Virtual Learning Environments: Definitions and Singularities

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Abstract

Article presents and discusses different definitions and characteristics of the systems involved in the creation of Virtual Learning Environments found in literature. It also presents particularities and main characteristics of Hypertext Systems, Hypermedia, Hyper video e Multimedia.

Key Words: Learning Management Systems (LMS), Content Management Systems (CMS), Hypertext, Hypermedia, Hyper video e Multimedia.

Introduction

The objective of this scientific article is to contribute for better comprehension of the nature of Virtual Learning Environments, as well as different techniques and tools used on their creation.

LATEC/UFRJ team has developed researches about Virtual Learning Environments for almost a decade. Beginning by Learning Management Systems (LMS), after that incorporating Content Management Systems (CMS), investigating languages of Multimedia Systems on their different manifestations (hypertext, hypermedia and hyper video), by passing on Learning Objects and, more recently, incorporating concepts and techniques of Virtual Reality on the development of Virtual Environments, all that by converging with the use of Educational Games and Serious Games. LATEC/UFRJ has been acting intensively on the discussion of theories and concepts, experimenting tools and techniques, testing, analyzing and investigating.
Virtual Learning Environments

It’s common to find in bibliography missing of clarity and apparent confusion on attributed meanings to the terms Virtual Learning Environment (VLE), Collaborative Environment and Learning Management System (LMS). Many authors use one or more of these terms as synonyms, when in fact they are not. The definition of Wikipedia is an example of this situation:

Virtual Learning Environments are software that auxiliary on installation of accessible courses by internet. Elaborated to help teachers on content management to their students and on administration of course, it permits to follow constantly students’ progress. As distance learning tools, they are used to complement face-to-face classes. Ex: Moodle, SOLAR, TelEduc etc. Wikipedia. (Our translation)

On this case, in only one definition, it was created confusion among all possible terms and definitions, one that Virtual Learning Environments are not software itself, but environments created from specialized tools or software, that on its turn are developed to facilitate the work of creation of Virtual Environments. VLE don’t exist just to auxiliary on course’s building, but, as its own name indicates, are environments used to facilitate or promote learning. They can be accessed not only by internet, but also off line, in DVD-rom or CD-rom.

The rest of the definition “to help teachers on content management to their students and on administration of course, it permits to follow constantly students’ progress.”(...) “they are used to complement face-to-face classes.” and “Ex: Moodle, SOLAR, TelEduc etc”, are definitions more suitable to represent LMS, not VLE.

The part that mix Distance Education (DE) with face-to-face classes, “as distance learning tools, they are used to complement face-to-face classes”, also contribute to
get confused more than to get clear, because on this case, the terms “semi face-to-face teaching” or “teaching assisted by computer”, or even “teaching supported by technologies of information and of communication (TIC)”, would also require more precise and right denominations.

Virtual Learning Environments can be developed, for instance (but not exclusively), by Learning Environment Systems. However, VLE (online or offline) can also be developed by different software and tools, such as Flash, o HTML, o VRML, o Director, 3DMax e 3Dquest, among others and, many times, by the combined use of several tools.

Environments developed like that can be collaborative or not, depending on the adopted learning strategy. If the strategy privileges the collective and collaborative construction of knowledge, so this VLE can be classified as Learning Collaborative Environment. If not, it’ll simply be a VLE.

There are several characteristics and qualities that a VLE must present, some of them relative to language (not only graphic but also textual), other ones relative to information architecture and to surfing, and still other ones relative to the degree of interaction with content and with other internet surfer (in cases where multiuser systems available in nets). Some of these characteristics and qualities are: (a) intuitive surfing, (b) clarity and consistence of signs used on the graphic project, (c) harmonious and pleasant graphic project, (d) content suitable to target audience, (e) direct and simple language, (f) possibility of authorship, (g) dialogicity, (h) interactivity (with content, with teaching team and with other surfers), etc.

An example of a Virtual Learning Environment developed in VRML (Virtual Reality Modelling Language), by LATEC/UFRJ team in partnership with GRVa/LAMCE/COPPE is available at [http://www.latec.ufrj.br/realidadevirtual.htm](http://www.latec.ufrj.br/realidadevirtual.htm) and can be seen on pictures 1 and 3 (Haguenauer et al, 2008).

PASTORINO et al (2008), present a study, also developed by LATEC/UFRJ in partnership with GRVA/LAMC/COPPE/UFRJ, whose goal is to reproduce the entrance environment and showrooms of National Museum, located at Quinta da Boa
Vista, on the district of São Cristóvão, Rio de Janeiro, with use of techniques of Virtual Reality, including VRML language.

Other study presents the process of creation of Virtual Environments with creation tools of tridimensional games (3D) (game engine), the Unreal (pictures 4 e 5).

The use of resources from Virtual Reality on creation of Learning Environments on internet has been shown as an effective alternative to approximate kids and teens to basic sciences, by their playful aspect and visually attractive (Monnerat et AL 2008).

Next, it’s going to be depth discussion about different software, tools or resources used to create VLE, besides the different denominations that can get according to their specificities.

**Learning Management Systems (LMS)**

Learning Management Systems (LMS), sometimes also denominated Online Learning Management Systems, or just platforms (of online teaching), are specialized software, as the name indicates, used to management of teaching (and learning) online activities. On its essence, LMS are constituted by database, management tools (of academic or didactic activities), content publication tools and communication tools.

Management tools are focused to support coordination works of courses or disciplines, or even to support teachers’ work on management of their classes. Some examples of these activities are: create, activate and deactivate classes, register students, connect teachers with their classes and attribute ‘status’ to students, such as approved, reproved, suspended, etc.

In general, these systems permit the definition of differentiated profiles, such as administrator, coordinator, teacher, tutor, etc, with different levels of access to content and to the platform functions, through the attribution of login and password. Tools of content publication, in general, permit getting content in different formats available for the participants, such as HTML, doc, pdf, etc. The communication tools
are, in general, the same found for free on internet in forms of more simple platforms, such as discussion groups, for instance, or of plug-ins for installation together with other software. Some examples of these communication tools are: blog, e-mail, chat and forum.

Some platforms offer a variety of additional resources for coordinators’ and teachers’ commodity, such as generation of access report of the participants and possibility of question base creation that can be automatically corrected by the own platform.

Fraga e Giraffa (2008) call attention for the importance of the LMS in current educational context:

> Distance Education (DE) is a type of teaching that has been growing worldwide. Consequently, arise the need for research and improvement of Learning Management Systems. These environments allow the management of courses and enable better interaction between students and teachers, who demand safety and performance from these systems. (Fraga e Giraffa, 2008:1, our translation)

Learning provided by internet offered space for new values that remodeled interaction, abandoning certainties and truths “Learning Spaces are no long restricted to the perimeter in which there is close relationship between teachers and students in the classroom, but opened to all possibilities and interactions”. (Kenski, 2004:101, our translation).

This way, LMS gains prominence on educational scenario by having tools that permit learners expressing themselves in a way which would not be possible in a traditional classroom:

> Online discussions give many students the opportunity to express themselves in a way they could not do in regular classes. Many students are reluctant to speak in classrooms because of shyness, uncertainty, or linguistic reasons. It is a development for students who have the ability to compose questions and answers in online discussions, and instructors reporte participation levels much higher than in classes. (Cole and Foster, 2007:3, our translation)

**Sistemas de Gerenciamento de Conteúdos (SGC)**

Content Management Systems (CMS), or platforms of portals, in its essence, is much like LMS. Both are highly specialized management software and based on a
combination of database, management tools, content publishing tools and communication tools. The main difference between the two types of systems (LMS and CMS) is in its specificity. While the first (LMS) is specialized in educational and academic activities, such as creating classes, determine teachers and register students, the other one (CMS) is specialized in publishing and news management or "theme".

Regarding ways of interacting with content portal, you can define two groups of tools: those ones that allow automatic responses, that although they give the feeling of interactivity, do not require the involvement of the staff portal. In this group are tools such as: surveys, newsletter, latest news, most read news, search into portal, among others. There is a second group of tools of communication and interaction that requires the involvement of staff in the processing of portal content, such as selection, filtering, writing answers, review and release. Here follows some examples of tools in this second group: talk to us and asked questions, among others, (Haguenauer et al 2008).

Such as in the combination of SGA, Instructional Planning and Content, results in a Virtual Learning Environment, the same way, a portal can be considered a VLE, when used in an educational context.

Haguenauer et al (2008), for example, shows several cases where the portals were used in contexts of professional development, using resources of Information and Communication Technology (ICT).

Filatro (2004) draws attention to changes on interaction, due the advent of learning in virtual environments:

The inherent characteristics to virtual environments (...) create new spaces to learn and teach, encourage the use of different forms of representation and communication of thought and new relationships with knowledge. (Filatro, 2004: 10, our translation)

According to Kenski (2007), with the expansion of information and communication technologies (ICT), both students and teachers are in constant contact with various
media (messages exchanged over internet, interactive games, etc.), independent of the use of technological equipment for learning. Consequently, she said, there were several changes in ways of teaching and learning.

**Hypertext, Hypermedia, Hypervideo e Multimedia**

Hypertext, Hypermedia and Multimedia are, on their essence, different denomination of the same kind of product. In some cases, these terms are used as synonyms, while that in other cases denote subtle differences.

The term hypertext, for example, is used more broadly to encompass the other ones, being used in discussions about its basic features, especially when the end result has a very great influence of the traditional alphabetic text. In this case, the basic difference between the two (hypertext and traditional text) lie in the existence of links that enable a new way of reading the text: a non-linear navigation through content.

The term Hypermedia, in turn, is most often used when you want to reinforce the fact that various media are being used, such as: sound, still image (photographs and drawings), moving image (animation and video), plus graphs, simulations, etc. In this case, the term would Hypermedia would be indicating more balanced use of different media, without there being a greater influence of the traditional alphabetic text.

It’s important to bounce that, in this case, the terms of Hypermedia and Multimedia, however with different origins, they are close in meaning.

Levy (2004) describes the hypertext into two areas, the technical and functional, highlighting the complexity that it can contain:

> Technically, a hypertext is a set of nodes connected by links. Nodes can be words, pages, pictures, graphics or parts of graphics, sound sequences, complex documents that may themselves be hypertext. The information items (...) extend their connection in star, in reticular way. Navigate in a hypertext means; therefore, draw a path on a network that can be as complicated as possible. Because each node can, in its turn, contains an entire network. (...) Functionally a hypertext is a type of program for knowledge or data organization, information acquisition and communication. (Levy, 2004:33, our translation)
Pierre Levy does not seem to distinguish between the terms Hypertext and Hypermedia, electing the first to represent both. However, it is important to note that the term hypertext better represents the idea of paradigm shift in the relationship of the reader to the text, both in the form of non-linearity, as in the form of choice of different routes of reading and content selection. On the other hand, the term hypermedia represents better the paradigm shift in relation to language, through the equitable use of images, sounds and traditional alphabet text.

Levy (2004) contributes to the perception that the images have a valued role in the new text (hypertext / hypermedia), stating that the image is also text not a mere accessory of this one.

Marcuschi (1999) states that the Hypertext disturbs our sense of linearity, because “differently of the conventional book text, hypertext doesn’t have a unique way of being read. (...) It has multiple inputs and multiple ways of proceeding.” (Marcuschi, 1999:1, our translation).

The term Hypervideo differs a bit from the other two terms (Hypertext and Hypermedia) because it has its origin in the video. In this case, the links are made from video images. The conduct thread of the Hypervideo narrative receives a greater influence of the video, although it also contains elements of Hypertext and Hypermedia. In this case, there is language hybridization of the different source systems, resulting in the emergence of a new language.

Like the LMS and CMS, the Hypertext, Hypermedia, Hipervídeos and Multimedia can be considered Virtual Learning Environments, if used in learning contexts.

According to Dias (2000):

The main innovation introduced by hypertext approach in the development of educational environments is presented in the model flexible representation and connection among different types of information (text, image and sound), which is presented in a hypermedia support in the form of an interactive network . (Day, 2000: 149, our translation)
Learning Objects

Learning Objects or Content Objects can be understood, according Muzio et al [apud Bettio and Martins, 2004] as a reusable piece of information, independent of media, built with beginning, middle and end.

One of the biggest advantages of using the concept of Learning Objects is the reuse possibility. In this case, the linking of Learning Objects with the educational context intended can be performed by the hypertext.

The image of the fishing net, an already quite used image to illustrate the concept of hypertext, can also be used to illustrate the relationship between Learning Objects and Hypertext that contain them. In this case, the network nodes would be Learning Objects and conjunctive tissue, or wires that connect the nodes, forming the network itself, would be the Hypertext. Therefore, following this analogy, the Hypertext, besides containing Learning Objects, it connects to these ones to specific educational context.

The Virtual International Network of Education (RIVED), program of the Distance Education Department of Ministry of Education (Brazil), aims to produce digital educational content in the form of Learning Objects and provides various articles and Learning Objects in the address http://rived.mec.gov.br.


Analysis of Learning Objects presented in figures 6 and 7 reveals features that help to reinforce the differences between the terms VLE and Learning Object. The unitary and "cellular" natures are emphasized in these examples, besides its content and simple navigation form, although enlarged, in these cases, by VRML tool, which allows three-dimensional visualization of the object.
Games, Serious Games and Educational Electronic Games

Games are part of people’s lives, even adults, since ancient times. They can be efficient instructional tools that facilitate recognition and understanding of rules, identification of contexts and their influences. By containing uncertainties and challenges, the game can still reveal autonomy, creativity and originality, besides allowing experimentation of everyday forbidden and dangerous situations, Tarouco (2004:2, our translation).

Electronic games (online or offline) can be considered as Virtual Learning Environments when used in educational contexts. In this case, the basic difference between the traditional VLE and the Game/VLE would be the incorporation, at first, of the elements of narrative of games, such as playfulness aspect and challenge. A variation that is gaining popularity among educational games, the Serious Games, incorporate fewer elements of the narrative of games, such as the use of characters, different levels of difficulty and challenges, but keeping the playful aspect, which can be achieved through language text and graphic design.

Educational games fun, motivating the learning process through exercises, and thus, it becomes important its use as an educational tool. Edutainment (education + entertainment) is a way to make education that combines entertainment and learning. It deserves to give prominence by it wide acceptance on the younger generations. (Filatro, 2004: 48, our translation)

Gosciola (2007) draws attention to audiovisual communication provided by games

every game is an audiovisual medium, as well as film, television, video. (...) Audiovisual, according to Gianfranco Bettetini, communication researcher at the Catholic University of Milan, is a work whose purpose is to exchange information through hearing and vision. (Gosciola, 2007: 107-108, our translation)

On the other hand, Clua e Bittencourt (2004) give prominence to the richness and complexity that games can reach:

Educational games can be quite simple, such as exercise and practice, but they can be rich and complex learning environments, called by some of micro worlds, because these ones provide an imaginary World to be explored by the student. (Clua and Bittencourt, 2004:2, our translation)
However, Campos (2009) states that:

more than the game itself, the climate of discussion and exchange with the teacher I
what will promote good learning, allowing attempts and divergent or alternatives
responses, tolerating mistakes, promoting their analysis, and not simply correcting or
evaluating final product. (Campos, 2009:1)

Environments Created with Virtual Reality Resources

Virtual Environments created with resources of Virtual Reality (VR) have the capacity
to amplify the immersive effect that the word "Environment" suggests. Besides
immersion, two other characteristics, eventually present in traditional VLE, are also
maximized in environments built with features VR: simulation and interaction. On the
other hand, there is a new feature, absent in traditional VLE and incorporated into
VLE built with VR features, represented by the possibility of intensifying and
expanding the involvement of other human senses, besides sight and hearing,
already triggered by Multimedia Systems, such as touch and smell. This tendency
contributes to further increase the sense of immersion into the environment.

Among different senses given by Pierre Lévy (1999) to virtual, it's possible to give
prominence for the following one: `Virtual reality ', in the strongest sense of the term,
specifies a particular kind of interactive simulation in which the explorer has the
physical sensation of being immersed in the situation defined by a database. (Levy,
1999: 70, our translation).

Ventureli (2000) refers to Ellis, Kirner and Pinho to define virtual reality:

One can define virtualization as the process by which the viewer interprets an
outstanding sensory impression in another reality than that one in which it is
physically [ELLIS: 1991, 321-347]. Complementing, we can say that Virtual
Reality is a computer simulation addressed to the human senses, sight,
hearing and touch, or even that it is 'an advanced technique of interface,
where the user can perform immersion, navigation and interaction in a three-
dimensional synthetic environment generated by computer, using
It’s possible to perceive that between the two definitions there is agreement that to be virtual reality, it’s fundamental the perception of sensory-motor reality with the presented content. And to be granted the feeling of immersion and interaction with the virtual environment for the user (or explorer).

In this sense, Cardoso e Machado states:

Technologies of input and output data associated with Virtual Reality (VR) are designed to stimulate efficiently the biggest amount of senses and capture with great fidelity the several user’s movements, such as movements of hands, head or eyes. (Machado and Cardoso, 2004:21, our translation)

Parente (1999) draws attention to the attractiveness of virtual reality: “The complete implication of the possibility of treating images and sounds in real time has as consequence the new fascination by virtual reality” (Parente, 1999: 60, our translation).

However, according to Braga (2001) “when it’s not possible to have real experiences, virtual reality is irreplaceable. Simulation in VR allows being in tough and dangerous situations, which are not ordinarily accessible.” (Braga, 2001:7, our translation).

**Final Thoughts**

While in VLE the characteristics associated with content, such as language, interactivity, navigation, and information and graphic design architecture influence more on the perception of the user. In LMS, in turn, attention is focused on the selection and configuration of tools and functionalities to be used in a particular course or discipline. While on the first, strategies related to the presentation of the content are defined, on the second, teaching and learning strategies that rely on available content, on the defined itinerary study and on strategies for the use of communication tools are defined.

Once the settings done, communication and learning strategies selected, these strategies to the participants informed and declared, tools filled with pre-defined
content and the "course" activated, one can say that the set forms a VLE. However, a platform by itself is not a VLE, at the same time it is possible to create a VLE without resort to the use of platforms. The same reasoning applies to CMS, which can also be considered a VLE, when used in learning contexts.

Another misconception is that note on the use of LMS, perhaps influenced by the fear that the intermediation of computer and different systems provoke excessive passivity. It is the exaggeration in the use of communication channels and conducting online discussions and debates, besides the overhead of interactive activities which increase the risk of promoting more hyperactivity among students than learning and skills development, making them unable to moments of reflection, awareness and lonely creation.

If the hypertext represented a paradigm shift about the form of reading and reader's relationship with the text, when replace linear reading by non-linear selective reading, based on links, Hypermedia and Hyper video represent a paradigm shift about communication and language. The trend in the evolution of the terms hypertext, hypermedia, hyper video and multimedia seems to point towards convergence in a single term that encompasses the meaning of the other ones.

At the same time, funds from the ICT and Virtual Reality are propitiating the emergence of new forms of communication and of a new language, which is still in its embryonic.

Teaching with support of various technologies, far from representing a simplified solution, it seems to face as many challenges as without the use of technology, plus a new problem: the cost of acquiring, maintaining, upgrading and training of the professionals involved on the project.

A content analysis of the RIVED website reveals a confusion between the terms VLE and Learning Object, since several software or systems presented as Learning Objects would be better classified as VLE, due to the high complex nature of the content and navigation. The origin of this term meaning confusion can be related to the term importation to Portuguese language from English language such as
“Learning Management System, Content Management System, Virtual Learning Environment, Learning Object and Content Object”. In this case, the confusion would be inherited along with the import of the terms.

Another factor that could influence on the term confusion is related to its use by professionals from different areas, they use different terms to represent their look and participation in the final product. Thus, for example, the same product could be called Software by a computer professional, System by an engineer professional, Multimedia by a communication professional, Hypertext by a professional in the field of languages, and Educational Software by an education professional.

In all cases, experience shows us that learning effectiveness depends more on teaching strategies adopted than the amount of tools or the technological sophistication level of the VLE, regardless they are built from LMS, CMS, Hypertext, Hypermedia, hypervideo, Learning Objects or Virtual Reality technics.

Finally, it is worth to note that the purpose of this text is not to fix the meaning of terms, but pointing out specific elements of each one, not only to contribute to clarity and precision in the use of them, but also alert to the dynamic nature of the meaning evolution.

References


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