the network. Intranets use servers to hold, or "host", web pages.

Simulation

A mode of instruction that relies on a representation in realistic form of the relevant aspects of a device, process, or situation.

Software

Programs that allow a user to complete tasks with computers, such as word processing and graphics programs. Compare to application.

SME

See Subject Matter Expert.

Soft Skills

The informal term for non-IT related business skills. Examples include leadership, listening, negotiation, conflict management, etc.

Storyboard

A collection of frames created by a developer that detail the sequence of scenes that will be represented to the user; a visual script.

Subject Matter Expert (SME)

The member of a project team who is most knowledgeable about the content being instructed upon. Frequently, the SME is an expert contracted or assigned by an organization to consult on the training being created.

Subordinate Objective

An task or objective that must first be mastered in order to complete a terminal objective.

Summative Evaluation

An evaluation performed after development used to measure the efficacy and return-on-investment of a training program.

Synchronous Training/Learning

A training program in which the student and instructor participate at the same time. For example, an instructor-led chat session is a form of synchronous training. Common examples today include the use of products from Centra, Interwise, or others that enable web-casts of live events.

T

Target Population

The audience defined in age, background, ability, and preferences, among other things, for which a given course of instruction is intended.

Task Analysis

A process of examining a given job to define the discrete steps (tasks) that insure effective and efficient performance of the job's requirements.

TBL

Acronym for Technology-based Learning. Synonymous with TBT, or Technology-based Training. *Just say e-learning.*

TBT

See Technology-based Training.

TCP/IP

Transmission control protocol/ Internet protocol. The set of rules and formats used when transmitting data between servers and clients over the Internet.

Technology-based Training (TBT)

The term encompassing all uses of a computer in support of learning, including but not

limited to tutorials, simulations, collaborative learning environments, and performance support tools. Synonyms include CBL (computer-based learning), TBL (technology-based learning), CBE (computer-based education), CBT (computer-based training), e-learning, and any number of other variations.

Terminal Objective

A learning objective the student should be able to master after completing a specific lesson or part of a lesson.

Text

The medium of delivering information via words to be read and interpreted by the learner. Compare to audio, video, graphic, and animation.

Tutorial

A mode of instruction that presents content, checks understanding or performance, and continues on to the next relevant selection of content. Tutorials may be linear or branched.

U

Uniform Resource Locator

More commonly referred to as URL. The standard address for a web page on the Internet or on an intranet.

URL

See Uniform Resource Locator.

Usability

An evaluation and measurement of a computer program's overall ease-of-use.

User Interface

The components of a computer system employed by a user to communicate with the computer. These include the equipment, such as a keyboard or mouse, and the software environment, such as the desktop of Windows or the program lines of DOS.

V

Vertical Slice

A program prototype that includes the development of one section, usually a complete lesson, for the course.

Video

The medium of delivering information created from the recording of real events to be processed simultaneously by a learner's eyes and ears. Compare to audio, text, graphics, and animation.

W

WAP

See Wireless Application Protocol.

WBT

Acronym for Web-based Training. Synonymous with e-learning.

Weblog / Blog

"Blog" is short for "Web Log" and refers to short messages that are posted onto a web site by an author. Blogs are typically informal and personal messages, almost like daily diary entries. *Blogging has caught on as a cheap form of knowledge sharing and expert communication. See www.blogger.com for more information.*

Wireless Application Protocol

The technical specifications required to communicate and display content on wireless devices, such as WAP-enabled cell phones. Relevant for m-learning.

World Wide Web

The most popular component of the Internet which can be accessed with browser

software. Offers interconnected screens containing text, graphics and occasionally other types of media.

WWW

See World Wide Web.

E-learning Resources (Bibliography, Web References)

E-Learning as a process in the present

Corporate e-Learning finds itself suffering from widespread malaise, with the majority of corporate customers slowing down and reconsidering existing and / or planned investments in e-Learning and severely tempering expectations for its importance and role to their business.

Small e-Learning companies of all types are struggling severely to stay in business, with many not succeeding. The middling and larger e-Learning companies are more and more making similar claims about the end-to-end nature of their solutions, and corporate buyers are tending to sift through the onslaught of marketing messages and limit their conversations about possible purchases to the perceived top dozen eLearning companies.

The standard "top 12" list might include *Centra Software, Click2Learn, DigitalThink, Docent, Element K, IBM Mindspan Solutions, Intellinex, NETg, Provant, Saba Software, SkillSoft, and SmartForce*, with consideration also given to more specialized offerings from *Franklin Covey, Global Knowledge, Indeligo, KnowledgeNet, KnowledgePlanet, LogicBay, Mentergy, Ninth House Network, PlaceWare, Quisic, RWD Technologies, THINQ Learning Solutions, TrainingScape, and Vuepoint*. Yet stock prices of most public e-Learning companies have sagged, some dipping to near-penny stock status.

Six trends raised and they represent the current focus of attention, the state of the art, in corporate e-Learning. The first three in particular are:

- *Blended learning* - Specifically, blending modes and media for learning, including self-paced eLearning, classroom training, live Web-based classrooms, videotapes, one-on-one coaching, and so on, into a complete training regimen;
- *Learning Content Management Systems (LCMSs) and learning objects* - A new generation of enterprise technology for authoring and managing (mostly online) learning content;
- *Web collaboration or Live e-Learning* - The use of Web collaboration software to enable live distance classes, virtual seminars, meeting places for communities of practice, etc., over Web connections;
- *Simulations, learning games, videos, and storytelling* - The use of multi-branching online simulations to teach procedural and interpersonal skills; learning games to motivate learners to win and thereby to learn; streaming videos that demonstrate examples and non-examples; and storytelling to engage learners in the unfolding of knowledge;
- *Training without trainers, version 1: Knowledge sharing* - An expansion of e-Learning into the domain of knowledge management wherein corporate experts are able to share their expertise directly with others, via live e-Learning;
- *Training without trainers, version 2: Informal knowledge exchange* - A second form of knowledge management, in this case gathering experts' knowledge in documents, and providing indexed, structured access to the otherwise unstructured knowledge base that results.

From 2002, the concept of *blended learning* emerged, combining classical classroom learning with any form of technology based learning.

Learning Management Systems like *Blackboard, WebCT* and *FirstClass*, based on licensing fees per user, are well integrated in large enterprises and learning organizations. However, another trend is emerging *Open Source*. The open source Learning Management platform *Moodle*, where many creative developers worldwide cooperate on

the development of a unique platform, is now becoming popular. The software is free-of-charge, and there are numerous communities providing support.

From 2004, another term emerged, *Web 2.0*, referring to a second generation of Internet-based services - such as *social networking sites, wikis, nlogs, fora, communication tools* that emphasize on-line collaboration and sharing among users. These are new tools and software, facilitating on-line collaboration, knowledge sharing, and formal and informal learning.

Digital Storytelling - the art of creating a powerful dialogue by narrating a story, weaving images, music and voice using the power of digital media design. The sharing of these stories with others can connect people in special ways.

a) *Photostory Tool*:

<http://www.microsoft.com/windowsxp/using/digitalphotography/photostory/default.mspx>

b) *Movie maker tool*:

http://users.chariot.net.au/%7Emichaelc/els/movie_maker_sample.wmv

Community spaces

a) *Learning Times*: <http://www.learningtimes.org/>

LearningTimes.org is an open community for education and training professionals. Members have free access to a wide range of opportunities to interact and network with peers from across the globe. Member activities include live webcasts and interviews with industry leaders, online debates and discussions, live coverage of industry conferences, and international working groups.

b) *My Connected Community*: <http://mc2.vicnet.net.au/index.html>

My connected community (mc²) is a virtual meeting place where communities interact online.

c) *Learning Communities Catalyst*: <http://www.lcc.edu.au/>

The Learning Communities Catalyst has been established to serve as a clearinghouse of information, research, case studies and practical tools to assist communities, councils, government, businesses, policy-makers and other stakeholders in research, advocate for and develop learning communities.

Voice Applications

a) *Skype*: <http://skype.com/>

Skype is free and simple software that will let you make free phone calls to anywhere in the world. Skype uses P2P (peer-to-peer) technology to connect you to other users. You can talk with up to 5 contacts at a time, exchange documents via email, surf the Web and chat simultaneously.

b) *Voice Mail*:

• *Handy bits*: <http://www.handybits.com/voicemail.htm>

• *iVocalize*: <http://www.ivocalize.com/support.htm>

Search

a) *Google Desktop*: <http://desktop.google.com/>

The site enables to find email, files, media, web history and chats instantly; view web pages you've seen, even when you're not online and search directly from your desktop using the desk-bar.

Virtual Classrooms - live web conferencing tools.

- a) *Elluminate*: <http://lluminate.com/>
- b) *Compued*: <http://www.compued.com.au/conference/>

Delivery Tools - Powerpoint Conversation Tools

- a) *Impatica* (samples): <http://impatica.com/>
- b) *Presentation Pro* (example): <http://presentationpro.com/>
- c) *Moodle*: <http://moodle.org/>

Assessment

- a) *Online Surveys*:
Zoomerang: <http://zoomerang.com/login/index.zqi>
Survey Monkey: <http://www.surveymonkey.com/>
Hot Potatoes: <http://web.uvic.ca/hrd/halfbaked/>

Open Source

- a) *Mind mapping - Cmaps Example*: <http://cmap.ihmc.us/>

Other Tools

- a) *Amplify*: <http://amplify.com/>
Amplify empowers to clip and collect content from different sites into an own Web collages. These collages can be saved as web-based documents, shared with anyone as a single link and set to automatically refresh in real time.
- b) *eDayz Cool Tools Site*: <http://www.cooltools.net.au/index.htm>
This site has been developed to encourage new and experienced users of flexible learning to explore a range of e-learning tools, resources and ideas. The tools, resources and ideas showcased have been used in a wide-range of VET practice including ACE/Community, VET in Schools, industry training, and private and public registered training organisations (RTOs).

Toolboxes

A Toolbox is a collection of resources, suggested learning strategies and supporting material to support online delivery of vocational education and training (<http://flexiblelearning.net.au/toolbox/>)

Whiteboards

- a) *Imagination Cubed*: <http://www.imaginationcubed.com/LaunchPage>
- b) *Group Board*: <http://www.groupboard.com/>
Group Board is a set of multi-user java applets including whiteboard, chat, message board and games which you can place on your web page by simply copying a few lines of html code.

E-learning Development in the EU (URLs of online courses and repositories, Educational Portals, ODL Platforms, Specific Projects, etc. activities)

Simulations in e-Learning process

For a number of years, simulations have played an important role in the training activities of certain sectors, like the defense, aviation and aeronautical industries in several countries. They were not adopted until now on a large scale as learning tools due to some factors like the cost of development and the lack of tools for developing high-quality simulations. These days we are in a different situation and simulations are being adopted in other industries and for a broad range of skills and competence development. Technology and cost barriers are continuing to shrink, opening up the potential for wider adoption of simulation technology.

Today, computer technologies, such as Macromedia Flash, have become ubiquitous and e-learning vendors with simulation-development expertise are trying to offer more industry- and topic-specific simulation templates.

There are still barriers to be overcome, particularly in terms of design innovation, but computer mediated simulations are expected to gain a larger share of education and training activities. Simulations may offer advantages over handbooks and they can complement lectures, demonstrations and real world practice opportunities.

The market for these kinds of learning services will probably continue to grow as simulation technologies become more sophisticated and more cost effective to build.

Adaptive learning environments (ALEs)

In the recent years there is an increasingly heightened awareness of the potential benefits of adaptivity in e-Learning. This is happening because the ideal of individualized learning (i.e., learning suited to the specific requirements and preferences of the individual) cannot be achieved, especially at a “massive” scale, using traditional approaches. Factors that further contribute in this direction include: the diversity in the “target” population participating in learning activities (intensified by the gradual attainment of life-long learning practices); the diversity in the access media and modalities that one can effectively utilize today in order to access, manipulate, or collaborate on, educational content or learning activities, alongside with a diversity in the context of use of such technologies.

A learning environment is considered adaptive if it is capable of: monitoring the activities of its users; interpreting these on the basis of domain-specific models; inferring user requirements and preferences out of the interpreted activities, appropriately representing these in associated models; and, finally, acting upon the available knowledge on its users and the subject matter at hand, to dynamically facilitate the learning process.

Adaptive behavior on the part of a learning environment can have several manifestations:

- *Adaptive Interaction* which refers to adaptations that take place at the system’s interface and are intended to facilitate or support the user’s interaction with the system, without, however, modifying in any way the learning “content” itself. Examples of adaptations at this level include: the employment of alternative graphical or color schemes, font sizes, etc., to accommodate user preferences, requirements or (dis-) abilities at the lexical (or physical)

level of interaction; the reorganization or restructuring of interactive tasks at the syntactic level of interaction; or the adoption of alternative interaction metaphors at the semantic level of interaction.

- *Adaptive Course Delivery* which constitutes the most common and widely used collection of adaptation techniques applied in learning environments today. In particular, the term is used to refer to adaptations that are intended to tailor a course (or, in some cases, a series of courses) to the individual learner. The intention is to optimize the “fit” between course contents and user characteristics / requirements, so that the “optimal” learning result is obtained, while, in concert, the time and interactions expended on a course are brought to a “minimum”.
- *Content Discovery and Assembly* refers to the application of adaptive techniques in the discovery and assembly of learning material / “content” from potentially distributed sources/ repositories. The adaptive component of this process lies with the utilization of adaptation- oriented models and knowledge about users typically derived from monitoring, both of which are not available to non-adaptive systems that engage in the same process.
- *Adaptive Collaboration Support* is intended to capture adaptive support in learning processes that involve communication between multiple persons (and, therefore, social interaction), and, potentially, collaboration towards common objectives. This is an important dimension to be considered as we are moving away from “isolationist” approaches to learning, which are at odds with what modern learning theory increasingly emphasizes: the importance of collaboration, cooperative learning, communities of learners, social negotiation, and apprenticeship in learning.

One of the problems regarding the adaptive learning environments now is that existing standards do have some provisions for adaptation, but require substantial extensions to accommodate common practice in ALEs. The motivation for seeking standardization in adaptive e-Learning is directly linked to cost factors related to the development of ALEs and adaptive courses.

Open source e-Learning tools

Today it is estimated that there are already more than 250 providers of commercial Learning Management Systems. In addition, there were recently identified more than 40 open source LMS offerings (some of the most well known are *Moodle*, *ILIAS*, *Claroline* etc.).

Most of these products have extensive developer communities and present strong arguments for considering open source applications like an alternative to commercial products. Some of the criteria that are in favor of making a decision regarding an Open Source software applications are related to cost savings, stability, performance and access to code. On the other hand, for ensuring that users in the near future as well as the longer term have access to the best available applications, these Open Source software applications should be built on open standards.

It remains to be seen if open source e-learning technologies will capture the current or future market share from commercial providers, but the important thing in the process of making a decision regarding the adoption of certain e-learning software for education is to consider all software options and make a choice based on their merits.

Standards development

Standard development is meant to knit together disparate groups and interests in the distributed learning community. It is intended to coordinate emerging technologies and capabilities with commercial/public implementations.

Until some time ago, a number of organizations have been working on different but closely related aspects of e-learning technology. These organizations have made great strides in their separate domains, but they have not been well connected to one another. Some of their specifications are general, anticipating a wide variety of implementations by various user communities (e.g., those using the Web, CD-ROMs, interactive multimedia instruction or other means to deliver instruction) and others are rooted in earlier practices and require adaptation to newly emerging approaches.

The idea is now to build a common “reference model” for the foundation of a good Web-based learning. It is generally accepted that all systems, whether commercial or open source, should be built on open standards if the market is to develop. These standards should articulate guidelines that can be understood and implemented by developers of learning content. In the second place, they must be adopted, understood and used by as wide a variety of stakeholders as possible, especially learning content and tool developers and their customers. Thirdly, they must permit mapping of any stakeholder’s specific model for instructional systems design and development into itself. Stakeholders must be able to see how their own model of instructional design is reflected by the reference model they hold in common.

In order to stimulate industry agreement some high-level requirements are established for the development of the e-learning environments. The requirements are:

- *Accessibility*: the ability to locate and access instructional components from one remote location and deliver them to many other locations.
- *Adaptability*: the ability to tailor instruction to individual and organizational needs.
- *Affordability*: the ability to increase efficiency and productivity by reducing the time and costs involved in delivering instruction.
- *Durability*: the ability to withstand technology evolution and changes without costly redesign, reconfiguration or recoding.
- *Interoperability*: the ability to take instructional components developed in one location with one set of tools or platform and use them in another location with a different set of tools or platform.
- *Reusability*: the flexibility to incorporate instructional components in multiple applications and contexts.

Probably standards and specifications (such as IEEE LOM, SCORM and more recently IMS specifications such as IMS LD, IMS LIP and IMS QTI) will successfully evolve and become flexible enough to allow for the integration of real time learning processes, simulations, games, customized adaptive learning, digital rights management by 2010.

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