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Communication in the distance education interaction modes and the pedagogical design

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1. Introduction

The present article intends to establish a conceptual-character discussion making it possible to deepen the understanding of the interaction role in Distance Education. Distance Education is characterized as being a mediated and mediatized modality, whose purposes come true by communicational technologies. Its pedagogical practices and design have been potentialized by communication digital technologies. In this sense, we try to carry out a reflection about communicational aspects of this educative practice.

The discussion about the communicational process feasibilized by the cybernetic conception aims at recognizing legacies from Programmed Instruction to Distance Education, as the former inspires the latter, not always expressly. Besides, many critics charge it with recovering Programmed Instruction to the educational scenario, or manifest their fear that it might do that. On the other hand, professionals who develop practices in this modality criticize the didactic procedure of expressing the learning objective as reflexes of Programmed Instruction influence, but do not conceive communicational processes escaping cybernetic control, even if employing the New Information and Communication Technologies as mediators of communicational and pedagogical processes.

The attitudes identified above are not accidental, inasmuch as Distance Education based its pedagogical practices on Programmed Instruction for a long period of time (Aretio, 2002), but demand more accurate studies enabling the critic to leave the ground of mere charges towards a solid theoretical production capable of subsidizing professionals involved in the preparation of projects directed towards the collective building of knowledge.

The concern guiding our discussion towards these two modalities encounters counterparts in Regina Calazans and José L. Braga (2001), who discuss mediatization contributions in Distance Education Systems. The authors worry about the possibility that the legacy left by Programmed Instruction may limit distance educational programs, considering that, by offering alternative ways and options to students, they are learning. On the other hand, the authors also worry about the possibility that a total hypertextual flexibility, in which the student is not supported in his or her routes and is limited to erratic guidance, might be dispersive and result in little learning.

In this sense, the discussion directed below about the cybernetic conception, represented by the Programmed Instruction proposal, and the dialogical conception, does not intend to

compare didactic-pedagogical procedures, but instead to identify the communication role and to recognize the communicational flows appertaining each one.

The cybernetic and dialogical educational proposals could influence educational proposals in many countries and represent different ways of understanding the communicational process. In the cybernetic model, communication has a character of manipulation and domination. In the latter, the co-participation in the process is preconized. The identification of the communicational flows of these educative modalities aims at recognizing the characteristics that should be displayed by dialogical communicational processes, both in the sense of deepening the distance education dialogical conception and to avoid that, despite proclaiming interactivity, a proposal in fact be based on the cybernetic conception.

In this sense, we will discuss the dialogical conception to understand the required communicational flows, clarifying the role of dialog and interactivity for the development of proposals directed towards collaboration and co-authorship. The collaboration mechanisms provided by the use of digital technologies disclose many possibilities for educational proposals aiming at collective production processes, but still face questions about the necessary actions to provide network learning, collaboratively.

The Distance Education is an educational modality constituted by two basic elements: a structured course, whose contents can be made available to students in several media, and the non-contiguous communication, that which is not carried out face-to-face, employing media (Holmberg, 1989). From "one-to-one" communication, based on the home delivery of contents, and from "one-to-many", based on mass diffusion from a broadcasting source, it started to propose the "all-to-all" communication, viabilized by the New Information and Communication Technologies. The Distance Education followed-up the communication technological development since the printed media use until the virtual learning environments. With this follow-up, it incremented its potentialities as a mediated and mediatized educative modality and feasibilized the diversification and improvement of the communicative and informative flows among its agents.

The informational flows concern the circuits of circulation and diffusion of information necessary for the process development, both administrative and pedagogical. The communicational flows concern the interaction, construction and circulation circuits of the specific meanings of a process whose intention is the collective knowledge construction. Four types of flows can be characterized between teachers and students: unidirectional, bidirectional, scale bidirectional and multidirectional. These flows reveal fundamental characteristics of the interaction modes stipulated in the pedagogical design of each educational project. Three interaction modes can be identified: Star Mode, Circle Mode and Network Mode. Each one of these modes display interactive patterns differentiated according to the pedagogical outline, or pedagogical design, chosen for each project.

In this chapter, it is intended to discuss how digital technologies feasibilize new interaction patterns in the Distance Education. In order to fulfill this objective, the communicational and informational flows present in the teaching and management processes will be characterized and described, the interactions present in the Distance Education will be characterized, the dialogical interaction will be differentiated, and the three interaction modes and their relation with the technologies of information and communication will be defined. With this discussion, it is intended to demonstrate that the interaction modes reveal that technology in itself does not determine how the interaction occurs between teachers and students, and among the latter themselves. The dialogicity is not based on the

technology of a given project, but essentially on the interactive possibilities provided to students, in the mode in which the communicational flows are conceived. The use of interactive technologies is a necessary, but not sufficient condition to assure interactivity in Distance Education, as besides that it is necessary that the interaction mode contemplated by the project assures multidirectional communicational and informational flows. Therefore, this chapter aims at understanding the communication phenomenon in Distance Education. Finally, it proposes the use of the Three Interaction Modes model as a tool to analyze the relation among the communication technologies, interactivity and the pedagogical design.

2. Programmed Instruction

The Information Theory arises dedicated to electronic message transmission studies, but is raised to the level of basis of understanding of human communication processes. Its great names are Claude Shannon and Warren Weaver. The passage from a strictly technical focus to the field of politics is carried out through the association with the conception of cybernetics by Norbert Wiener, who when looking for a term that described his theory, which encompassed the study of messages, automatisms, some considerations about Psychology, Nervous System and Scientific Method, found it in the Greek term *Kubernetes* or 'pilot', the same Greek word from which we derived the word governor (Wiener, 1950).

The author understands that communication is fundamental for life in society, but conceives the message as a means to drive machinery and society, inasmuch as they are "ways of configuration and organization" in themselves. Understanding organization as a situation opposed to entropy, he conceives information as the latter's negative, that is, in positive entropic systems there would be informative shortage, and information arises from the least likely message. Then, he defines information as being the term designating the content of what we barter with the outside world when adjusting to it, and which makes our adjustment in it to be perceived (Wiener, *op. cit.*).

In the machine adjustment process, the *feedback* acquires a fundamental role for the control system, inasmuch as, by monitoring, it follows-up its performance based on the effective behavior displayed. The control is necessary to check the order fulfillment (the message) and there are not any differences in the communication mechanism of an order to a person or to a machine. After all, the purpose of Cybernetics would be to develop a language and techniques enabling us to deal with the control problem and with the problem of communication at large. (Wiener, *Ibidem*). The *feedback* makes it possible to carry out readjustments in the methods and techniques employed, in order to increase the system performance. Wiener names its process as learning. The feedback role is to avoid entropic increase, and on this the author fundaments the parallels that he sees between the operation of live organisms and machines.

In relation to this aspect, Adilson Citelli (2000) affirms that this theory is extremely limited when called to compose analytic schemes in the field of messages social circulation. Pierre Lévy (1993) considers systemic and cybernetic modeling as being insufficient, as they consist in designating a certain number of emission and reception agents, and later in sketching the informational flows trajectory, with as many retroaction rings as desired. This way, this theory reduces information to an inert datum, and describes communication as a unidirectional process of transportation and decoding.

The best known application of cybernetics in education, Programmed Instruction, was extensively used in the Brazilian education, mainly in the formation of teachers, and developed significantly in the fifties and sixties of past century, when the teaching machines were replaced by printed media, and later by the computer. The computer showed to be flexible for the contents structural organization, interesting due to the many esthetic possibilities for presentation and versatile due to the multimedia resources made available.

The Programmed Instruction key concept is that of 'program', which consists in splitting the content to be taught in small portions, of easy assimilation, and in coordinating their sequence in order for them to lead the student to a solid understanding of the concepts fundamenting instruction (Schiefele, 1968). For Skinner (1972), a well programmed instruction eliminates the need of teacher intervention. In order to prepare an instruction program, Skinner warns that programming is not a mere question of organizing contents in such a way as to allow advance in small steps, but to assure that the student is successful, not requiring from him or her more than he or she can do. The small steps have the function of keeping the student at the reach of strengthening, that is, of minimizing the possibility of errors and maximizing the occurrence of hits. The program is directly connected to the measurable behavior desired for the student to acquire, which is its didactic objective. Then, it appertains the programmer to organize contents so that they constitute didactic steps to be proposed selectively, independently among themselves, and as many as necessary, in order to adapt the program to the various individual conditions and skills (Schiefele, *op. cit.*). Efficiency criteria are defined in the program itself, the means become the ends, and the teacher's role is that of a learning facilitator by offering suitable conditions for this to occur.

Disagreeing with the linear way of organizing programs conceived by Skinner, Norman Crowder recovers the proposal of Sidney Pressey – the original conceiver of teaching machines, still in 1925 –, and suggests the branched program (Thompson, 1973). In Pressey's proposal, the machine displays the answer options, among which only one is correct. In the linear structure, the student does not go ahead while he or she does not hit the answers; in the branched structure, he or she is referred to other structures until he or she submits the desired answer. Branching allow students to follow different paths, which increases the possibilities of individualization, the core of the Programmed Instruction proposal.

The computer educational use surpassed Programmed Instruction, but the latter continues to be a current practice through programs known as tutorials. Computer Assisted Instruction - CAI, programs arose and later the more varied types of programs and educative games. The good tutorial programs trend is to use Artificial Intelligence techniques to analyze error standards, assess the student's learning style and capability and provide special instruction about the concept in which the student is facing difficulties. Personal computers operate in education to help solve problems, prepare texts, handle data banks and control processes in real time. According to this approach, the computer started to play a fundamental role in education quality, as it took over a complement role, allowing the creating and enriching of learning environments .

Our interest here is centered at the role performed by the source as main controller of the communication process and its continuance in educational proposals.

Feedback is the element making the cybernetic model possible and attributing it a circularity character, inasmuch as it admits the emission of messages by the receptor. Although the cybernetic communication model is essentially interactive in order there to be learning – understood in this conception as a behavior change –, the interaction possibilities are

restricted to the obtainment by the source, who holds the process control, of the system performance. In cybernetic systems, the source holds the process control and the *feedback* is the instrument through which it renders the control efficient.

In educational terms, it is useless for us that the cybernetic model communicational flow be circular, as the *feedback* can be obtained through information of other natures than the intentional emission of messages by the receptor, inasmuch as it can be obtained by sensing, using a different return channel than the channel through which the message was emitted. The emission carried out by the receptor may not be of the same nature of that carried out by the source. We can exemplify this situation with the *feedback* obtained through the application of a test, or by the observation performed concerning the attitudes and/or behavior of the students to something that is being said. In these terms, the teacher receives information about the class or the reception of his or her classes without the students having performed any actions in this sense, that is, the information were extracted from them and not emitted by them as agents. The same can be said when teachers of *online* courses use attendance markers carried out automatically per programs, independently of the student's permission or knowledge.

If we wish an emitting/receptor student, the cybernetic model shows its limits, as in these terms teaching is to control the students learning, and the *feedback* is the possibility just supposed of modifying the source message, still considered as origin and holder of the process control.

3. Paulo Freire's dialogical education

Paulo Freire opposes dialogical education to banking education, or traditional education. Banking education is defined by that educator as that in which the agent is the teacher who speaks contents, who lectures about contents, who issue releases. The pedagogical relationship is guided by fragmentary content transmissions, removed from the totality endowing it with meaning, compartmented, static, strange to the students experience, to be "deposited" in the students. This way, the teacher speech is hollow; it is "verbosity" (Freire, 1996).

Freire defines banking education as that in which it is the educator who educates, who knows, who thinks, who says the word, who disciplines, who opts and prescribes his or her option, who disciplines, who chooses the syllabus, who identifies the authority of knowledge with its functional authority, and, finally, who is the process subject. Students are those who do not know, the thought, whose who listen sweetly, those who follow the educator's prescription, those who have the illusion of acting in the teacher's action, those who, never heard, should adapt to the determinations of the former, those, finally, who are mere objects in the educative process. (Freire, *op. cit.*).

In this educational practice, the student is a passive receptor of information an the teacher plays the role of process conductor and legitimated source, even if he or she is helped by books or other sources of information. In this educational practice, the educator appears as its indisputable agent, as its actual subject, whose indeclinable task is to 'fill' the students with the contents of his or her narration (Freire, 1973).

The banking model, centered on the contents planned ordering and sequencing, is based on information transmission. In this pedagogic practice, the media are attributed a role of didactic resource to regulate the communication flow, acquiring the role of instruments to

reach an end, with their action circumscribed to pedagogical illustration, didactically guided and controlled. Communication, in this model, is unidirectional, as the teacher teaches and the student must learn.

In opposition to banking education, Paulo Freire proposes the dialogical education, also named problematizing, problem-posing education, liberating, or even transformer, which is based the subject matter of knowledge as mediator between students and educators and the hierarchy elimination between both, enabling the dialog, attributing an active role to the student. Information acquires a structuring character and the access channels to knowledge are articulated aiming at a significant grasp of reality.

In the dialogical educational conception the source role played by the teacher is interchangeable, as communication occurs as co-participation. The teacher does not lecture about something indefinitely for somebody who is just a receptor, the sole player of the cognoscent role. In this sense, knowledge is not something transferable, transmittable. For this author, knowledge requires the curious presence of the subject in face of the world, requires a transforming action over reality, requires a constant quest, and this implies a critical reflection of everybody about the very act of knowing, through which the subject recognizes himself or herself as knowing, and when recognized as such he or she notices the "how" of his or her knowledge and the conditionings to which his or her act is subject. (Freire, *op. cit.*).

 The famous Freirean maxim, "nobody educates anybody, nobody educates oneself, men mutually educate themselves, mediated by the world" (Freire, *op cit.*), was many times misinterpreted, as if there were not any intentionality in the educational process or as if there were not any need of studies by the teacher. This interpretation is not supported because, for Paulo Freire, the teacher is always learning when preparing for his or her "chores" and while carrying them out. At the same time, the student is not a receptor of contents, as he or she also has something to say about the world.

It is in this sense that Adilson Citelli (*op. cit.*) warns us that the pedagogical thought spread the idea that it is necessary to relativize the central character of the teacher speech and transform the student into a subject. This, however, implies decentralization of voices, confronting to other voices, but without excluding the voice of teacher.

Learning, for Paulo Freire, is a permanent quest and understands dialog as problematization of knowledge itself and its indisputable relation with the reality in which it is generated and about which it incides, in order to better understand and transform it (Freire, *op. cit.*,). According to this educator, it is by facing the world that the student builds his or her knowledge, 'says his or her word'.

The word, according to Paulo Freire, has two components: one of action and another one of reflection. The absence of any one of the word dimensions turn it into verbalism or activism - action by the action -, which characterizes it as an unauthentic word, which does not transform the world. The authentic word, therefore, is *praxis* and is everybody's right. The dialog is an encounter to pronounce the world, requiring the critical thought perceiving reality as a process. When affirming that the word cannot be directed "to others", Paulo Freire refers to the authoritarian act of dictating, of prescribing; for this the transforming – authentic – word is an encounter for the world change and can only be said with others in dialog.

For Michael Bakhtin (1973), a Russian theoretician who works with the concept of dialog, the word presents two faces, as it is determined both by the fact that it comes from

somebody and by the fact that it is directed to somebody. The word is exactly the product of interaction between the speaker and the listener, inasmuch as through the word somebody defines himself or herself in relation to the other. (Bakhtin, op. cit., p. 113). The word is directed to other because it is a function of the counterpart, because it is socially directed, affirms Bakhtin, concerned about dialog as verbal interaction, as 'language fundamental reality' (*Ibidem*). He understands dialog in a broad perspective in which he includes all forms of verbal communication, besides face-to-face interaction.

In the same direction of Michael Bakhtin's argumentation, who thinks dialog as an element including tensions, Jorge Huergo (2000) reiterates the conflictive nature of dialog, inasmuch as communication is seldom carried out by equals and is not always harmonious, sometimes being conflictive. And in these terms, communication is rather an encounter than an agreement.

For Jorge Huergo (2000), the pronunciation of a word seeking the world transformation is not confused with the neo-liberal view that understands dialog as exaltation to the diversity suspending conflict. For this author, dialog never happens only between isolated counterparts, but within spaces of intercessions, of intertextualities and social practices.

In this context in which the term dialog is considered, it is convenient to resume the concept by Paulo Freire, who, although not excluding the idea of conflict, emphasizes the necessary mutual respect to make possible the participation of educators and students in the knowledge building process. The teacher educates because it participates in the knowledge building process of his or her students. The students educate the teacher not because they remove him or her of his or her functional authority, but because they participate in the re-elaboration of his or her knowledge. The educator-student dichotomy overcoming is a necessary condition for the dialogical conception of education, in which the knowledge subject matter is the pedagogical relationship mediator, and not its end.

This is not a mere change of roles or an alternance of functions, but a break in the traditional hierarchic view of knowledge command, understood as something to be transmitted, by the teacher. The knowledge is fruit of a process experienced by both cognoscent subjects, who control the process in a shared way.

The communicative process control sharing is a key point differentiating a dialogical model from a cybernetic model. In the dialogical education control is shared; in the latter, the control belongs to the emitting source. The concept of interaction is understood in a very different way for these two pedagogical conceptions. In the dialogical model, the interaction has a broader concept, of co-enunciation, co-participation, and is marked by the shared process control, in which source and receptor interchange roles.

4. Dialogical conception and interactivity in distance education

Distance Education is an educative practice that ruptures with the idea that we only learn with a teacher talking to us on the front side of a classroom and if we are at this room at the same time, all together. This rupture was possible because globalization 'occurred', the requirement of workers with differentiated profiles, the social demand for education, the arising of the receptor/user/navigator, the corporations pressure for higher education and the digital development of telecommunications and of NTIC with their interactivity devices. Otto Peters (2003) affirms that the Distance Education expansion cannot be regarded as a single-cause phenomenon, but we can identify a set of factors that indicate changes in the

economic and social context in which the information acquires an unprecedented *status*. The Information Society led Distance Education to overcome its stigma of second-class education and to become a feasible education proposal for our time, that is, because it displays characteristics suiting it to the current society.

According to Pierre Lévy (1999), the Distance Education characteristics are similar to those of the Information Society, as both are related to networks, speed, personalization. The consensus among authors emphasizes the technological development in the field of telematics as a factor of Distance Education expansion nowadays (Keegan, 1990; Bates, 1995; Peters, 2001), especially in informatic and telecommunication areas, pressuring the access need to higher education, continued education, academic and scientific improvement. The development of interactive technologies that provide learning and the collective building of knowledge by means of telematic networks, based on the permutability of the source and receptor roles, has been revealing to be a preponderant factor for the Distance Education expansion.

The cleavage between presence and distance educational processes is in the necessary human and technological mediation of the latter, which implies to say that distance education is a mediated and mediatized modality. The human mediation is carried out by a team of professionals that provides all types of support to students: the Tutorial System, composed by: tutors, whose responsibility is the students pedagogical follow-up; didactic material writers, responsible for the subjects and learning; teachers, responsible for the learning and evaluation; and the course managers, responsible for the students academic life. This is the group of professionals who develop activities directly towards learning and the students needs (Sartori, Roesler, 2005). Mediatization, on the other hand, is provided by the medias used to perform the technological mediation. The medias and the ways in which they will be used are defined by the course management team at the moment when they establish how the interactions among students, teachers and the academic administration will occur.

Concerned with the role of interaction in the distance modality and with the lack of accuracy with which the term is used, Michael Moore (1993) proposes that they can be classed in three different types, according to the communication being unidirectional or bidirectional:

> Learner-contents interaction: it is a characteristic of the very educative activity, as the interaction with study contents or subject matters results in changes in understanding, in perspectives and in the cognitive and mental structure of students. Distance education proposals based on unidirectional communication offer only this type of interaction.
>
> Learner-tutor interaction: the tutor helps the student to keep motivated and interested in the studies, evaluates the learning process, counsels and offers the necessary support for the studies progress. This type of interaction, however, requires a high degree of autonomy of the student and the assistance tends to be individual.
>
> Learner-learner interaction: this type of interaction has been growing wince the nineties, with the development of telematic; it can occur with or without the tutor's presence and has been showing to be a rich source of learning.

The author, in the mentioned articles, states that the telecommunications development allows that Distance Education Systems offer the maximum possible of each one of these interactions, according to educational objectives, area of study, students ages, among other factors. Courses based only on unidirectional communication offer only one of the

interaction types, or emphasize one of them to the detriment of the others. The integrated use of several medias is the solution indicated by the author in the sense of emphasizing the need of assuring that the three types of interaction occur. In order to offer these conditions in a distance course, the managers must employ the technologies of information and communication; however, in function of the target public and of access, they need to think in all alternatives to guaranty the highest degree of interactivity, which implies strategies such as medias integration, implement variations of the tutorship system, development of collective pedagogical practices of knowledge building and socialization, among others.

The concept of interaction is very broad, and according to Marco Silva (2000) it can be understood in a generic way, in a mechanicist or systemic, interactionist or dialectic way. The interaction occurring in the cybernetic conception is of the second type: systemic. The dialogical interaction can be identified as being of a third type: dialectic, interactionist. Still according to this author, interactivity is particular type of interaction and displays its three supporting pillars:

Participation – intervention: the information is no longer closed, untouchable, as conceived by classical theories, but manipulable, reorganizable, modifiable, allowing the receptor intervention. In this process, the message has its nature altered, the emitting source role changes and the receptor *status* change (Silva, *op. cit.*).

Bidirectionality-hybridation: the author affirms that since the sixties the source emitter unidirectionality has been questioned as communication conception, which starts to be understood as possible if emitters and receptors interchange roles. This way, the emitter is potentially receptor, and the receptor is potentially emitter. Bidirectionality and hybridizing are related to the communication agents role changes, allowing the fusion of both of them in co-authorship.

Permutability-potentiality: this interactivity fundament has its maximum realization in hypertext, but it is anterior to interactive informatics and can be encountered in the permutatory art. Marco Silva mentions several authors of permutatory literature in which the launched work is recreated by the reader-operator, who alters the work that be in probability status, virtuality status. It is related to the authorship of actions of somebody who is no longer receptor, spectator, as he or she interferes in the work, which is unfinished and modified as from his or her intervention, his or her collaboration. Thus, or she becomes a co-author as from barters potentially allowed by the work.

Marco Silva bases himself on the interactivity concept grounded on the mentioned fundaments, to emphasize the need of modifying the communicational process predominant in the education pedagogical action, both attendance and distance, and affirms that interactivity add character fine-tuned with our time for an educational proposals.

The dialogical conception can be considered interactive because it is based on the presupposition of the student participation-intervention, of the creation possibility and of co-authorship. The content is not a closed information package, but material for intervention instead, displaying permutability-potentiality in face of student actions. Communication is not unidirectional, but bidirectional instead, in the sense that it allows source-reception interchange.

Dialogical education admits the need of communication among all those involved in the process; therefore, it is based on another communication concept, abandoning the idea of message emission in the source receptor unidirectional direction and admitting the source-receptor multidirectional relationships. Students acquire *status* of co-enunciators, as

meanings are collective constructions; only in co-enunciation it is possible to think about a dialogical relationship.

In Distance Education, dialogicity and interactivity are intrinsically connected to the pedagogical design. Therefore, it involves communication management. The dialogicity of a pedagogic model can be identified by the way in which communication is managed in a Distance Education System, that is, by the way in which the communicational flow is planned, executed and viabilized. An interactive pedagogical design allows participation, intervention, co-authorship, collective construction of knowledge, dialog, and the most diverse conditions of interlocution among students and professors. This discussion is extremely pertinent when we report to Distance Education due to the inherent relationship between the educational modality in discussion and technologies of information and communication, with their growth provided by digital technologies. The interaction modes of a pedagogical design are revealed in the informational and communicational flows that feasibilize Distance Education as an educative proposal. The communicative flows occur in all processes involved in the provision of a course, from production to reception of the didactic material, from assistance to students, passing by the interaction among professors and students, and among the latter themselves.

5. The interaction modes in distance education

The communication occurs through the two basic mediations: the technological and the human mediation. The former is a condition for the non-contiguous communication and provides support to the latter, which is performed through the Tutorial System. Each one of these mediations carries out actions of paramount importance to guaranty the informational and communicational flows continuity that jointly viabilize the pedagogical mediation.

The informational flows concern the circuits of circulation and diffusion of information necessary for the process development, both administrative and pedagogical. The communicational flows concern the interaction, construction and circulation circuits of the specific meanings of a process whose intention is the collective knowledge construction.

The communicative flows occur in all processes involved in the provision of a distance course, from the didactic material production and receipt, student assistance, passing by the interaction between teachers and students, and of the latter among themselves. In relation to the didactic material production, exchanges occur permanently between the management team and the material producers, during design, writing and pre-evaluation, with the tutors and students inclusion along the use and after-evaluation. Four types of flows can be characterized between teachers and students:

Unidirectional flows: the flow occurs in the direction from the institution to the student. In this type of flow, only the teaching-providing institution is a message issuing agent, and does not provide tutorial support. The student is a receptor, both of information and of school contents, the so-called teaching packages.

Bidirectional: the flow occurs in the direction from the institution to the student, individually and in the inverse direction, from the student, individually, to the institution. The communicative flow bidirectionality is viabilized by medias and by tutorship, which allow the student to make requests and ask for support in their studies. The student still is a message receptor, but has some degree of possibility of manifesting or of making requests, either administratively or pedagogically.

Bidirectional of scale: the flow occurs in the direction from the institution to the students in large audiences; and from the students to the institution, individually. In this type of flow, the institution delivers its teaching packages using medias, but viabilizes some form of communication from the student to the institution and the tutorship.

Multidirectional: this type of flow occurs in several directions, either from the institution to a collective of students; from the students to the institution, individually or collectively; and among the students. Not only the students communication with the tutorship is viabilized, but the communication among the students plays an important role in the knowledge building, learning and socialization.

The unidirectional flow can be associated to correspondence teaching, through the postal service or the Internet, and the tutorship offer allows the flow to be bidirectional, which enables us to make the association with the "one-to-one" communication mode. The scale bidirectional flow with the education performed through radio and television that can be identified with the "one-to-many" communication mode, and the multidirectional flow with the "many-to-many" communication. The Internet can viabilize proposals in any one of the previously described communicational possibilities. In this sense, we propose the "Star" metaphor for the communicational flows involved in Distance Education based on the one-to-one communication, the "Circle" metaphor for Distance Education based on the one-to-many communication, and the "Network" metaphor for the many-to-many communication.

5.1 The First Interaction Mode: Star Mode

The pedagogical design is totally centered on the source - teaching providing institution -, and consists in the addressed assistance, which enabled Distance Education to be individualized and personalized. Among the pedagogical conceptions possible in this interaction mode there are the banking education, based on the content delivery with some tutorial follow-up, and the cybernetic conception, which employs Programmed Instruction. In this mode, the communication occurs between the source and an isolated receptor, following the printed media model, which delivers a newspaper copy to each subscriber. It marks the Distance Education beginning all over the world through the correspondence communication, and continues until today, through courses sent by e-mail or accessible in the Internet upon fees payment and password obtainment, with or without individual assistance. The communication is asynchronous, which allows it to be considered as a flexible teaching model, as the student can always decide about the study time and place.

Its characteristics are described in Table 1, below:

Star Mode:		
Characteristics	Pedagogical conception	Medias
One-to-one interaction Packages delivery (contents, activities, evaluation) Centralization Individualization Personalization Flexibility Asynchrony	Banking education: contents delivery Cybernetic: programmed instruction	Printed media CD-ROM Cassette tapes Video tapes Postal services Internet Telephone (fixed and mobile) Fax

Table 1. Characteristics and medias used in the Start Interaction Mode
Source: Sartori, A. S. 2005.

5.2 The Second Interaction Mode: Circle Mode

The pedagogical design is centered on the source - teaching providing institution -, and consists in the massified distribution of contents; the teaching is not personalized. The predominant pedagogical conception in this interaction mode is the "banking education", inasmuch as it is characterized by contents delivery. The synchronous communication does not allow any time flexibility, as the audiences have predetermined times and sometimes the place is too. In this mode, the communication occurs between source and disperse receptors, following the broadcasting communication model, with contents issuance in a non-individual and non-personalized way. The communication in this case is characterized by being "to many". It appeared in the seventies of past century, with class transmissions or live or pre-recorded programs vehiculation. The interaction between students and teachers is almost nonexistent and of difficult execution, in view of the great number of students that it can reach.

Its characteristics are described in Table 2, below:

Circle Mode		
Characteristics	Pedagogical conception	Medias
One-to-many interaction Mass communication Synchrony Centralization Non-personalization Nonexistent collective interaction	banking education": contents delivery	Television Radio Internet Tele and videoconference Telephone (fixed and mobile) Fax Postal services

Table 2. Characteristics and medias used in the Circle Interaction Mode
Source: Sartori, A. S. 2005.

5.3 The Third Interaction Mode: Network Mode

In this third interaction mode, the pedagogical design becomes markedly decentralized, non-massified and non-personalized, allowing differentiated group trajectories. The predominant pedagogical conception is dialogic and in network. In this interaction mode the communication between source and receptors becomes more complex, following the network communication model viabilized by Internet. It is even possible the interchange between the source and emitter roles, and the communication can occur among all. The complexity is due to the occurrence possibilities of all flows, "one-to-one", "one-to-all" and "all-to-all". The medias integrated use must be contemplated and planned to favor communication among those involved, as well as human interaction via tutorship and students interaction through collective activities.

Its characteristics and used medias are described in Table 3, below:

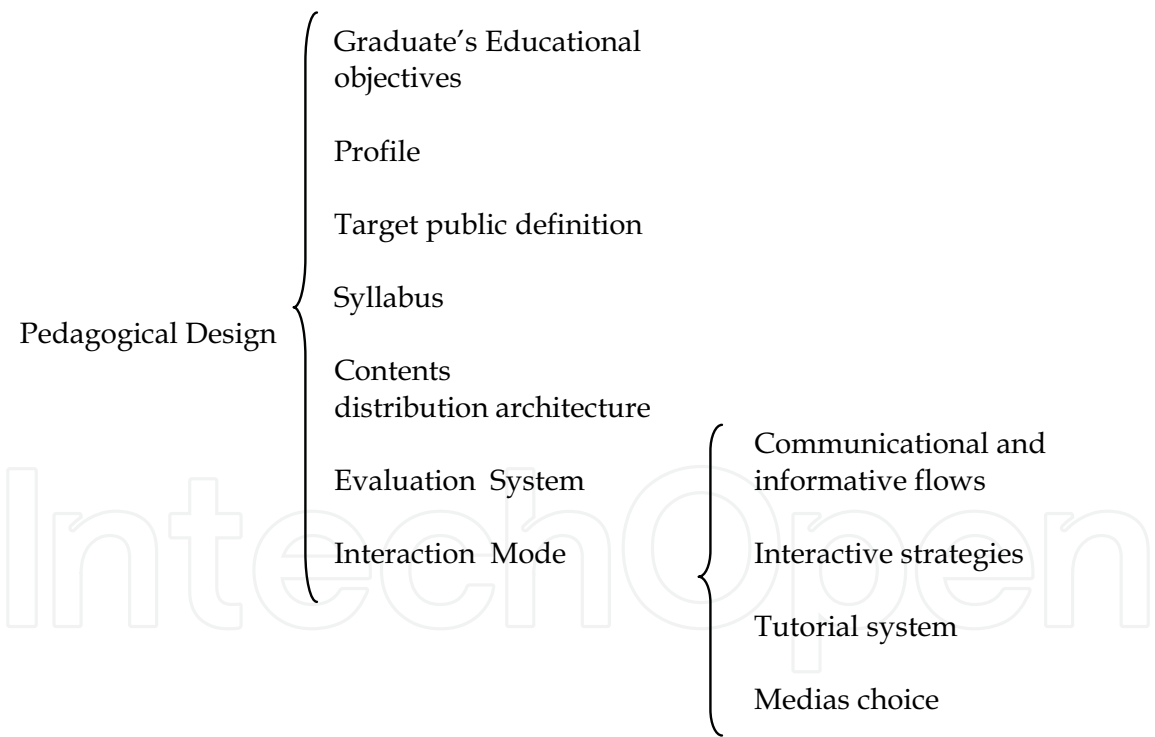| Network Mode:		
Characteristics	Pedagogical conception	Medias
Many-to-many interaction Synchronous and asynchronous communication Intense collective interaction Decentralization Non-personalization Non-massification	Dialogic: knowledge collective building	Printed media Video tapes Internet Telephone Television Radio Internet Tele and videoconference Telephone (fixed and mobile) Fax Postal services, Others

Table 3. Characteristics and medias used in the Network Interaction Mode
Source: Sartori, A. S. 2005.

The Star Mode, although it receives much criticism from the pedagogical viewpoint, still is widely used by several institutions in the most varied formation types and will last due to its organizational simplicity and due to the education and formation traditional conception persistency. The Circle Mode may disappear as it faced many criticisms and because the Internet has been more and more used as a media allowing communication between those involved, increasing the interaction degree among students, teachers and the institution. The Network Mode is increasingly becoming the ideal to be sought by institutions that wish to offer education fine-tuned with the modern society, taking advantage of the telecommunications and pedagogical thought development. The dialogic educational conception contained in the Network Mode presupposes the dialog, exchange and co-authorship. The knowledge is built with the participation-intervention of all; and all medias are called to collaborate. The tutorial support is fundamental and the provision of material and infrastructure conditions is fundamental, namely in the countries where a small percentage of the population has access to the Internet.

The Interaction Modes herein proposed constitute a reflection instrument about the relation between the various communication technologies and the pedagogical design of a course in the distance modality. The choice of the medias that will provide the interaction among students and contents, tutors, teachers, academic administration and colleagues is defined in the pedagogical design, which on its turn is prepared in function of a give pedagogical conception. Understanding the technologies of information and communication role avoids confusions or discrepancies in relation to the strategies outlined to use the means and to the announced pedagogical conception.

Multimedia and hypertextual technological appliances, such as CD-ROM, can be found in Distance Education programs based on the Star Interaction Mode, as they can constitute didactic material delivered by mail, in courses in which the student holds their activities

individually, without participating in collective activities. Contents can also be delivered through the Internet without the student receives tutorial support or enjoys interaction with course classmates. It is necessary to explicit the possibility of individualized proposals through the Internet, via Banking Education or Programmed Instruction, in the sense of highlighting that the technology in itself does not guaranty dialog and interactivity.

The interaction between the teaching and learning process participants is potentialized by the Internet, as it is the technology capable of offering this type of synchronous and asynchronous communicational devices. All interaction modes previously described are possible to be performed through this means of communication. Therefore, it is the pedagogical design that informs whether the Internet is used in all its interactive potential.

The proposed Interaction Modes reveal that the technology in itself does not determine how the interaction occurs between teaches and students, and among the latter themselves. On the other hand, the impossibility to access a more sophisticate communication technology is not an impediment for a pedagogical design to be interactive. The dialogicity is not based on the technology of a given project, but essentially on the interaction mode provided to students, according to the contemplated communicational flows.

The relation between pedagogical design and interaction modes can be summarized according to the scheme displayed below:

Pedagogical Design
- Graduate's Educational objectives
- Profile
- Target public definition
- Syllabus
- Contents distribution architecture
- Evaluation System
- Interaction Mode
  - Communicational and informative flows
  - Interactive strategies
  - Tutorial system
  - Medias choice

Scheme 1. Relation between the Pedagogical Design, the Interaction Mode and the media of a Distance Educations System.

6. Final considerations

Understanding the Distance Education phenomenon from communication point of view means to change the mediatic instrumental point of view, centered on the media understanding as didactic instruments or resources, to the communicational flows, that is, the interaction modes feasibilized by technologies of information and communication.

Interactivity is understood as participation in the other people's learning and as coauthorship, and not in the access to several languages and information sources, which denotes a strong need of communicational and pedagogic procedures and devices allowing exchanges among those involved. Interactivity is more an issue of exchange among the participants than a technological characteristic. The construction and exchange of meanings is not restricted to the participation of colleagues in the construction of knowledge, but also in the presence and work of tutors, considered indispensable for the modality. The tutor's mediating role is supported both in the emphasis attributed to the contribution for the discussion and in the identification of the student's profile as somebody who interacts with tutors and professors.

The expected profile for the student of an Distance Education course requests an adult person, responsible, participative, collaborative with the colleagues, mainly capable of self-organizing himself or herself. Besides, he or she must be willing to learn and always learning. It is no longer conceived a course organized with unidirectional flow and a passive student. The possibility of participation-intervention is accompanied by the premise of responsibility. It is not an abstract action, as the meeting of deadlines and the quality of works presented continue being requirements for a good academic performance. For short, the interactivity favors the dialog, needs the tutors' mediation, but requires a responsible attitude. It can be perceived that the image of Distance Education as a modality based on individual isolation, on solitary learning occurred in the interaction between the student and the didactic material, with occasional tutorial support, is outdated. Contribute for this new concept of Distance Education the communicative technological possibilities, the tutor role reiteration and the emphasis on the responsibility and participation attributed to the student's profile. The first is related to the technological development and its contributions for the even more diversified offer of communicational devices supplying the social-technical structure necessary to feasibilize the teaching-learning process. The second, by acknowledging the importance of human mediations, which allow symbolic and affective exchanges of all orders, the feeling of belonging to the group, the virtual getting together and the agency of co-authorship processes. The third consists in the resonance of the times in which we live, in which interactive processes at large require initiative and an attitude of quest. Interactive processes based on intervention and coauthorship as potentiality require from that who is no longer a mere receptor, but a potential coannouncer and co-producer, the capability of dialoging and working in teams, and the willingness to learn how to learn. A modality preconizing new pedagogic practices, the Distance Education is prioritarily directed towards serving the adult public, with the role of democratizing the access to higher education, even by corporate education.

Its most interesting characteristic is the convenience of choice, by students, of times and places to study and participate in asynchronous activities. The pedagogical design must prioritize the integrated use of medias, and tutorship has been arising as a means to speed interactions among students, professors and the institution.

We could identify the importance of the communicational processes manager for the Distance Education and eliminating the emphasis given to technology in the debate and place it on the interaction modes provided to those involved in the course. The interactivity implies the participation of the involved parties in the exchange processes conceived in the pedagogic design, which expresses the interaction modes and the technologies to feasibilize them, to the need of providing mediation by means of tutorship and to the requirement of responsible students. The communication and the pedagogic design are in process of interlocution.

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Technology Education and Development

Edited by Aleksandar Lazinica and Carlos Calafate

The widespread deployment and use of Information Technologies (IT) has paved the way for change in many fields of our societies. The Internet, mobile computing, social networks and many other advances in human communications have become essential to promote and boost education, technology and industry. On the education side, the new challenges related with the integration of IT technologies into all aspects of learning require revising the traditional educational paradigms that have prevailed for the last centuries. Additionally, the globalization of education and student mobility requirements are favoring a fluid interchange of tools, methodologies and evaluation strategies, which promote innovation at an accelerated pace. Curricular revisions are also taking place to achieved a more specialized education that is able to responds to the society's requirements in terms of professional training. In this process, guaranteeing quality has also become a critical issue. On the industrial and technological side, the focus on ecological developments is essential to achieve a sustainable degree of prosperity, and all efforts to promote greener societies are welcome. In this book we gather knowledge and experiences of different authors on all these topics, hoping to offer the reader a wider view of the revolution taking place within and without our educational centers. In summary, we believe that this book makes an important contribution to the fields of education and technology in these times of great change, offering a mean for experts in the different areas to share valuable experiences and points of view that we hope are enriching to the reader. Enjoy the book!

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Ademilde Silveira Sartori (2009). Communication in the Distance Education Interaction Modes and the Pedagogical Design, Technology Education and Development, Aleksandar Lazinica and Carlos Calafate (Ed.), ISBN: 978-953-307-007-0, InTech, Available from: http://www.intechopen.com/books/technology-education-and-development/communication-in-the-distance-education-interaction-modes-and-the-pedagogical-design

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