

## COOPERATIVE LEARNING THROUGH INTERNET.

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This paper refers to a case study on the application of Internet technology in activities of distance education. The pedagogical trend of these activities enables the social-cultural approach to the knowledge production and its application takes place through the establishment of a virtual environment for co-operative learning in the form of a computational system.

Nowadays, a series of computational systems are intended to give support to the educational process using Internet as a means for interaction among teachers and students. This virtual environments offer interaction, but, by themselves, they do not guarantee interactive communication between those involved in the learning process. Proposals like the development of “virtual learning communities”, where groups of people can cooperate to produce knowledge, indicate the need for readaptation, or even, for the creation of new models that privilege the communication and processes of co-authorship and the shared production of didactic material, on-line or not, among others. In this study, we consolidate the theoretical foundations related to environments of network co-operative learning, and we analyse the existing informatics tools to give support to educational environments in Internet, aiming their characterisation according to various ways of access and use. Based on the theoretical foundations and on the analysis of the existing tools, here it is identified the group of resources and technologies that, implemented together, can make up an environment capable of enabling educational activities based on co-operation. As validation, a virtual environment for co-operative learning is created, following the group of resources and technologies here identified, and a distance specialisation course is put into practice

**Keywords: Distance Learning, Co-operative Learning, Internet**

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### **INTRODUCTION**

Nowadays, most of the computer systems that are supposed to mediate the learning process via Internet are based on Website models, containing didactic material exposed in form of pages written in HTML, while communication is performed in non-synchronic form – by electronic mail, discussion lists and newsgroups.

These tools can offer better interactivity to the actors of the educational process when compared to the traditional models of distance learning courses, by mail, with or without using complementary media of transmission (radio and television). Even though, proposals like the creation of “virtual communities”, where groups of people could cooperate to generate learning, show the necessity of readapting or even creating new environments to prioritize the communication among the actors of the educational process, the co-authorship and the production of didactic material shared among people, whether on-line or not, etc.

The implantation of a Virtual Cooperative Learning Environment – VCLE – is supposed to privilege the functionality, facility of operation and administration in order to minimize the technical requirements of its users. The virtual community must be supported by the variety of communication resources offered by the environment. Besides, the cost of implementation and maintenance of a VCLE must be compatible with the reality of most educational institutions in Brazil.

Also, it's important to evaluate, during the implementation of a VCLE, the necessity for optimization of the existing resources and the limiting Internet factors, such as data transfer speed, popularization of access which generates growing traffic, security and data integrity, etc. As being a communication structure, the Internet2 will represent the extinction of the nowadays limits. However, having creativity, it's possible to use the available tools and obtain good levels of interactivity and learning.

### **THE INTERNET AS A MEDIA FOR EDUCATION.**

According to Lévy (1999), the Internet provides new ways to integrate students and educators in an environment of mutual learning and intellectual development. Technologies based on Internet can disseminate

the teaching-learning resources by taking information in a continuous rhythm, in real-time, or in a flexible way, according to time availability.

Different from the other technological innovations for education in the last years, the Internet allows: breaking geographical barriers of space and time; sharing information in real-time and supporting cooperation and communication in real-time as well. “Besides being an easy and inexpensive vehicle to provide lessons, the Internet makes possible to create dynamic learning communities, in which participants can make questions and exchange ideas. The available learning environments through telecommunication technologies can soon equate to an interactivity level previously available only in face-to-face learning situations”. (HEIDE and SILBORNE, 2000, p.277)

The Internet, as a communication structure, still presents problems in many regions in Brazil, and the full utilization of Internet in the country is not a reality yet. The main difficulties are related to: data transmission and reception speeds; the availability of dedicated access – permanent connection; the number of available telephone lines and the number of houses, commercial institutions and educational institutions – especially the elementary public schools – that have computer and telephone connection.

Talking about the set of tools available on Internet for the communication, we can find client-server sets capable of providing one to one communication (private communication), one to many (spreading), and many to many (discussion groups). These sets are usually divided in two large categories: synchronic (works in real-time) and non-synchronic (works in flexible time, according to the user’s availability), presented on the board 2. (BITTENCOURT, 1999; HORTON, 2000)

Board 2. Main tools available on Internet.

Type	Text Mode	Multimedia
Non-synchronic	Electronic mail (e-mail); Discussion Lists (Listservs); Newsgroups; FAQ (inserted over the WWW)	WWW (World Wide Web)
Synchronic	IRC(Internet Relay, Chat)	Audio and video conference; Whiteboard

Source: Adapted from Bittencourt (1999)

To use the tools described on the board 2 in teaching/learning processes, it’s necessary to have in mind the technical requirements about the connection speed demanded to the perfect functionality of each one of them. The board 3 shows these requirements.

Board 3. Minimum requirements about connection speed for main tools available on Internet.

Tool	Connection Speed
Electronic mail (e-mail); Discussion lists (Listserv); Newsgroups; FAQ (inserted over the WWW)	14.4 Kbps
Chat ; WWW (with few multimedia resources)	28.8 Kbps
WWW (using multimedia resources) Whiteboard	56 Kbps
Audio conference	128 Kbps
Videoconference	256 Kbps

Source: Adapted from Horton (2000)

The usage of tools that provide navigation through hypertext documents exposed on Internet makes the interactivity possible, which provides the students to have control over the navigation. That means they can trace out their own access route to the available universe of knowledge, making researches for exploration or even an objective search.

The learning environments – considered here as the virtual space on Internet where teaching-learning projects will be implemented – are not limited to physical space. The whole world – including universities, research centers, museums, libraries, magazines, newspapers and many other exploration opportunities – may be available to the students. Also the access to these environments may be open to several groups of students in potential – varying from millions to many, or some.

In order to establish how a learning environment will be constructed, the proper characteristics of the educational model of a particular project must be observed. Different educational institutions – or even different institutions - have different strategies and distinct pedagogical chains.

Therefore, depending on the presented characteristics, a virtual learning environment may be a site open to any Internet user, or a site containing open areas – public – and others restricted to registered users, or even a restricted access system – only for authorized users – whose entry, stay and exit are controlled.

The virtual learning environment requires, in general, students and educators having prior access to the available resources. Mainly in the synchronic interactions, a visitor that is not participating in the teaching-learning process might injure it. To administrate these “users community” that share the learning environment, it’s necessary the existence of a more complex platform than a WWW server, which is capable of hosting unrestricted access sites. The AulaNet – an initiative of the Padre Leonel Franca Foundation, having as partner the Software Engineering Laboratory from the Information Department of PUC-RIO – is an example of a platform for which courses via WWW can be developed. Other products with the same objective are: LearningSpace, produced by Lotus Co. and WebCT, created in the University of British Columbia, and today traded by a company which name is the same as the product. Using these environments, students may access

lessons and complementary resources that might be presented in a vast variety of media. (HEIDE and STILBORNE, 2000)

### **VIRTUAL COOPERATIVE LEARNING ENVIRONMENTS - VCLE**

We can assume here that learning is fundamentally a social experience of interaction through the language and action and that this interaction must provide a “learning community”. Such community will produce meanings, comprehension and criticism actions, centered on the individual for the construction of knowledge and bring about results of cognitive, affective and action nature. (COELHO, 2000)

Vygotsky (1977 apud Bittencourt,1999) affirms that the “social interaction is the origin and the engine of the learning and the intellectual development”. This approach does not emphasize teaching as being a planning and choice of material/activities to reach predefined objectives (empiricist vision). It also does not attribute to the apprentices the integral responsibility on their learning when in form of non-attended comprehension (aprioristic vision). It considers the other’s wisdom as a knowledge object for an apprentice, and this apprentice’s knowledge as a knowledge object for the other.

Pierre Lévy incorporates the social cultural approaching of learning in the titles “Collective Intelligence” (1998) and “Cyberculture” (1999) when he proposes: the virtual learning communities; the shared wisdom constructed collectively and the network cooperative learning. For the author, “the educational systems today are found submitted to new restrictions related to quantity, diversity and velocity of the knowledge evolution”. (LÉVY, 1999, p.169)

On the quantitative issue, the approach is related to the demand for formation without historical proceedings. The traditional environments of educational formation are saturated and the national societies demand higher quality standards.

On the qualitative issue, the change is in the learning processes. The most promising direction in this area, according to Lévy, is on the cooperative learning.

Learning with the others, reformulating the knowledge based on the other’s criticisms is important for the strengthening of the communication and reasoning abilities. The notion of cooperative learning is that the acquirement of knowledge, abilities or attitudes is not an inherently individual process, but it’s a result of group interaction.

The support provided by computers and information network to the cooperative learning makes the individual learning construction to be more dynamic through systems composed by equipments and programs that, united by a communication medium, implement a cooperative environment with active role in the analysis and control of it. The cooperative technologies allow the constructions of common forms to see, to act and to know, through environments that enables/motivates people to produce sharing knowledge and/or new communitarian actions.

To make computer systems support virtual learning environments in a cooperative approaching, using the Internet as medium, they must offer: (I) an authorship system for courses creation; (II) a space for publication of contents and activities; (III) a set of synchronic and non-synchronic interaction tools; (IV) resources to support the students' and apprentices' activities; (V) resources to evaluate the apprentices' learning; (VI) resources to administrate and manage the system.

A virtual cooperative learning environment, as defined, may constitute a base for courses where students and teacher(s) will access physical metaphors of school, with areas to acquire contents, interactivity and communication with the learning community, areas for research and production. The tools that will provide interaction and cooperative work are: e-mail, discussion list, newsgroup, chat and the publication rights of the academic production and co-authorship of the didactic material of the course.

### PERFORMING OF AN EXPERIMENTAL COURSE IN THE VCLE

To validate the set of hardware, software and network allocated in the configuration of a virtual learning environment, and to verify its usage as an instrument of education in a cooperative approaching, it was necessary to perform an experimental course designed accordingly to the pedagogical content that guides this approach.

A Virtual Cooperative Learning Environment was especially constructed for the experiment, using AulaNet as base – software of authorship for virtual learning systems. The audio/videoconference via Internet and the “whiteboard”, important synchronic communication resources, are not implemented because of the unavailability of hardware and limitations of the communication medium. (HORTON, 2000). The figure 1 shows the general scheme of the experimental VCLE constitution.

The experimental course became viable with the collaboration of the Group of Study and Research of Learning Interactive Technologies (TEIA-GEPE), associated with the Education College of the University of the State of Minas Gerais.

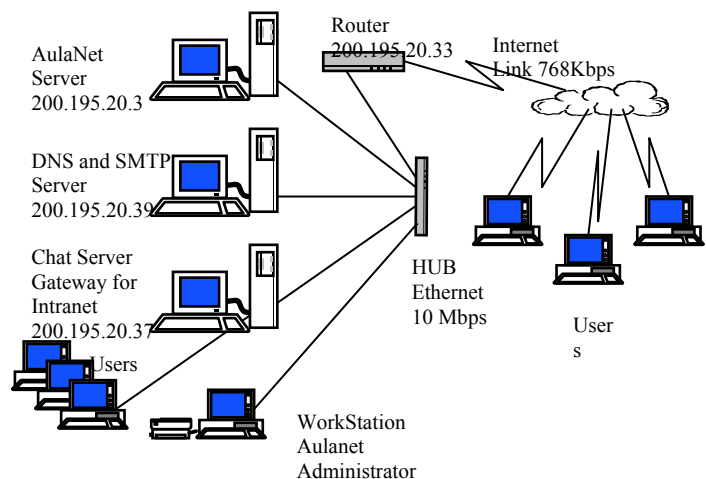


Figure 1: General scheme of the Virtual Cooperative Learning Environment

The course titled itself “Initiation to the On-line Learning – IOL” and was intentionally planned and produced in the city of Belo Horizonte, State of Minas Gerais, 340 kilometers far from the place where the computational structure was installed. The responsible people for the pedagogical project didn’t know the physical installations of the virtual learning environment. The tutorship was also coordinated in that city. The “IOL” was planned to be a university extension course, having forty hours as estimated time, oriented by the construction of necessary knowledge, abilities and competences to the learning mediated by a computer – CMC – through the Internet, having as main objective to provide experiences and discussions about the technical and theoretical references and about the proper usage of communication strategies, collaboration and researches in electronic networks. (COELHO, 2000) The apprentice’s profile was defined as of a graduation teacher and/or a post-graduation student with previous experience in the usage of basic tools and availability of Internet connection.

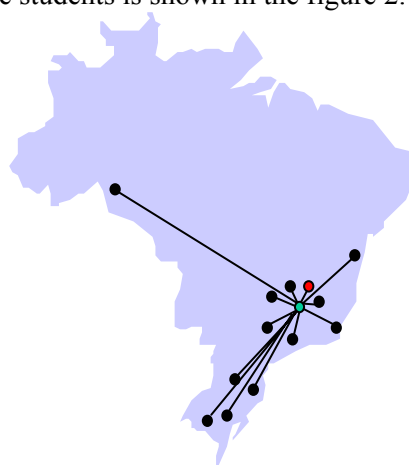
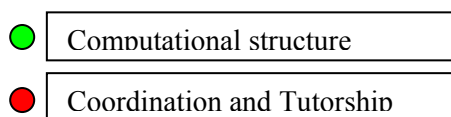
The focus of the current work is the computational system of learning support, the experiment evinces: the analysis of the available resources for the cooperation and the usage of the VCLE on the IOL course. The planning, designing and production of the course are detailed by Coelho (2000).

The methodology used in the production of the IOL course incorporates the adoption of tasks for cooperative learning. These tasks determine the cooperation model proposed by the environment and can be numbered independently of the issue domination that is being taught (SANTORO et. al, 1999). Kumar shows the following types of tasks: cooperative concepts learning tasks, cooperative tasks for solution of problems and project development cooperative tasks (KUMAR, 1996 apud SANTORO et. al, 1999). The project development cooperative task was adopted in the experiment.

The course was initiated on May 10<sup>th</sup> in 2000, having 30 students from many states in Brazil, and 4 co-authors teachers. The geographical distribution of the students is shown in the figure 2.

Figure 2: Geographical distribution of the students

Participants of the IOL course in Brazil.



The course activities were ended on July 10<sup>th</sup> in 2000, while auto-evaluations were analyzed and it was detected that 16 out of 30 students initially subscribed to the course accomplished all the tasks. However, the 14 students who didn’t accomplish all the tasks can’t be considered as resigned, because the motivation for the

experiment participation was much varied and some students didn't send their auto-evaluations, but participated of all the scheduled activities. Only 4 of the students actually abandoned the course.

An evaluation formulary was sent to all the participants and answered by 11 students. Some important points of the evaluation can be evinced: among all the tools supported by the environment, the discussion group got the highest level of acceptance by the participants of the experiment, and it was considered a good pedagogical tool, being easy to use and pointed as the main reason for motivating the participation. This is a relevant fact, because it shows the cooperation characteristic incorporated in this tool. The full analysis of the evaluation is available at Martins (2000).

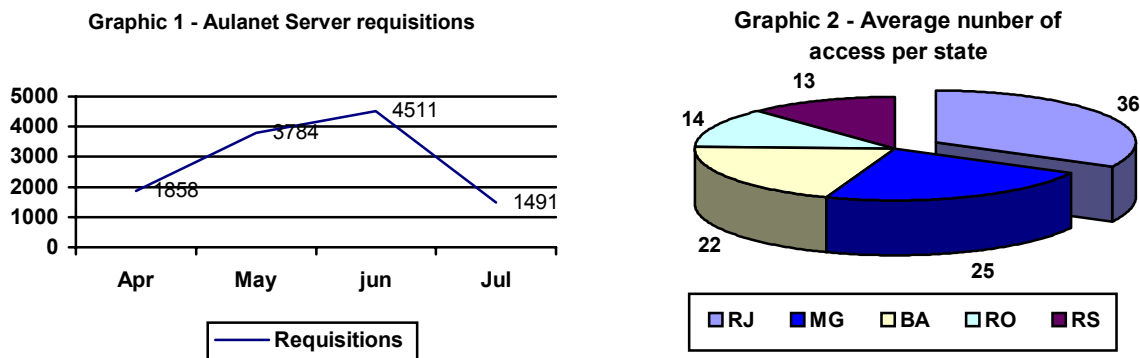
About the technical aspects, the system kept stable during all the period that the IOL course was performed. The traffic of information generated by the participants of the course could be observed through the requisitions registered in the administration tool and presented in the graphic 1 in the figure 3. A requisition is considered equivalent to a solicitation made by a user to the AulaNet server – the access to a page, module or discussion group, for example. The requisitions made before the beginning of the course pointed in the graphic represent the developing and implementation phase of the didactic material.

There's another important statistical data about the AulaNet that demonstrates its stability, even for more distant connections: the number of times that each participant accessed the system. Considering an access as a positive confirmation of authentication on the system entrance, it was registered 574 accesses on the IOL course. It represents an average number of 19 accesses for each student. The student who performed the greatest number of authentication was from Rio de Janeiro and accessed the system 59 times on the course. Not considering those who accessed the course less than 8 times – 2 for each module – the total number registered is 509, with an average of 26 per student. The graphic 2 in the figure 3 shows the average number of access per state, excluding all the values less than 8 authentications.

Based on these values, we can prove that even for a very reduced number of users – considering the universe of potential students subscribed to courses of this nature – the number or requisitions on the server raised in 243% during the execution of the experiment.

To produce and bestow tutorship on the course, the responsible teacher executed 310 authentications from Belo Horizonte/MG, with a dial up connection at 33.6Kbps with a local Internet service provider.

Figure 3: Statistics of the requisitions and authentications of the IOL course





Source: Aulanet Software.

## CONCLUSIONS.

Having as premise the necessity of adaptation of the educational systems to the qualitative (way of education), quantitative (demand for education) requirements, and the state of art in computational systems used for education via Internet, this work provided the confirmation of the possibility to perform educational activities on Internet, in a cooperative approaching, inside the limits imposed by the medium. It was confirmed the necessity of adoption of proper methodology on the design and execution of the course. The cooperative characteristic of the environment is directly related to the methodology adopted by the projector of the educational activity.

A computational system can support learning environments and can be used for the cooperation. However, this cooperation, while being a pedagogical action, only works effectively with the active participation and continuous attendance of the tutorship in the learning environment. The activities coordination, the act of taking a decision, the representation of the knowledge of the groups and the sharing of information are activities related to the presence of the tutor.

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