THE MODELS OF DIDACTICAL PROCESS COMMUNICATIONS IN TRADITIONAL AND DISTANCE LEARNING SYSTEMS: ANALYSES THE STATE OF THE ART

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ABSTRACT

This paper consists of an analysis of the state of the art of research and development for the different models of didactical processes in traditional and distance learning systems. The educational system is an open and dynamic system. In such context as the educational system, seven models of didactical process communications can be observed. The contemporary models are based on collective knowledge building in collaborative learning environments. The last model needs self –regulated students' competence of learning.

Keywords: **Communication, educational models, communication, cybernetic, distance learning, self-regulated learning, and collaborative learning environments.**

INTRODUCTION

The aim of this article is to generalise the existing models of the communication teacher-student in traditional and distance learning didactical process and to determine the evidence that can be included in the Contemporaneous Didactical Process Communication Model.

According to the Bespalco, 1989 the didactical process is a combination of two algorithms: the algorithm of student activity and the algorithm of professor activity. The algorithm of student activity, as an algorithm of functionality constitutes a system of actions that determine aims, motivations and methods of forming knowledge and abilities. The algorithms of professor activity, named the algorithm of conducting the students' activity includes a system of operations of teaching, assessment and corrections of the students' activities. Both algorithms are dependent on each other and constitute the basic framework of a learning situation in the educational system. The didactical process in educational system can be realized traditionally (real didactical process) and at a distance (virtual didactical process). In the first case, the teacher uses different didactical technologies to increase student motivation and learning, but the teacher's "talk" dominates traditional classroom instruction and the learner is limited to oral information and in same case to writing. At a distance, the didactical process can be realized synchronically, asynchronically and in mixed form. On-line didactical technologies include interactive and adaptive models of learning, realized through charts, e-mail, videoconferences and computer conferences.

In our point of view the Didactical Process Communication Model is an algorithmic representation of a didactical process including the following main elements: professor and students and their interactions through communication. The didactical process is a subsystem of the educational system that is an assemblage of inter-related elements comprising a unified whole. It is an open system. Typically, in an open system elements are connected together in order to facilitate the flow of information. The educational system is an open and dynamic system, so it is influenced by events outside of the declared boundaries and is changing over time. The didactical process as a subsystem has the proprieties of an open and dynamic system, too, and the main components of didactical process: professor and students, whose interaction through communication is influenced by events outside the didactical process system. But, the influence is reduced or neglected by the self-regulation function of open systems. So, the didactical process as the self–regulated process developed

different models of increasing the efficiency of learning that was realized through changes in professor-student communication. In analyzing the different didactical processes from ancient times to the present, it can be observed that only the first teachers came in front of learners with their interiorized knowledge and abilities to communicate it. This epoch was named by the Ricmond, 1968 the "Epoch of chalk and dialogue". But, in the epoch of chalk and dialogue, books began to be seen as effective tools in the hand of teachers and the lecture of books – as a method of individually acquiring competence.

The First Museum from Alexandria with a collection of 700000 books, Libraries from Perdam, Phodos, Pebla, Efes, and Univeristas magistrorum et scholarium from Salermo, Bolgna, Oxford and Cambridge were the first to present the problem of student–instructional context interaction, but the problem could not begin to solved until the "Epoch of Techniques" and continue in the "Epoch of Technology".

PURPOSE

The Informational–Communicational Technologies have affected all subsystems of the Educational System: aims, objectives, the didactical process, teachers, students and forms of education (Bespalco, 1989). But, if the ICT has affected the forms of teaching, in the educational system appear new fractals, that is more vital forms of teaching and learning: virtual communicational models based on adaptive and intelligent didactical technologies – open characteristic of system. The process of communication realized in virtual communicational models of distance learning processes had decreased the external influence with 1.correspondence models (middle of XIXth century), 2.audiovisual models (1960) and 3.informatics and telematics models (1980) – dynamic characteristic of system.

However, in some cases distance learning is viewed as distributed learning and the proposed models have not contributed to increased learning. This is because in instructional design the "improving" models of the first teaching machines are used: instructional material accompanied by a test with three or four variants of answers. On the other hand, as more and more teachers use virtual learning environments to build and deliver their courses, the effectiveness of models in the achievement of communication between teacher and students in distance education has spawned vigorous debates. Thus, this study seeks to generalise the existing teacher-students models of communication and computer–student communication that can be used to evaluate the effectiveness of instructional design principles in distance learning courses.

REVIEW OF LITERATURE

Ricmond, 1968 identifies three epochs of Educational Technology. In his opinion the first epoch is the "Epoch of chalk and dialogue", the second is the "Epoch of Techniques" and finally the "Epoch of Technology". Bespalco, 1989 determines that a didactical process can be realized in a chaotic and leading or conducted mode. He identifies 8 models of implementing the didactical process in educational system:

1. **Group method,**
2. **Audio - video tools,**
3. **Individual consultation,**
4. **Simple book of instruction,**
5. **Small group,**
6. **Technical resources,**
7. **Tutoring or completed individualization and**
8. **Programmed instruction.**

The author notes that the didactical process as a chaotic informational process is characteristic for types 1, 5, and 6. That is because the teacher cannot determine what has been learned at that moment and the information is external. To be internalized the student must work with information and transform it into knowledge, abilities or competence. This can be done through models 3, 4, 7, 8, characterized by leading the learning process through individual consultation (one teacher–one student); book of instruction (tools –one student); tutoring (one teacher or computer instructional system–one or two students) and programmed instruction (one computer program and one student). Between the object (professor) and subject (student) of leading in the didactical process a correlation is initiated depending on the content and instructional context. In the model proposed by the Frick, 2002, seven dependencies are established: Professor-Student, Student–Content, Professor–Content, Student–Context, Professor–Context and Content–Context.

In modern society the development of human competence has become focused on more abstract and generalized forms of knowledge. It is in this context the process of competence formations has been delegated to computers. Competence-based education tends to be a form of education that derives a curriculum from an analysis of prospective or actual role in modern society and that attempts to certify student progress on the basis of demonstrated performance in some or all aspects of that role [Grant, et al 1979]. Lindgren R., Stenmark D. and Ljiungberg J. analyze the notion of competence as established in early 20th century by Taylor, 1911 and remark that competence must be visible and measurable.

The Schinner linear model of behavioral teaching was the first model of forming the competence with the educational software. Marsh II, 2005 pointed out that "beginning with Thorndike and continuing with more contemporary work by B.F. Skinner, "effective" teaching methods have been isolated and recommended as generalizable. The lesson plan, use of behavioral objectives, reinforcement, and simplification of content are based on this tradition. The basic approach is to isolate what is to be taught, present it in a linear way, give feedback, and not introduce a new piece of information until each step is mastered". The author remarked, "that learning complex knowledge is analogous to crisscrossing a conceptual landscape. This approach is based on the uses of multiple representations of the knowledge domain, putting heavy demands on the designer to develop numerous representations". In discussion of the role of computers in the classroom, Hinostroza, 2005, proposes a model of educational software as a rehearsal tool designed to be integrated into a teaching strategy that separates teaching into 2 stages: learning new concepts and rehearsing these concepts.

Murray, 1999 described the Authoring Intelligent Systems and enumerated seven categories of ITS authoring systems: Curriculum Sequencing and Planning, Tutoring Strategies, Device Simulation and Equipment Training, Domain Expert System, Multiple Knowledge Types, Special Purpose and Intelligent/ Adaptive Hypermedia grouped according to the type of ITS system they produce. Graesser, 2005 presents the AutoTutor as a web-based intelligent tutoring system that helps students learn by engaging them in a natural language conversation about a particular subject matter. The computer literacy version is designed to help students learn basic computer literacy topics covered in an introductory course (e.g., hardware, operating systems, and the Internet). The author notes that AutoTutor works by having a conversation with the learner. In this point of view AutoTutor appears as an animated agent that acts as a dialog partner with the learner and the animated agent delivers Auto Tutor's dialog moves with synthesized speech, intonation, facial expressions, and gestures. Students are encouraged to articulate lengthy answers that exhibit deep

reasoning, rather than to recite small bits of shallow knowledge. For some topics, there are graphical displays and animations.

Okada, 2005 suggests that one of the greatest advantages in virtual learning environments (VLE) is communication anytime from anywhere. He concludes that VLE is not only a technological resource (computer, modem, connectors, web servers, software, web services, synchronous and asynchronous interfaces), but also consists of all participants (teachers, students, guests, technicians, specialists, and apprentices, including their interactions), the traffic of text, documents, images, sounds, the sharing of messages, the discussions forums, the registering of databank and forms, the access of websites, and all information. The author postulates that VLE began to reveal the development of a new paradigm in education: the transformative nature of the learning process where students and teachers can learn and contribute to each other.

Boekaerts, 2002 analyses the problem of "understanding the dynamic of self-regulated learning" and "understanding the dynamic of powerful learning environment as a key to promote self-regulation in the classrooms". The author argues that students bring their own goals to the classroom and that these goals are the key to their adaptation system that gives meaning and organization. His opinion implies that students:

- **orient toward the attainment of their own goals;**
- **generate thoughts, feelings, and actions in order to attain these goals;**
- **work systematically toward the attainment of goals.**

Teaching students self-regulatory skills in addition to classical subject–matter knowledge is currently view as one of the major goals of education. Weinert, 1996 classified prerequisites for self-regulatory learning in:

- **motivational preference;**
- **volitional approach, strategies and regulatory techniques;**
- **metacognitive competence;**
- **availability of learning and problem–solving strategies.**

According to Simons, 1992 learning must be prepared (prior knowledge activated, goals defined and the relevance of goals made clear); learning-related actions must be executed (the cognitive strategies and processes necessary for understanding, retention and transfer activated); the learning process must be assessed (e.g. by self-evaluation of achievement), and motivation and concentration must be maintained.

METHODOLOGY OF THE STUDY

To evaluate the effectiveness of the Didactical Process Communication Models comparisons of the existent models of the didactical process through two algorithms were made to see the significant differences existing in the teacher - student communication model. In addition, the historical method and the systemic approach of education were used. The concept of educational system as an open and dynamic system is based on the theory of systems in cybernetics.

ANALYSING THE COMMUNICATION MODELS OF THE DIDACTICAL PROCESS

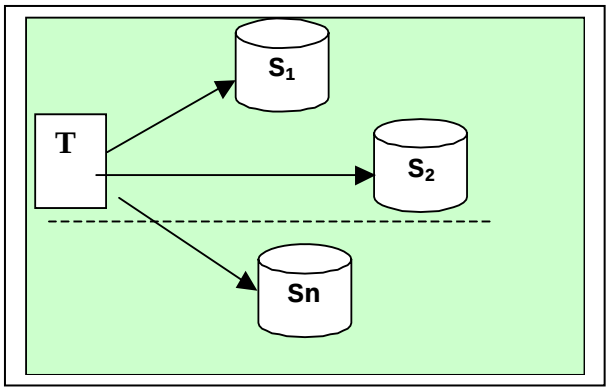
In the structure of the didactical process, one can observe two directions of the evolution in logics of Bespalco algorithms:

- **in *functionality*, which refers to the informational context, developed by the teacher (or instructional designer, author, methodist);**
- ***in leading the didactical process* as result of assimilation the facts and transformation into knowledge and competence.**

The first direction is more characteristic for developing the technological tools for instruction (books for instruction, manuals, audiovisual, CAI etc.), and for developing the ITS authoring tools for building the ITS authoring systems. The second direction is more characteristic for Intelligent and Adaptive Tutorial Systems and models for Adaptive Assessment of Students Knowledge [Zaiteva, 2004]. Nevertheless, the evolutions of the didactical process communicational models have their roots in ancient times. The first models of the "epoch of chalk and dialogue" were based on verbal and writing technologies.

In this point of view, the first models could not initiate a discussion about the problems of communication between teacher and student (it was done later by hermeneutics), because it was considered more important to probe the model in the real didactical process, between one teacher and one student.

Figure: 1 The epoch of chalk and dialogue



It was the first conducted process in which the teacher has the dominant role and the student must only execute exactly the proposed tasks. Monro, 1911 acquired that only one principle was important at that time: do as I do.

Whitney-Smith points out that traditional instruction only modestly facilitates learning, because it is based on a materialistic notion of learning where the instructor "owns" knowledge given like an apple to the student. It implies that knowledge is a thing and that it is always the same. The "Socratic dialogue" changes the vision about education and the sophists were first to use the teaching technology of group discussion [Caplan, 1998] until the 11th century when Abelard's Scholastic method was developed.

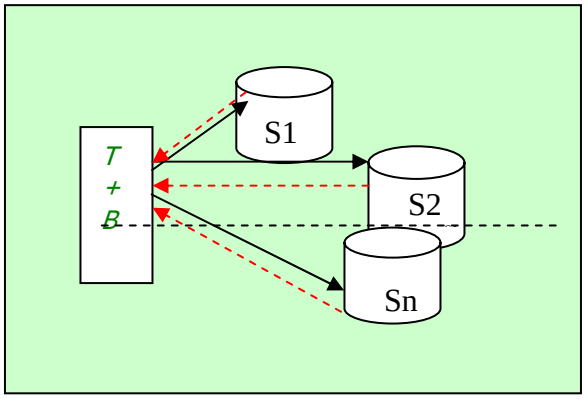
Later, in the 17-century the printing press technology affected the traditional didactical process and the book of instruction with sequencing content from simple to complex for the first time tried to imitate the function of teacher.

According to Eric Ashby, 1967 writing words began to be used as tools for the communication of knowledge. The author notes that formerly, knowledge was transmitted only through spoken knowledge and writing could join the old communication tools only after overcoming the strong opposition of the intellectuals of that time.

The dialogue introduced change in the process of communication: it became bi-directional. On the other hand, the rapid development of the ancient Univeristas magistrorum et scholarium placed dialogue before all traditional didactical methods and put the base of active learning. The active learning develop the second Communicational Model, but now the teacher more frequently uses the book of instruction for implementing the function of teaching.

Figure: 2

Figure: 3 The II Communicational Model, B- book of instruction



So, two problems were initiated by the epoch:

- **the problem of developing the informational context for instruction;**
- **the problem of leading the didactical process in form: one teacher–more students.**

Under the influence of this model, educational systems tended to provide for one-way teaching interaction.

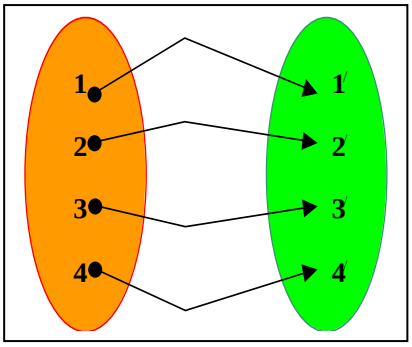
The invention of printing and the possibility of storing knowledge in books are viewed as a teaching revolution that effected a radical change in human life and in didactical process.

The Epoch Of Technique

Ricmond associates the epoch of technique with the first industrial revolution and with the application of technical innovation: photographs, radio, motion pictures and TV. Technical innovations contributed to the increasing the quality of knowledge and served as an antidote to abstract and limited teaching styles of verbal representation. The new technologies and methods were specific and aimed to delegate the communication function of teacher to teaching machines, but did it with sound educational films, radio or mail.

As a result of the technical innovations and theoretical research, more and more didactical processes have implemented these innovations. The arguments can be found from the following correlation:

Figure: 4 The dependence between scientifically - industrial and didactical innovations



1. **Theory of education, theory of curricula, 1900- 1'. module learning, plans for instructions, 1910**
2. **Mail, phone, photography -2/ distance learning (the age of correspondence and the age of electronic tools for communications)**
3. **TV (mute and sound film), -3/ instructional film (1940);**
4. **Computer -4/the first machine of instruction (1920, Sidney), programmed instruction (1950).**

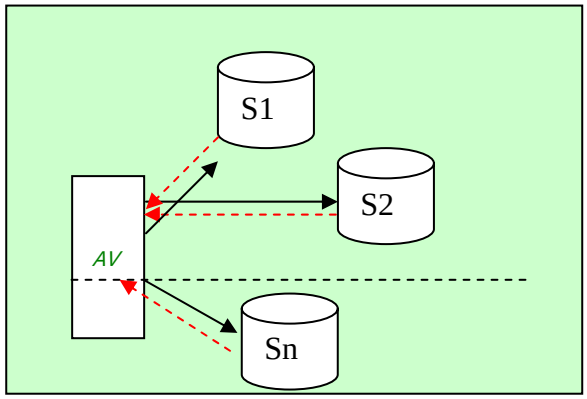
Analyzing the role of the audiovisual in the Educational Technology, it can be concluded that richly visualised representations and sound technology serve a new communication model: audiovisual resources (AV) – student (S). Some researchers demonstrated that AV contributes to form more superior educational significant level of performance when compared with traditional methods. The main line that influences competence formation was named the *pictorial mode (PM)* and it was assumed that it must aid recall, comprehension and understanding. Also, it was demonstrated that transformational illustrations have a direct effect on memory by targeting the critical information to be learned, the

representation frequently embodying disparate elements in a coherent whole [Levin et al, 1987].

On the other hand the model serves as a negation of the traditional model T–S. The teacher's function of communication has been delegated totally to audiovisual resources, but the new model was only a bad copy of human function, without feedback and with minimal results. In the same time, according to the Eric Ashby, 1967 the development of electronic system and new communication technologies not only permitted knowledge to be memorized, but also provided interactive methodologies for its transmission. AV can be seen as an educational media, antithesis of traditional verbal methods to make learning more concrete and relevant to real world into the classroom through the use of a variety of still and moving pictorial displays.

For example, Wilson, 1950 had written in his report "The necessity for teaching more and more without increasing the class period, school day, or graduation age, ..., there are some of the vital problems which can be solved best, if not only try the use of audio-visual material". Studies showed that AV offers no significant differences between traditional and television methods.

Figure: 5 The III Communicational Model



Ricmond, 1968 mentioned that radio, instructional films and TV presented information dynamically, but the listeners had reduced control of the provided information.

The didactical process using audiovisual resources was chaotic, but the combination of audiovisual+practical work+traditional assessment increases the quality of knowledge.

The best result of the epoch was the invention of the principle of interactive feedback. In every feedback, as the name suggests, information about the result of transformation or an action is send back to the input of the system in the form of input data. New data can accelerate the transformation in the same direction as the preceding results, or new data can produce a result in the opposite direction to previous results. The principle of interactive feedback allows teacher to know the results of the students' learning immediately and the machine could be used not only for instruction, but for assessment, too. In this case; the role of the teacher changes from delivering knowledge to building the context for teaching at a distance. On the other hand, the principle of immediate feedback in instruction initiates the problem of intelligent analyses of answers, permits the realization of the virtual tutor and serves as a core for *technology of intelligent analysis of student solution* [Brusilovsky, 2000]. Accumulated evidence also shows that various methods of grouping and teaching ranging from tutorials to lectures and two-way telephone discussions fail to produce significant instructional benefits [Dubin, Taveggia, 1968; Kulik, Kulik, 1982; Bangert, 1983 etc.] By contrast, the Keller model, based on mastery learning methods, seems to be more efficient. The Personalized System of Instruction (PSI), specifies objectives and provides reinforcement for their successful achievement, and gives more opportunities for professor-student interaction than traditional systems. In this case the professor acts as a proctor and his/her role is to monitor student progress and ensure mastery of each teaching unit (model II). Mastery research review shows a better final exam performance. The emphases on

feedback and correctives were the correct points with continue development in the epoch of technology.

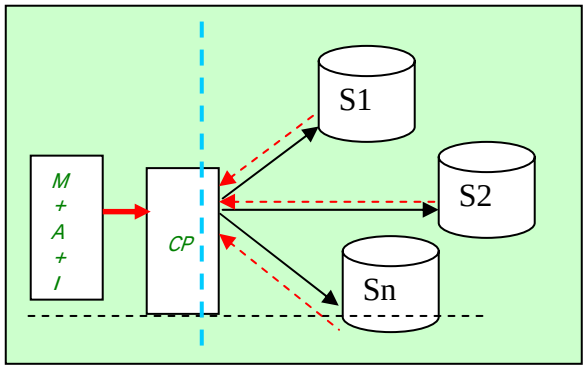
The Epoch of Technology

Cybernetics, the science of control and communication (Wiener, 1948) is another important discovery that linked the epoch of technique and epoch of technology, based on conversation theory, theory of systems, theory of information, theory of chaos, etc. The most important concept is feedback loops that occur whenever part of an output of some system is connected back into one of its inputs. But, if learning is viewed as a way in which a system changes its structure in response to the experience of its environment, we can consider that learning takes place in a black box. This is the point of view of behaviorism. On the other hand, if we consider that learning is a response of a system to its environment and that this response takes place internally in the altering of the systems structure, then our point of view is based on cognitivism. As a result, the instructional process can be viewed as:

1. **A simple adaptation to the environment, that assures indirect links with the environment.**
2. **Adaptability through instruction that behaviour may change as a result of the instructional process.**

The development of cognitive psychology in the epoch of technology evidences two separate, but interconnected systems within the human organism: a verbal system and an image system. Interactive models that included machine simulations and pictoral mode was the key of success for activation the human iconic memory storage system and provides opportunities for feedback.

Figure: 6 The IV Communicational Model, T-teacher, CP –computer program, M-methodist, A-author, I-engineer.



In new conditions the first instructional designers as authors of the educational software instructional context can be seen, but the main problem was in imitation of conversation in the traditional didactical process through machine. On these bases, programmed learning methods simply report success or failure, providing minimal interactive features, no diagnostics and no mastery conditions.

Although nominally a tutorial approach, Poslethwait's audio-tutorial method uses a non-interactive medium (audiotape) to provide the tutoring. In 1982 the personal computer was named as *the man of the year* shortly after IBM introduced its first mass-marketed personal computer. The availability of computers gave specialists in educational technology a concrete task: to develop knowledge using the computer. The problem was how? Different schools found different solutions. For example the American point of view was based on the philosophy of pragmatism: knowledge can be developed as a result of solving real practical tasks, but the ex- Soviet point of view was based on the psychology of action: all children have enormous genetic potential and the role of educational technology is to ensure the process of assimilation of knowledge. As a result, computer programs developed in the East first of all assessed students' knowledge, and the computer programs using a pragmatic

point of view were tutorials. These results indicate that the technology for enhancing learning can be provided using a variety of different techniques for teaching and assessment.

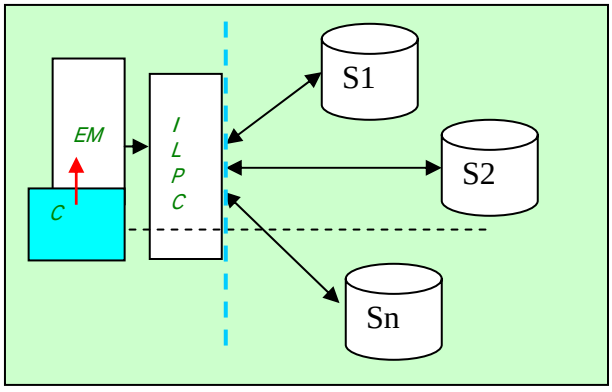
The computer aided instruction systems (CAI) inspired by theories of behaviorism reduces every psychological process to a stimulus-response causal model, but educational systems tended to provide for a one –way teaching interaction with predefined dialogues. In this point of view, the assessment was based on a comparison of the students' answers with a limited number of predefined possibilities stored by the system without any attempt to analyze the reason why the student had made a mistake. The single teaching interaction between a teacher and a student has been studied since 1970 by researchers in AI and in cognitive psychology.

The new models: Intelligent Computer Aided Instruction (ICAI)→Intelligent Tutoring System (ITS) → Intelligent Educational Systems (IES) abandon the stimulus-response model and realize a mixed-initiative teaching dialogue, personalized to the needs of the individual student using Intelligent Learning Personalized Context (ILPC) based on educational models (EM): an expert module on the subject domain, a tutorial module, a student model, and an interaction component. The problem is in elaboration of the strategies to guide the teaching-learning interventions through suitable teaching methodologies and tools.

The interactive module determines the effectiveness of the educational system and above all, it allows the student to take the initiative in creating a mixed initiative dialogue. The analysis of interaction between system and student allows the student learning process to be continuously monitored.

Educational Software Development Company

Figure: 7 The V Communicational Model

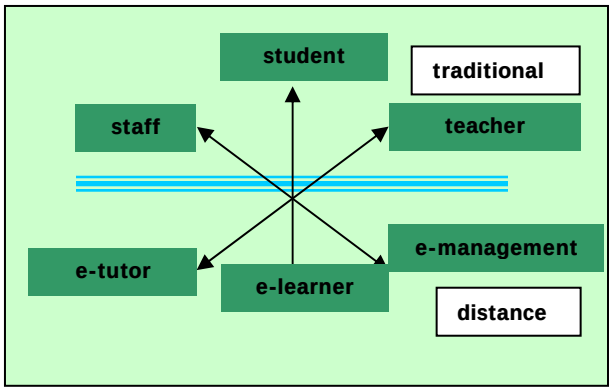


The theoretical foundation for designed an educational intervention take into account every variable involved in a teaching–learning relationship [Cerri, Leoncini, 1987].

Realizing first off all the function of tutor the Intelligent Learning System was used outside the educational classrooms.

The applied Internet in Education changes again the role of the teacher. New forms and models of providing information and communication began the age of Informatics and Telematics with computer, server, browser, and data base, video library, CD, networks, communication through satellite, and learning without frontiers.

Figure: 8 New role of the teacher and student



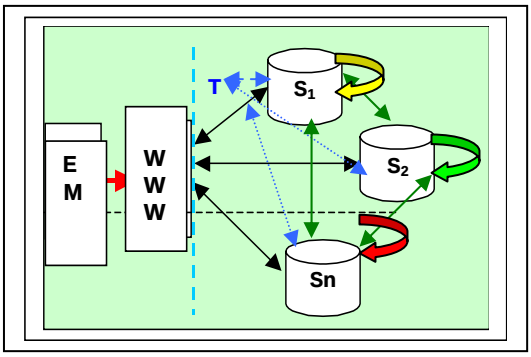
Technological innovations have needed teachers capable of reacting to change rapidly and in a constructive way and able to guide students in new educational needs of the society.

The scenarios for distance learning are different. Teaching –learning interaction can already be established with / without direct mediator of a teacher (Intelligent Educational Systems).

So, the forms of distance learning communication can be realized synchronically, asynchronically and in mixed forms.

The instructional context in distance learning modes presents an important development. Firstly, this is important because the improvement of instructional context with audio and visual files contributes to the increase of human cognition and comprehension. Secondly, the instructional context presented by the computer is a new learning environment and highly motivates the student. Finally, the instructional context provided at distance needs special principles of instructional design and in this case the context must be as clear as possible; the student cannot put any questions about how to learn or in which form to write and to present the solutions. The text becomes part of a social activity of gesture and response activities in the form of patterns of intertextuality. Jensen et al, 2005 note that the identity of the participant changes from being a writer located in a *face- to- face* interaction to becoming the author of a text represented in an abstract environment of a computer system in time and space. In the Net environment participants take part in the social interaction as an author whose identity is concurrently constructed in the process of social interaction through the intertextuality of computer-mediated texts.

Figure: 9 The VI Communicational Model

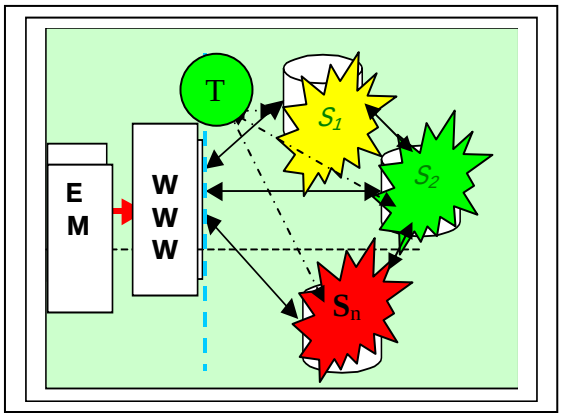


The next model of communication is a collaborative model whose main characteristic is the collaborative building of knowledge in collaborative learning environments [Okada, 2005].

The split of identity into writer and author models is a characteristic of communication and collaboration in networked learning. The extension and prolongation of a double identity in time and place make possible new forms of interaction based on designed and decided shifts of roles and advanced role-plays [Jensen et al, 2005]. The author notes that participants in

Net based collaborative work and the gestures (digital text) are distinctively differentiated from the way in which the other participants are perceived as an author of text and their responses in social interaction. In the patterns of social interactions an integral part is concurrent shifts of role between the role of writer, author and reader across different frames of reference in time and place interrelations.

Figure: 10 The VII Communicational Model



For efficiency in the Virtual Learning Environment the students must have the ability to self-regulate their learning.

The problems mentioned in 1929 by Whitehead about inert knowledge still exist at the present time.

To be self–regulated the student must have the ability to develop knowledge, skills and attitudes with enhance future learning.

Self–regulated skills can be described as goal-oriented process of active and constructive knowledge acquisition, involving the guide interaction of an individual cognitive and motivational/emotional recourses. The literature emphasizes the importance of cognitive, motivational/volitional and metacognitive processes [Boekaerts, 1999; Zimmerman, 1989; Martines-Ponts, 1990]. The processes are essential for self-regulated learning and their development are dependent on the readiness of individuals to define their own goals and objectives. New communication models include self –student interaction with own beliefs about the instructional context, student - student interaction as a collaborative method of instruction, and teacher – student interaction.

CONCLUSION

The models of Didactical Process Communications in Traditional and Distance Learning Systems included bilateral teacher – student; content – context; teacher – content; student-content; student-context and teacher context interaction. New collaborative technologies have added the student–student communicative model. This technology constitutes a new paradigm of learning, but the efficiency of the model described above depends on students' competence to self-regulate their learning. Such competence can be formed through functionally instructional context.

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