

# An Ergonomic Vision of Actors and Resources in Distance Education Environment

*Isnard Thomas Martins<sup>b</sup>, Edgard Thomas Martins<sup>b</sup>, and Marcelo Márcio Soares<sup>c</sup>*

*<sup>b,c</sup> Department of Design  
Universidade Federal de Pernambuco  
Recife, 21267173, Brazil*

*<sup>a</sup> Institute for Universidade Estácio de Sá  
Advanced Systems Engineering  
Rio de Janeiro, 98714888, Brasil*

## ABSTRACT

Comparative studies aim to identify, describe and evaluate conceptual and technological innovations focused on the continuous training of students with emphasis on distance education methodologies and tools. The learning process in web-based instructional models becomes a complex commitment to educator, just as the blackboard and the chalk paradigm had been in the past, when the blackboard and chalk were deemed the formal means of transfer of knowledge between the professor and the student in the traditional school environment. Breaking this paradigm is just the initial step to accept the "Invisible School" and the "remote" teacher, who can be "turned on and off" by the students, according to their time constraints and learning conveniences, which are as flexible as the selection of roadmaps on the development of the curriculum frameworks of what should be learned, and where to learn, with whom to learn and when to learn. Some Distance Education environments are being designed by web-designers and html language programmers, and it is expected that the final product, besides presenting a friendly interface and pleasant visual, can also present a pedagogical environment and ergonomic relationships with its users.

**Keywords:** *Ergonomics, Distance Education, Constructivism*

## INTRODUCTION

The reading of information in a book replaced by the reading on a display represents the mere replacement of the boredom of reading books by reading on video. The constructivist philosophy of learning defines the cognitive process as the internal construction of the knowledge in terms of long-term memory, with the personal knowledge built through experience and interaction with the world, which he called active learning. Upon replacing the traditional technology of the "Computer-Teacher" binominal, where human contact is lost, students are isolated and the educational experience is passive, limited and alienated by environments where the WEB represents the means of interaction, enabling research and consultation of information and interaction with tutors and fellow students. The role of the teacher and inflexible rigid teaching methods has been questioned by educators who advocate cooperative learning, as opposed to the dictatorship of tax knowledge, practiced by traditionalists who believe that teaching authority, and assimilation of knowledge for apprentices are necessarily two sides of the same coin (Fox, 2008). The nature of the relationship between learners, teachers and mediators with these environments sets, however, the <https://openaccess.cms-conferences.org/#/publications/book/978-1-4951-2107-4>

greater or lesser degree of interaction of actors with the pedagogical proposals offered, directly reflecting the level of interest of the user-customer, reflecting itself directly on the overall results achieved in the Distance Education Courses. The restructuring of the knowledge teaching and transfer process from teacher to student through new paradigms that determine a deep change in the manner and means by which this knowledge is constructed by the actors involved in the instructional environment that comprise the new education model (Killen, 2000). The most promising direction, actually, translates the perspective of collective intelligence in the educational field.

Resources and technologies used must be efficient and ergonomically connected to the information and knowledge sources, which includes exploration of ideas from a research perspective, data acquisition and synthesis, and problem-solving models that are unique and specific to each subject. When working with multiple cultures, the ignorance of the subject can be a major obstacle to the success of the enterprise. A more humanized, intuitive, ergonomic and metaphorical man-machine interface should be progressively more available to the end user and, when added to the teachers and students' intelligences, we will have an educational model, integrating a powerful network endowed with intellectual, cognitive, collective and cooperative energy, where human essence must prevail above all (Martins, 2001).

The relevance of this subject is recognized in countries like Brazil, India and China, among other countries with continental dimensions, where the education-directed resources almost always lie below the real needs of the target audience and where the term "distance" gains, therefore, a certain importance in the range of concerns of the authorities related with the educational system, as well as teachers, researchers or institutions dedicated to education, specialization or training of its universe of users.

The consideration of the geographical and social factors related to the democratic context of Distance Education Systems arouse discussions where the Piaget's theories could significantly influence the usability, construction and specifications of models focused on user's cultural process (Niskier, 2000). The undergraduate and continuing graduate education represent strong needs for getting qualified professionals in the Brazilian professional scene (Azevedo, 1012). However, the huge geographical dispersion, added to reduced investments, greatly restricts the qualification and continuous refreshment activities of university-educated professionals who wish to improve their studies and create specialties in their respective educations. For this reason, short or medium term Distance Education courses can stand as a rational solution to the potential and idle demand and fill the gap represented by the education deficiency.

## **CONTEXTUALIZATION**

The huge drain of students in Web courses is widely known, especially due to the lack of usability of instructional tools and the lack of courses focused on the real needs of the target audience, which is not prepared for activities involving interaction with automated tools applied in Distance Education courses. The interactive technologies led to the development of the Computer-Aided Distance Education systems, questioning the pedagogical efficiency of the conventional educational system, exclusively based on the use of classroom, in a fully synchronous mode, requiring the physical and simultaneous presence of both teacher and student (Campos, 2000). Distance Education comprises the education through printed or electronic media provided to people engaged in a learning process at a time and place that are different from the instructor or other learners'. Since early times, when paper and ink were used for mailing in England, the Distance Education incorporated several technologies to meet requirements of the different medias, such as radio, television and computers. Computers and communications have been used in different ways: chat groups, email and, more recently, the World Wide Web.

In the evolution of the pedagogical tools made available from the systemic modeling, modern computational resources, combined with high-speed communication networks, have been applied, transforming the previous and restricted scenario of instructional environments in a new educational model. The new system allowed the asynchronous learning offer, delivering teacher's lessons through multimedia contents. The student keeps contact more often with the "invisible teacher", through chats and discussion forums. The learner interacts with the syllabus of distance education classes and participates in constructive discussions with colleagues who are geographically far from him, meeting them virtually through the educational distance education tools. Virtual environments supported by new information and communication technologies combine synchronous and asynchronous resources - these are the "multi synchronous" environments.

## **PREPARATION OF AN EDUCATIONAL ENVIRONMENT**

The constructivist model is advocated by many authors as being the teaching method with the best cognitive usability, comprising a high degree of interaction in Distance education cooperative environments. However, it requires ergonomic tools for the actors involved, aiming at better operating and pedagogical results (Ritto, 1995). An efficient Distance education requires an extensive preparation, adaptation of traditional methods to the new learning environment, as well as a deep observation of the social and technical environment of the target audience of the educational material. According to Campos, the systemic environment can be rated according to the degree of interactivity allowed to it and initiative afforded to the student:

- High interactivity: It enables the unexpected discovery and the discovery with free exploration.
- Average interactivity: it enables the guided discovery
- Low interactivity: it favors the directed learning, the inductive exposure and the deductive exposure

The degree of interactivity with the instructional environment is also related with the learning theories that distinguish educational environments, with greater or lesser student's participation and control in the knowledge construction process. Masson listed the properties considered essential in the development of the pedagogical content of the distance education environment: ease reading, motivating and interesting, well structured, clear and defined objectives, practical and relevant, activities, accurate instructions, appropriate information density, nice presentation.

## **RESULTS AN DISCUTION**

The consideration of the geographical and social factors related to the democratic context of Distance Education Systems arouse discussions where the Piagetian theories could significantly influence the usability, construction and specifications of models focused on user's cultural process. Ritto and Machado Filho (1995) say that Piaget's ideas feed our reflection. The Constructivism has continuously contributed to our formulations, being constantly present in our educational background. Freitag (1984) quotes the interference of the structure of classes in the very construction of the consciousness structures, differentiating individuals as to their competence to understand and assimilate the world. Often, individuals are unable to change the external material reality or assimilate changes that occur in the social structure, simply because they do not have cognitive condition to perceive, criticize or try to overcome them. There is a play of forces (social class, school level, language and biological maturity) that acts either in favorable or unfavorable manner on the psychogenetic development, and that ranges in accordance with the age variations and social constellation in which the individual is.

Thus, we see that there are sharp implications related with the usability factors, in face of the heterogeneity of the prospective target audience, which hardly ever is culturally and socially leveled. The perception of these differences becomes relevant when the system's developer works in the specifications and models an environment that will be applied in a distance education-oriented context (Falkembach).

## **TEACHER AND STUDENTS AS ACTORS OF THE MODEL - CHAGE FACTORS**

The student is the subject who builds his own knowledge. Shortfalls occur when the exchange of action between the subject and the object of knowledge fails. Considered as the father of constructivism, Jean Piaget, a Swiss psychologist, studied the development of the human being's intelligence, from birth to old age. Piaget examined the evolution of thinking, being it the most widespread pedagogical line among teachers who advocate the "Active School" instead of the "Traditional School". Based on the Piagetian theory, three basic principles regarding the learner can be inferred:

respect to his production, space to test his hypotheses, group work to facilitate his learning..

Lévy put the teacher's role as the epicenter of a problem related to qualitative changes in the learning process to an emphatic discussion, where he sought to establish new paradigms for knowledge and learning acquisition. In response to it, there was the restructuring of the teaching process and the transfer of knowledge from teacher to student through new paradigms that determined a deep change in the manner and means through which this knowledge is constructed by the actors involved in the instructional environment. Teachers should be trained in creating attractive and competitive educational content, presenting quality results backed by support for the construction of educational tours, web designers, literary editors, software engineers, project managers and experts in industrial processes, librarians and art managers (Levy, 1999, 2007).

The institution that promotes a distance instructional environment must prepare itself to compete with cinema, newspaper, radio and television. In the technical and pedagogical sphere, it is observed the redirection of methods brought to the participating student, emphasizing the ergonomics of the tools used for distance learning. In models of non-ergonomic automated instructional environments, which feature a significant part of the free courses offered over the Internet, the content provider represents the remote "teacher", using the computer as a unique vehicle for the transfer of knowledge and means of control of participation, assessment of results, tests and application of educational contents. Kanuka cites that the complexity related to the control and motivation of a distance instructional environment provided with interactivity, efficiency and pedagogical quality should not be underestimated.

If, on one hand, the innovations and tools offered in the new instructional designs practices surprise the Teacher-Facilitator's practices, on the other hand, this diversified model presents such a complexity degree that requires a reflection on the methodology to be employed, resulting in the reorganization of tasks to be performed. This also occurs with the Teacher-Facilitator interface with the assessment methodology on content generated by student-users.

The professional responsible for building this mediating interface arises in this scenario and is defined as the art/science capable of creating an educational environment, using specific technological materials that will allow the student to learn the educational content, enabling him to perform certain specific tasks. The instructional design is based on research in the cognition, educational psychology and problem-solving practice areas. Kanuka alerts to the growing use of instructional designers as pedagogical specialists involved in e-learning activities, emphasizing the importance of these professionals' mastering the design and development of pedagogical contents referring to each subject transported to the virtual environment . When instructional designers are employed as pedagogical experts, but are not specialized in the content addressed in the virtual environment, or online tutors specialized in educational contents, but with no domain of pedagogical practices, the result of the educational model will present an undesirable bifurcation dividing content and pedagogy. Thus, the knowledge of the pedagogical content shall integrate itself to the functional competence of the instructional designers, incorporating this important feature to their professional profiles.

The changes noticed in the role of teachers and students in this scenario of changes. The former fails to act merely as a transmitter of knowledge to become the facilitator and provocateur of the learning process of this relationship. Besides offering a basic content, the teacher must also assume his/her presence as support for the development of ideas and interactions with the disseminated content. The teacher, while an actor in this scenario, must be treated carefully, after decades of rigidity of presence-based classroom, starring in a new role in the forms and means of communication of digital spaces. However, the success or failure of the technical and ergonomic model is conditioned to factors that can decisively contribute for the efficient achievement of their pedagogical goals. This set of factors is subdivided into four groups: context of use (physical, emotional, functional factors); expertise domain (influence on system, influence on user); user's characteristic (computing experience, frequency of computer use, knowledge of content addressed in hypertext, reading ability, cognitive factors); characteristic of browsing tools (forms as they are related to skip zones, browsing features, audible and visual receptive feedback, level of confidence to go back to the homepage).

## CONCLUSIONS

The reading of information in a book replaced by the reading on a display represents the mere replacement of the boredom of reading books by reading on video. According to Bostock (1996), the constructivist philosophy of learning defines the cognitive process as the internal construction of the knowledge in terms of long-term memory, with the personal knowledge built through experience and interaction with the world, which he called active learning. Upon replacing the traditional technology of the "Computer-Teacher" binomial, where human contact is lost, students are isolated and the educational experience is passive, limited and alienated by environments where the WEB represents the means of interaction, enabling research and consultation of information and interaction with tutors and fellow students.

The role of the teacher and inflexible rigid teaching methods has been questioned by educators who advocate cooperative learning, as opposed to the dictatorship of tax knowledge, practiced by traditionalists who believe that teaching authority, and assimilation of knowledge for apprentices are necessarily two sides of the same coin. Resources and technologies used must be efficient and ergonomically connected to the information and knowledge sources, which includes exploration of ideas from a research perspective, data acquisition and synthesis, and problem-solving models that are unique and specific to each subject. When working with multiple cultures, the ignorance of the subject can be a major obstacle to the success of the enterprise. A more humanized, intuitive, ergonomic and metaphorical man-machine interface should be progressively more available to the end user and, when added to the teachers and students' intelligences, we will have an educational model, integrating a powerful network endowed with intellectual, cognitive, collective and cooperative energy, where human essence must prevail above all .

## REFERENCES

- Azevedo W. *Muito Além do Jardim de Infância: O Desafio do Preparo de Alunos e Professores Online*,. London, Routledge,1998.Lastaccessed 5 january, 2012 <http://pt.scribd.com/doc/49666884/Muito-para-Alem-do-Jardim->
- Campos, G.. *Vantagens, Desvantagens e Novidades da Ead*. Rio de Janeiro, 2000. Last Accessed 15 may 2010 [http://www.timaster.com.br/ext\\_materia.asp?codigo=205](http://www.timaster.com.br/ext_materia.asp?codigo=205)
- Falkembach, G. A. M.. *Adaptive hypermedia: An option for the development os educacional systems in order to getting more effective learning*. 2000. Last accessed 12 march 2001 <http://www.conex.com.br/user/fabrizio/construtivismo.htm>
- Fox, S. I. (2008). *Human psychology* (10th ed.). Boston: McGraw-Hill Higher Education.
- Freitag, B.. *Sociedade e Consciência - Um Estudo Piagetiano na Favela e na Escola*, São Paulo, Cortez Editora, 1984. Cap.6. P. 109
- Killen, J.D., Fortmann, S. P., Schatzberg, A. F., Hayward, C., Sussman, L., Rothman, M., Strausberg, L., et al. (2000). Nicotine patch and paroxetine for smoking cessation. *Journal Consulting and Clinical Psychology*, 68, 883-889.
- Lévy, P. *Cybercultura*, São Paulo, Editora 34, 1999. Cap.2-4. P. 22-54
- Lévy, P. *Inteligência Coletiva*. Edicoes Loyola, 2007, Cap 3. P.39-40.
- Martins, I. *Estudo Ergonômico de Ambientes Instrucionais na Internet*. Rio de Janeiro, PUC-Rio, Dissertação de Mestrado em Ergonomia, 2001, pp. V-VI.
- Masson, J. *Sur La Satisfaction Des Etudiants Dans Un Contexte De Formation À Distance: La Télé-Université*. Paris. 1988, Au Press, [Vol 3, No 2](#)
- Niskier, A *Ciência e Tecnologia do Estado do Rio de Janeiro*. Cedibra, Rio de Janeiro, 1968. Cap 5. P. 38-41
- H. Fuks, C. Lucena. *A Educação na Era da Internet*, Clube do Futuro, Rio de Janeiro, 2000. C.2-6. P 67-81
- Ritto, N. Machado Filho. *O Caminho Da Escola Virtual - Um Ensaio Carioca*, Rio de Janeiro, Edições Consultor, 1995. Cap.3. P. 61

