# e-Learning

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> In times of change, the learners will experience the world, whilst the taught will have adapted to a world that no longer exists.
>
> *Erich Hoffer*

## 1. Introduction

Publishing means different things to different people. With the development of the Gutenberg printing press in the middle of the 15th century, oral traditions, as well as texts written by hand and recited aloud by literate elites were replaced by mass publications allowing large numbers of ordinary people to read on their own, but also requiring them to make their own sense of what they read. Nowadays, consumers of electronic publishing face a similar opportunity and challenge as technological advances take them beyond decoding and synthesis of information from printed text. They are required to interact with and evaluate multimedia materials, while understanding, as book readers before them had to, the innuendo, the context of ideas, the larger picture. Even more is expected from the audience of electronic learning (e-Learning), namely the acquisition of knowledge and skills through the engagement with electronically published material.

## 2. What is e-Learning?

e-Learning at the first sight. e-Learning is a relatively new concept that encompasses a variety of learning methods using technology, such as programmed instruction, computer-based learning (CBT), web-based learning (WBT), and net-based learning, to name just a few. e-Learning includes the use of technology to manage, design, deliver, select, transact,

coach, support and extend LEARNING (of all kinds). This common sense definition by Lovell [1] integrates a variety of perspectives from specialists in diverse fields and hence is very practical and applicable. To understand the importance of the expansion of e-publishing through e-Learning, a closer look at the 21st century views on teaching and learning needs to be taken.

e-Learning at a closer look. "How do we learn?" is a question that many educational theorists deliberate. This paragraph describes the three main approaches and their usability for e-Learning in particular. Behaviorists viewed learners as relatively passive recipients of information, expected to repeat what they learned if asked. If they provided a correct answer, they would receive a positive reinforcement based on their observable behavior (the correct answer). B. F. Skinner's term for this process, "operant conditioning," refers to the fact that humans learn to "operate" on their environment with a particular response in order to obtain a particular result [2]. The pre-eminent example of behaviourism is programmed instruction. This method is also suitable for teaching machines, from which Skinner inferred they would be able to replace human teachers. In his time, internal activities of the human psyche that led to the observable behavior were a "black box." Cognitivistic theories formulated by Ausubel, Bloom, Gagné, and Reigeluth concentrated exactly on those activities. A cognitivist teacher not only presents and explains information, but also leads the learners in their learning and monitors their progress. The learners themselves play a passive role in receiving the information. However, in comparison to the behaviouristic theories, cognitivism does emphasize the processing of the information that takes place within each individual learner.

Constructivist theories have been proposed by Collins, Greeno, Lave, Resnick, Kegan, Rychlak, Wilber, and Rogoff. In contrast to cognitivism, these theories view the learning process as the construction of knowledge. The learners are active participants in this process: they construct their knowledge on the basis of their experiences and interactions with others and the environment. The teacher's role is to facilitate and support the learners' effort whenever needed, primarily when the learners need further information [3, 4].

The term 'learning environment' grew out of this constructivist perspective on learning and teaching and encompasses diverse learning styles, teaching techniques, and teaching materials including multimedia. A constructivistic teacher offers the learners a variety of learning activities from which they can select the activities that meet their personal needs. When some of these activities are offered as multimedia, especially through the use of a computer, the learning can be called e-Learning or learning in an electronic or virtual environment. According to the didactical concept of the learning environment, a course designer can define more precisely the teacher's and learners' roles in the process of learning and choose corresponding methods, techniques, technologies, and materials and integrate them into the environment. As stated by Seel and Dörr [5], a learning environment has to be designed to motivate the learners, to trigger and sustain their learning process, to give them feedback on their success, and support cooperative learning.

The continuously expanding use of e-Learning environments calls for a careful evaluation of the quality of learning they provide. Empirical evidence on this topic supports the following statements:

- **Computer- and net-based learning environments** are highly flexible in regards to where and when the process of learning takes place. This enables self-regulated learning [6].
- **Multimedia and distributed environments** open to learners a wide range of activities such as exploring web sites, experimenting with search engines or new ways of seeking information, manipulating things, and engaging in discussions. This enlarges the spectrum of learning strategies and provides the learners with an authentic experience [7, 8].
- **Well designed and facilitated e-Learning courses** solicit a more active participation from learners than traditional face-to-face classroom settings [9].
- **Multimedia** is highly suitable for realistic presentations of complex situations and can successfully help learners to see topics from various perspectives and in various contexts. Thus, multimedia fosters learners' interest, flexible thinking, development of mental models, and acquisition of applicable (as opposed to inert) knowledge [8, 10].
- **Computer-mediated communication** can restrain the possibilities of active learning. The main reason is that the construction of a common knowledge background implies higher costs [11]. Under these circumstances, special media competence is required to enable efficient learning.

Relying on these findings, Jacobson and Archodidou [12] formulate three goals for e-Learning that ideally place it high above superficial clicking on hyperlinks or rote memorization. According to them, e-Learning should enable learners to (a) construct deep conceptual understanding of challenging domains of knowledge, (b) change their understanding of a domain, when their initial models or preconceptions are qualitatively different from a more expert representation, and (c) transfer or apply their knowledge to new problems and situations.

e-Learning in a broader context. Reinmann-Rothmeier and Mandl [4] state the importance of two forms of learning that can fulfill the requirements of the emerging knowledge society better than the teacher-centred learning: self-regulated and cooperative learning. The self-regulated learning is based upon learners' own decisions regarding what, where, when and how to learn (e.g. how the necessary material is to be sequenced, which resources to use, etc.). These decisions are supported by the non-linear structure of e-Learning environments: use of networks, hypertext branching and bookmarks. The cooperative learning can be supported by the use of computer-mediated communication. The learners can work in virtual groups and communicate with each other during the process of learning and problem solving, either synchronously (using chat, audio- or videoconferencing) or asynchronously (via text-based discussion forums or message boards). In the context of e-Learning, the self-regulated and cooperative learning can be regarded as fundamental, and

more complex teaching styles can be seen as a mix of these two, either with multimedia support or in the traditional face-to-face setting.
Without recognizing the growing importance of self-regulated and cooperative learning, the growth in the number of e-Learning courses and their proliferation across all educational institutions are truly astonishing. In the last two decades, K-12 schools opened virtual classrooms. Virtual classes of all kinds are attended not only by students who are too sick to go to regular schools or athletes and actors whose jobs interfere with the regular school calendar. Even students who are bored in a traditional school setting or opposed to it (e.g. for religious reasons) are now taking advantage of virtual collaborations with like-minded individuals. In colleges, universities and corporate training organizations, e-tutorials, virtual courses and seminars, virtual practice and virtual learning communities are well known concepts, even if they are not yet as frequent as the traditional methods and techniques. More and more companies try to reduce travel costs and other expenses associated with traditional workforce training by moving all suitable training activities to the Internet. Almost every educational institution offers at least some e-Learning courses to expand their traditional face-to-face course catalog and the number of fully virtual schools is growing worldwide.

# *3. Instructional design of e-Learning*

Scholars have made different suggestions on how to design e-Learning courses. The best known include those of Welsh [13], who recommends an event-oriented model, of Dick & Carey [14], who recommend a nine-steps approach, and of Willis [15], who compressed Dick & Carey's model to four steps. What these and all competing design models have in common is the pre-instructional analysis, including the setting of learning goals for the potential audience of learners, as well as the selection of pedagogical approaches that in turn influence the choice of assessment techniques.

## 3.1. Pre-instructional analysis

The design of an e-Learning course begins with an analysis that includes the setting of specific and appropriate learning goals for the potential audience of learners. To ensure its competitiveness, e-Learning should address foremost the learning needs that result from new developments in science, economy, and education. The goals of an e-Learning course should be set after considering the following questions [16]:

- **What course content is relevant to the potential learners?** A designer of an e-Learning course needs to consider current and future professional and leisure activities of the learners, their current knowledge and skills, and, if present, the established learning culture to which the learners belong.
- **What competencies and what prior knowledge do the learners already have?** This question refers not only to their knowledge, skills, and methods, but also to relevant social competencies.

- **What other factors could influence the learning and its success?** While designing an e-Learning environment, cognitive factors (e.g. prior knowledge), emotional and motivational factors (e.g. performance motivation), and students' behavioural tendencies (e.g. effort put into learning) need to be taken into account.

All factors identified in the pre-instructional analysis can influence the setting of specific learning goals. If, for example, the pre-instructional analysis reveals that students do not have sufficient media competence, the acquisition of this media competence becomes an explicit learning goal [17]. In many e-Learning courses, virtual cooperation becomes an additional goal of the learning activity [18].

McCormack and Jones [19] add the following factors that need to be taken into consideration in pre-instructional analysis:

- **The Outside Factors:** The outside factors that might influence the design of an online course are the educational institution itself, the local region and country in which the learning experience takes place and their associated policies, procedures, laws, and general trends, the funding for the course, and last but not least, the instructor's workload.
- **The Course:** The design of an online course depends heavily on the subject area, the mode of delivery, and existing resources.
- **The Instructors:** The instructor's personality, educational philosophy, and preferred teaching styles make online courses unique and have to be taken into account during the design process.
- **The Technology:** Crucial to the online course design is the technology available to both instructors and students. It is imperative to know which software, hardware, networks, technical training, and technical support are available to instructors and students.

## 3.2. Pedagogical approaches

There are many pedagogical approaches to teaching in the traditional face-to-face classroom as well as in e-Learning. Basically, these many approaches fall into one of two categories: direct instruction or problem-based learning. The direct instruction is usually the presentation of content. It is recommended for students who already have extensive knowledge and skills in a particular area or need a quick overview of a new topic. Direct instruction, however, may result in acquisition of superficial and inert knowledge of the topic that learners will be unable to apply to new contexts. In problem-oriented learning environments, learners work on concrete and authentic problems to acquire the knowledge and skills set forth in the learning goals. This active engagement with the topic produces curious and motivated learners [20] who process the learning material in-depth. Any kind of in-depth analysis and evaluation requires more work from the learners than just having information presented to them through direct instruction. Some learners may even be

challenged too much by the problem-oriented approach, which leads to cognitive overload [4, 21].

Both pedagogical approaches consist of an information space and an activity space [12, 22, 23]. The information space contains the materials needed by the students during the e-Learning course, primarily multimedia presentations of content. The organization of these materials (for example, the order of learning objects or other pieces of information) depends partially on the pedagogical approach. Directed instruction usually presents pieces of information, which are eventually put together into a coherent whole. In problem-based learning, the e-Learning course starts with an authentic problem and is accompanied by all information that is needed to solve the problem. As stated by the Cognition and Technology Group at Vanderbilt [24], authenticity encompasses a narrative structure, a didactically suitable complexity, embedded data, and the use of visual presentations.

The activity space consists of all design elements that trigger and support various learning activities, such as descriptions of tasks, recommended learning scenarios, recommended ways of communication, to name just a few [25]. Direct instruction may be augmented by giving tasks to the learners, such as sorting and selecting activities or answering multiple-choice questions, to ensure the information was indeed understood. In problem-based e-Learning environments, the activity space allows for the solving of concrete practical problems that initiate the learning process. Activities differ in their complexity [26, 27]. Simple activities may quickly familiarize the learners with the learning resources and help them start the learning process. More challenging activities require conceptual crisscrossing and solving actual problems. Collins, Brown & Newman [28] recommend to increase the complexity of tasks step-by-step and to fade out the cognitive scaffolding as the learners become more independent in their learning (see also [29]). Similarly, Salmon [30] suggests a framework in which initial activities are primarily fostering motivation and online socialization, then move to information exchange, and finally lead to knowledge construction and the development of critical and reflective solutions for the initial problem. Benjamin Bloom [31] presented a similar hierarchy as early as 1956.

Another facet of the activity space is the social dimension, which ranges from individual learning to dividing tasks into pieces that are eventually combined into a whole, to "real" cooperation benefiting from the synergy of a team that integrates each member's knowledge, experience, and viewpoints. Task-oriented communication is the most relevant aspect of the social activity. Learners develop a shared understanding of the learning material and a joint conception of the problem they have to solve and thus build shared knowledge. The e-Learning instructor guides and facilitates this discourse by focusing on debates and constructive disagreements between the participants, on specific argumentation structures, and on various aspects of participation and interaction [32, 33].

## *4. Implementation of e-Learning*

Once the instructor has adopted a particular pedagogical approach to e-Learning, an implementation can follow. The two main technical issues are the learning management system (LMS) that provides the virtual classroom and the standardization of the e-Learning materials required for their reusability.

## 4.1. Learning management systems

In the past decades, e-Learning environments had to be programmed with programming languages such as HTML or Java. Additionally, the access rights of the users, instructors and technologists had to be set. Consequently, the teaching of e-Learning courses required at least two distinct competencies, the pedagogical and the technical. Today, almost all e-Learning courses are developed using learning management systems (LMS), also called e-Learning platforms that allow one to design a course without knowing any programming language. Often, administration of an LMS requires no more than pointing and clicking. Hence, e-Learning educators only need a minimum of technical knowledge to efficiently develop an e-Learning environment and their collaboration with IT specialists is often not necessary ("rapid authoring"). An LMS fulfils three basic functions [34, 35]:

- **Authoring system.** By means of a user-friendly interface, e-Learning developers or instructors create so-called learning objects that become components of the information and activity spaces described above. In addition, they define tasks, develop tests, and build the user desktop.
- **Learning environment.** Individual learning objects are linked to each other and built into the information and activity spaces common to e-Learning modules, virtual courses or even complete programs. Guided by their own learning goals, the learners follow their particular learning paths, on which they study the learning materials, solve problems, and cooperate with their fellow learners, until their individual learning goals are achieved.
- **Administration.** The LMS defines individual access rights to each learning object and virtual space of the environment. For example, developers and instructors need unlimited read/write/execute access to all data, while registered learners may see and use only some data and change even less of the available materials.

All three functions – authoring system, learning environment and administration – refer to a database containing information needed for the system administration (user and course data) and for the content management (learning objects and their descriptions).

Large e-Learning programs, such as virtual universities, often deliberate thoroughly about the right choice of a suitable LMS. Today's software market offers numerous platforms that feature the necessary functions in a variety of ways. To select an LMS, criteria for the evaluation of available platforms must be established that consider both the general requirements of the e-Learning system and the specific goals of the particular course or program [22, 34].

## 4.2. Standardization of e-Learning environments

With the growing number of e-Learning concepts, solutions, management systems, courses, and modules, calls for interoperability and integration are becoming stronger [34, 36]. Standards are developed to permit technical portability as well as collaborative development and sharing of educational resources. Interoperability refers to the

infrastructure that is not visible to the end user of an e-Learning course, but makes it work in the first place. Without interoperability, corporations and educational institutions might consider it too risky to invest in e-Learning initiatives, because a bankruptcy or other business decision of an e-Learning provider might leave them with a defunct proprietary LMS without content. Integration is the development of standards specifying the content of e-Learning courses and enabling resource sharing among institutions. The standardization of content is much more difficult than just plain technical compatibility, as shown, for example, by problems with document file conversion. Pedagogical concepts are often not addressed properly in standardization attempts, primarily because of the different interpretations of diverse pedagogical terminology. The development of formal standards for learning technologies is under way, but far from completion. Standards organizations, such as the Institute for Electrical and Electronics Engineers (IEEE) and the International Organization for Standardization (ISO) are working closely with several key organizations, intertwining global developments.

The IEEE Learning Technology Standards Committee (LTSC) has been leading the development and maintenance of the Learning Object Metadata (LOM) standard since 1997. LTSC defines a Learning Object as any entity, digital or non-digital, which can be used, reused or referenced during technology supported learning. The international development effort coordinated by LTSC resulted in the 1484.12.1 LOM data model standard of June 2002. The origins of LOM, however, can be traced to the Alliance of Remote Instructional Authoring & Distribution Networks for Europe (ARIADNE), the European research and development foundation that developed the so-called Knowledge Pool System, a distributed database of reusable Learning Objects with associated metadata.

The general idea behind LOM is to provide a standardized description of components for education and training [37]. The Metadata describes what the Learning Object contains and how it might best be used. The components themselves are called Learning Objects. Theoretically, any content provider could pick and choose Learning Objects based on the information provided in the Metadata, hence, making e-Learning modules more portable within and between institutions.

The information provided in the Learning Object Metadata falls into the following categories [38]:

1. General: In this category, the Learning Object is described as a whole including an identifier (unique label), the title, the language used, a brief textual description of the content, applicable keywords, the coverage (time, culture, or region to which this Learning Object applies), the underlying organizational structure, and the aggregation level.
2. Life Cycle: In this category, the history and current state of the learning object is described through the version or edition of the learning object as well as the completion status. In addition, this category includes information and dates on contributions of both individuals and organizations, including the role these entities played in the contribution (for example authors, editors, and/or publishers ordered according to relevance).
3. Meta-Metadata: The purpose of this category is to provide information on the descriptive metadata itself rather than the Learning Object. This category allows for identification of the origin of the description and clearly explains the

specification used to create this Metadata instance. In short, it provides a scheme for the Metadata.

4. Technical: In this category, the technical requirements and characteristics of the Learning Object are listed, such as the format, size (in bytes), location (URL), and duration (time a continuous Learning Object takes) as well as technical prerequisites (necessary hardware and software including lowest possible version), installation remarks, and requirements for other platforms.
5. Educational: This particular category is the most subjective one and open to interpretation. Opinions can vary drastically when it comes to the assessment of the difficulty of a Learning Object, for example. However, LOM is unique in including a category on pedagogical characteristics at all. It is intended to describe the key educational or pedagogical characteristics of the Learning Object as accurately as possible.
    a. The Interactivity Type indicates if the Learning Object is more suited for active or expositive learning. Active learning, also known as learning-by-doing, directly induces productive action by the learner. An active Learning Object prompts the learner for semantically meaningful input or for some other kind of productive action or decision. Active Learning Objects could be questionnaires, simulations, exercises, case studies, whereas passive Learning Objects include essays, audio- or video-clips, graphical material, and hypertext documents. Later are also called expositive learning in which the learner is primarily required to absorb information without being prompted for any meaningful input. Clicking on a hyperlink is not considered meaningful input.
    b. The Learning Resource Type describes the teaching methods, for example, exercises, simulation, questionnaires diagrams, figures, graphs, slides, tables, texts, exams, experiments, case studies, lectures, or self-assessment.
    c. The Interactivity Level describes the degree of interactivity, which ranges from very low to very high. Interactivity in this context refers to the degree to which the learner can influence the aspect or behavior of the Learning Object.
    d. The Semantic Density is the degree of conciseness of a Learning Object. The semantic density of a Learning Object may be estimated in terms of its size, span, or duration. It is independent of its difficulty.
    e. The Intended End User Role specifies the intended use of a Learning Object by teachers, authors, learners, or managers. If the Learning Object was designed for a variety of users, the most dominant should be listed first.
    f. The Context specifies the environment within which the learning is intended to take place, such as a school, higher education institution, or training company.
    g. The Typical Age Range of learners for which the Learning Object is designed. Besides a numeric age range, other indications might be appropriate, such as “suitable for children over 3” or “adults only.”

   h. The Difficulty Level indicates how hard it is to work through this Learning Object for the typical intended target audience, ranging from very low to very high.
   i. The Typical Learning Time expected for the target audience.
   j. The Description of how the Learning Object is to be used in education or training.
   k. The Language of the intended end user, which may be different from the language of the Learning Object itself.

6. Rights: In this category, the intellectual property rights, copyrights, and conditions of use of the Learning Object are explained. If applicable, the costs for using the Learning Object are listed.
7. Relation: This category describes the relationship between the Learning Object and other Learning Objects, for example which Learning Object is part of which series or which Learning Object is based on another Learning Object.
8. Annotation: In this category, information is recorded on the educational use of the Learning Object to provide some kind of assessment or constructive feedback/suggestions for future use. This information is accompanied by the name (entity) that created annotations as well as the date it was created.
9. Classification: In this category, the Learning Object is described in relation to a particular classification system, for example the discipline, educational objective, educational level, skill level, security level, etc. It refers back to the purpose and keywords.

   As mentioned above, the LOM standard is based on the initial effort of ARIADNE. At some point, ARIADNE in Europe and the Instructional Management System Global Learning Consortium (IMS) in the United States, which developed the Sharable Content Object Reference Model (SCORM), became aware of each other's efforts to develop Learning Object metadata. Both organizations decided to submit their metadata classification jointly to the LTSC, which then formulated the current LOM specification.

Overall, several institutions have adopted or tried to adopt LOM specification, even though it has been criticized for its complexity and lack of pedagogical considerations. For us, one of the most important issues is related to the pedagogical aspects. Like Lego Building Blocks, Learning Objects are supposed to fit together regardless of their size, shape, and colour. Educators, however, plan their courses as a whole with long-term and short-term goals in mind. Individual units or lessons are based on ideas such as project-based learning (several theories or topics are discussed and/or applied by working on a larger project), transfer theory (connecting to the learning from a previous lesson) or diminishing coaching (instructor gives less and less advice and has students work on problems more independently as the course goes on). Therefore, pulling a course apart into individual Learning Objects would destroy the pedagogical relationship between units or lessons and fail to meet the overall goal of the course. SCORM, for example, was developed to support mutually independent self-study modules designed for use by U.S. Military [36]. Only recently has IMS released the "simple sequencing" specification that will be a part of the

next version of SCORM standard. Educators doubt if any technical standard will properly take overall pedagogical considerations into account. Even Dan Rehak of Carnegie Mellon's Learning Systems Architecture Lab, one of chief architects of SCORM points out that it is “essentially about a single-learner, self-paced and self-directed. It has a limited pedagogical model unsuited for some environments" [39]. What SCORM or LOM will evolve into in the future is difficult to predict, but infusing these standards with pedagogical concepts will be one of the most difficult challenges.

## 5. The future of e-Learning

Chances that faculty can be replaced by sophisticated e-Learning platforms are considered very low by most educators and trainers. However, making Learning Objects more usable for educators seems to be achievable. One promising attempt by the Open University of the Netherlands to describe the pedagogical perspective of a unit of learning is the Educational Modelling Language (EML). EML attempts to describe both the information and activity space as well as the roles of learners and instructors. A unit of learning thereby is the smallest unit providing learning events, satisfying one or more interrelated learning objectives. If this unit of learning were broken down into its component parts, the learning objectives likely would not be achieved [40]. The four components of EML model are: (1) theories of learning and instruction, such as behaviorism, cognitivism, pragmatism, or an eclectic combination of these and other theories; (2) a learning model describing the expected interaction of learners in specific learning situations; (3) a domain model; (4) units of study model showing how individual units could be conducted after consideration of the three components mentioned above. The categorization of instruction methods provided by the first component of ELM model often seems insufficient to educators, since many of them have difficultly even defining their own philosophical basis. To avoid the pitfalls of this theory-based categorization, the Essener-Lern-Modell (ELM) includes descriptions of actual instruction/learning methods that allow a potential user to follow the necessary tasks and learn from the experiences of others [41]. This approach also permits a more detailed comparison of learning theories that can not be made using short descriptors open to various interpretations.

Besides the new technological developments and the necessary subsequent research, we would like to emphasize the acute need for further research and development in the field of education and educational psychology. The search for optimal pedagogical concepts and configurations for e-Learning is very far from completion. Ongoing research focuses on the optimal blend of face-to-face and virtual phases in the process of learning and on suitable scripts and scenarios for e-Learning. Another interesting topic is the personalization of learning environments: how can e-Learning adapt to the learners' characteristics, preferences and needs? [42, 43]

In the general context of institutionalized education, the establishment and development of virtual schools is a new phenomenon creating much interest and numerous yet unanswered questions. Virtual schools are now a part of educational landscape in many countries of the world. However, their role and position alongside traditional institutions, the quality of education they provide, their ability to supplement or replace older modes of learning are very much open issues.

No matter in which directions the virtual schools will develop in the near future, one statement remains true: The conception and technical implementation of e-Learning must rely not only on the newest technologies, but also on the newest findings of the educational science and psychology. It is of fundamental importance to the long-term future of e-Learning to evaluate realistically the potential, as well as limitations and problems, of the electronic media and to exploit them in an optimal way.

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## Learning Technology Standards Organizations

Advanced Distributed Learning (ADL)
http://www.adlnet.org

Alliance of Remote Instructional Authoring & Distribution Networks for Europe (ARIADNE)
http://www.ariadne-eu.org

Aviation Industry CBT Committee
http://www.aicc.org

Educational Modelling Language (EML)
http://eml.ou.nl/eml-ou-nl.htm

Essener-Lern-Modell (ELM)
http://wip.wi-inf.uni-essen.de/elm/elm/diss/

Global Learning Consortium (IMS)
http://www.imsglobal.org

International Organization for Standardization
http://www.iso.org

Learning Technology Standards Committee (LTSC) of the Institute for Electrical and Electronics Engineers
http://ltsc.ieee.org

Open Knowledge Initiative
http://web.mit.edu/oki

Sharable Content Object Reference Model (SCORM)
http://www.adlnet.org/Scorm/scorm.cfm

World Wide Web Consortium
http://www.w3c.org

## Glossar

**Activity space**: Part of a learning environment. "The activity space is the space of 'real world' activities. The activity space is the space of physical action and physical experiences. In order to undertake activities in the activity space, people need access to information." (Benyon, in print)

**Authenticity**: Subjective characteristic of a learning environment (referred esp. in problem-based learning), provided when the learner can relate the provided information, goals and tasks to his/her own activities and experiences.

**Computer-mediated communication**: Communication through computers and networks, characterized by specific constraints depending on the bandwith or social presence of the technology used. CMC is the basis of virtual cooperation in virtual groups.

**Cooperative learning**: Form of learning in which students have common goals, share common resources and construct knowledge cooperatively. In the context of e-learning, cooperation has special characteristics that rely on the use of computer-mediated communication (e.g. the coordination is more difficult than in face-to-face environments).

**Didactical concept**: Central point of a learning environment determining all the details of its implementation (such as tasks, learner support, technology etc.) The didactical concept takes into account a pre-instructional analysis, and includes the definition of the pedagogical approach and the implementation form.

**e-Learning** refers to the use of technology to manage, design, deliver, select, transact, coach, support and extend learning of all kinds.

**e-Learning platform** see Learning Management System

**Information space**: Part of a learning environment created to provide the information needed in the process of learning.

**Instructional design**: Cognitivist theory of teaching and learning represented by scientists such as Reigeluth and Lowick. Instructional design is based upon highly detailed and structured teaching plans.

**Integration** is the development of standards specifying the content of e-Learning courses and enabling resource sharing among institutions.

**Interoperability** refers to the infrastructure that is not visible to the end user of an e-Learning course, but makes it work in the first place.

**Knowledge transfer** (from one context to another) refers to the use of knowledge learned in a certain context as application in a new context.

**Learning Environment**: Technically, a LMS filled with didactical meaningful lectures, activities, and communication prompts. Pedagogically: Constructivist term designating

a multitude of factors (information resources, tasks, learning scenarios etc.) that support coherently a learning process.

**Learning Management System** (LMS), also known as e-Learning platform, is a software tool that allows an instructor to provide virtual students with a login to the course, course content, activities, and communication tools.

**Learning Object** is any entity, digital or non-digital, which can be used, reused or referenced during technology supported learning.

**Learning Object Metadata:** LOM describe what the Learning Object contains and how it might best be used.

**Media competence**: Users' or learners' ability to task-oriented use of (communication) media. Refers to manipulating technology, evaluating, selecting and applying information as well as responsibly using media in a social-political context.

**Pre-instructional analysis**: First step of the course design. In takes into account the learning goals and objectives, as well as the factors that can influence the learning success.

**Self-regulated learning**: Form of learning in which the student have a relevant influence on the learning goals and contents, the time and place of learning, and the use or resources. Self-regulated learning is a crucial dimension of e-learning.

**Sharable Content Object Reference Model**: SCORM is a similar approach than LOM to describe a learning object as specific as possible.

**Virtual groups**: Several people separated phisically and/or geographically while communicating and coordinating through computer and networks, and acting together towards common goals.