SEEAD – A MODEL OF DECISIONS CHOICES ABOUT TECHNOLOGIES IN THE DISTANCE EDUCATION BASED ON POLITIC-PEDAGOGIC PROJECTS.

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Abstract - The article describes the development of a model for choice of technologies for courses in the modality of Distance Education (EAD), starting from the evolution of contextualization and from the technological bases of EAD, from the means used for the effectiveness of this teaching modality and their characteristics and, mainly starting from their pedagogic projects. With the analysis accomplishment, based on the specifications of the political-pedagogic projects and the ready model, the model implementation and executed with the use of the Expert SINTA computational tool, that it is utilized by Artificial Intelligence techniques for automatic generation of specialist systems. SEEAD – Specialist System for Distance Education, resulting from the implementation of this model, helps on the decision making on the technologies to be used.

Index Terms (Distance Education, new technologies, political-pedagogic projects.

1. INTRODUCTION

The incorporation of technologies in the people's day to day makes the world's reality known. Books, newspapers, television, computers and information nets appeared as different ideas in the form of circulation. Each one having means, individually or associated with the others, its art and own techniques for the presentation and representation of reality.

Due to this technological incorporation and increase of information, new repercussions and paradigms appeared, with reflexes to the several segments of our social lives and productive processes. As it could not stop being, the education system was also affected by the need of looking for processes that do not limit to just the function of transmitting knowledge, but valuing invention and discovery, stimulating the development of creativity and initiative. With this, it was necessary to invest in the implementation of innovative pedagogic projects, which turns to the technologies, contributing significantly to the enrichment and the updating of the educational system. Due to that, the interactivity is a factor of great impact in the teaching and learning process.

With the search for larger interactivity in education, the technologies are contributing so that another teaching form occupies space of emphasized importance on the scenery of the current education system.

The distance education modality took on enormous proportions with the technological evolution. In this new evolutionary picture, the technologies assume a strategic function in the sense of introducing new time and space conceptions on education, contributing significantly to the promotion of changes in the institutions; resulting in coherent methods and strategies for the improvement of teaching quality.

This progress, however, did not come accompanied by effective ways of selecting technologies for teaching and learning effectiveness. The choice of technologies for the use in programs and courses in EAD, is usually done in an empiric form, based on courses and experiences already accomplished. The concern with the appropriate form of choice to the mean, in which the transmission, interactivity, teaching and learning happens is one of the main objectives of this work.

What we intend to demonstrate is a form of appropriate choice of the technologies used in programs and distance education courses, starting from specifications of their political pedagogic projects, implemented in a Specialist System, utilizing for its development the tool Expert, SINTA.

2. TECHNOLOGY AND DISTANCE EDUCATION

Since the beginning of distance education, different technologies were being incorporated to teaching, that contributed to define fundamental supports of the proposals: books, television, radio, audio and videos, satellite nets, electronic mail, Internet, videoconferences, special atmospheres and programs for non presential teaching, that besides support, they appeared as great challenges for this education system.

Today, we understand that the development of the technologies favors the creation and enrichment of the proposals in distance education, to the extent that it allows us to approach in an agile way innumerable themes, as well as generates new ways to approach teachers, students and institutions in a bi-directional way, solving a problem that is crucial in the EAD: interactivity.

Another point of high importance, but of easy understanding of the use of technologies in EAD, is described by RUMBLE[1]. The technologies must make possible "to the professor to teach and to the student to learn", because by themselves, they don't guarantee the learning.

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Distance education, in this new form of technological development, assumes a strategic function in the sense of introducing new time and space conceptions in education, contributing to the promotion of substantial changes in the institutions, taking them to the adoption of coherent methods and strategies for teaching quality improvement.

The distance education systems were transformed according to the information technologies evolution. Evolution thus, beginning with writing (print) arriving today, and the use of the largest of communication nets, the Internet. This evolution is described by RUMBLE apud PRETI[2] in four generations:

- *First generation systems were based on middle print text or handwritten.*
- *Second generation systems were based on television and audio.*
- *Third generation systems brought the systems of the first and second phases together in a multimedia approach; based in texts, audio and television.*
- *The fourth generation systems (New Technologies) were developed around communications mediated by computer, computer conferences, and electronic mail; in association with database access, information banks and electronic (virtual) libraries, with the use of computer guided instructions, CD ROM, etc.*

2.1 THE TECHNOLOGIES THAT ARE PART OF DISTANCE EDUCATION

The distance education programs use almost in its totality, technologies to supplant or subsidize the live face-to-face interactions. If the technologies facilitate the transmission of instructions, they will not change the nature of those without making changes in the conceptions and methods of teaching and learning. Although many people perceive that the use of technologies is implicitly innovative, the use of technology in the distance learning programs has often repeated the most effective live instruction methods, face-to-face. TUROFF apud COMASSETTO [3].

The technologies used in distance education programs must be used to provide the students the opportunity to interact and work together in problems and significant projects; also to join together the students' and the professionals' communities. Technology should extend the best of practices in the classroom to distant places.

For BARRY[4], the technological ways used in the distance education become separated in four categories:

Prints: it is a fundamental element of EAD programs, it is the base of which the other methods developed**.** Several forms of prints are ready to be used, besides books, texts, study guides, exercise books, courses, and case studies.

Voice: audio instructional system that includes interactive technologies as telephone, audio-conference, and radio. Independently, the audio systems include tapes and radio that are unidirectional.

Video: This type of system always includes images such as slides, pre-produced movable images (films, videotapes), and images in real time combined with the audio-conference.

Electronic/computer: In this method, the prominent part is for the computer to receive and send information electronically; this category can also be denominated as New Technologies. The computation programs for EAD are varied and they include:

- Tutorial programs: the use of computer as self-sufficient pedagogic machine to present individual lessons.
- Instructions administered by the computer: the computer is used to organize the learning and point out the student's performance and progress.
- Education mediated by the computer includes: applications and programs that facilitate the mailing of instructions. For instance: electronic mail, conferences on the computer in real time (cq/chat), fax and www programs, as well as the video-conference through IP.

3. THE TECHNOLOGICAL CHOICES IN DISTANCE EDUCATION

Making the appropriate choice of the technology to be utilized in EAD is not an easy function, and it demands responsibility. For it deals with the tool that will directly help in the course's understanding and learning, often substituting the teacher.

That decision will directly influence the objectives proposed by the course, whether it is from a teaching institution or a company. The interactivity can be committed, beyond the communication and understanding that is taught by the teacher to the student. The teaching and learning process can become inefficient and the student could feel discouraged and isolated. He will give up.

Therefore, the use of correct technology in the modality at distance is of fundamental importance.

3.1 HOW TO MAKE THE CORRECT TECHNOLOGICAL CHOICE?

The choice of technological courses in the distance education modality is usually made in an empiric form or in accordance with the existing technology in the promoting entities, be it teachings or companies. It is understood that these forms today don't assist the guidelines drawn in their pedagogic projects.

Starting from this principle and performing research in some methods, such as SciELO – Scientific Electronic Library Online, from 1991 to 2001 and other digital libraries, certain difficulty was detected in finding a bibliography on the subject. Then, it was tried to develop justifications and a proposal ("model") of analysis based on pedagogic projects specifications to make the choice of the technologies to be used in the distance programs and courses.

These justifications and the proposed "model" seek to answer some inquiries that appeared when analyzing

course[3] proposals developed in this modality, in the planning of others. Such subjects refer to the technologies and its proper use in each application:

- What is the reason of the use of a certain technology?
- What is the reason of the technology choice (x) and not of (y)?
- What was the technological choice based on?
- Is it possible to reach the proposed objectives in the course starting from the chosen technology?

It is known that not all of the institutions or companies have a great and varied range of technologies used in EAD. The reasons are the lack of market readiness and high cost. With that in mind, it is convenient to double the caution in the technological choice, because the courses present objectives and peculiar specifications that could not all be developed by the same technology. In case that happens, the quality of offered courses can take serious risks and the results can be negative to the expected results.

To understand the form of how this work can help the decision making on the technology to be used in EAD courses, we described its operation graphically in illustration 1.

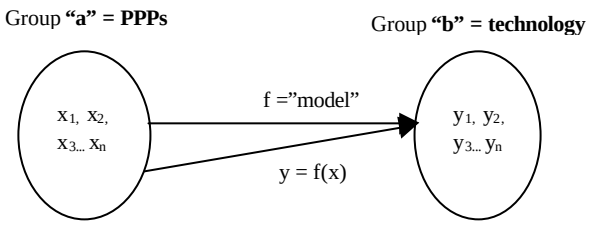

Fig.1
Graphic sample – technology choice

Where:
Group "a" = PPPs group,
x1, x2, x3... xn = elements that are part of PPPs
Group "b" = technologies group
y1, y2, y3... yn = technologies used in EAD

This way, we used a "mathematical Function" to describe the process of choosing the technology(s): y = f(x)

To obtain "y"(technology), we used a function "f"(proposed model), starting from elements "x"(items) of PPPs. In other words, we made a mapping of PPPs and, through the objective proposed by this work - "model" -, we can get to the technology result to be used in EAD Courses.

3.2 POLITICAL-PEDAGOGIC PROJECTS IN THE MODEL CONSTRUCTION

The political-pedagogic project (PPP) is a work instrument that shows what will be done, when, how, by whom, to get to such results. Furthermore, it explicits a philosophy and harmonizes the education guidelines with the institution reality.

In the distance education, there is a function to give the direction of the actions and methods of each course or accomplished programs on this teaching modality, in addition, it drives the planning and execution of the activities, always searching to idealize the proposed objectives.

The essential challenge of this modality is to establish processes and instructions to take the teaching through means that are not personal/presential, usually technologies. Therefore, it is in need of perfect planning.

In distance education, planning is an indispensable and primordial "act", and for being an educational activity that usually happens in different spaces and times with the teacher's absence, its activities operation and the methods to be used must be thoroughly planned previously. These methods include: tutorship, attendance, didactic material under a series of pedagogic characteristics, with a lot of effectiveness and precision. On the contrary, the risks are larger and the failures would be irreparable.

Some existent risks from the lack of planning are pointed out by GUTIERREZ and PRIETO [5]:

- *Industrialized teaching: the danger of an industrialized education, takes with it the mechanization, depersonalization, standardization and instrumentalization. With those conditions, occurs a denaturalization of the educational process, not reaching the educational objectives.*
- *Consumerist teaching: the industrial production of instructional materials and means of its execution, release, as a consequence, sale processes and consumption also in industrial scale.*
- *Institutionalized teaching: the institution, with its complex structure, is the one responsible for the mechanisms' operationalization, the intellectual production, materials production, technological means, and their distribution.* In that structure of different specialized groups, they dilute to the maximum the "personal style" and the interpersonal relationships inherent to the educational action.
- *Authoritarian teaching: it is proper for a good manager to be effective in his function. These are called distance education "fanatics", and they were incorporated to the new modality. The first steps should be an effective organization, a strict order, well defined command lines, control of every process and all the other strategies, and institutional requirements to guarantee rigorous execution of the proposed objectives.*
- *Massive teaching: the operation has profitable results only when it has reached a massive application, which is because of the need of reducing the production and distribution with success.*

To prevent from taking such risks mentioned above, an institution that works with distance education should do the analysis of their projects before beginning a program or course.

3 Extention courses and discipline of graduation courses proposed to the EAD modality, at UnC–Universidade do Contestado

4. THE "MODEL" ELABORATION

The "model" that has as an objective: reach the result on which technology should be used in a certain EAD course, was elaborated from the mapping of political-pedagogic projects specifications[4].

To the "model" elaboration, there was attendance and collaboration in all stages of a specialist group in the area of education and distance education from Universidade do Contestado, Concórdia/SC campus, which educators, pedagogic advisors, courses coordinators and teachers participated.

1st Step: Selection of the political-pedagogic projects:

The following projects were selected because they are classified as principal in a promoter entity of courses (teaching institution or company):

a) PPP of teaching institution or company;
b) PPP of knowledge area (degree courses);
c) Course plan of pedagogic discipline/project of the extension courses[5].

2nd Step: Main items selection of a PPP:

Starting from the structure and knowledge analysis of the meaning of each PPP item, the specialists selected items denominated "principal", because they gather aspects which are of fundamental importance for a course development and the concretization of teaching and learning process.

a) Presupposed philosophical-sociological: lead the institution in relation to:
   - What citizen to graduate?
   - What society to build?
   - What education conception to proceed?
b) Presupposed epistemological: it orientates the institution as for the knowledge;
c) Didactic-methodological presupposed: defines the methods and techniques used;
d) Course conception;
e) Objectives and purposes
f) Profile and the student's characteristics
g) Abilities that they intend to develop
h) The proposals, actions and wanted results
i) Practices pedagogic/methodology

3rd Step: Questionnaire elaboration starting from the analysis of the selected items:

Starting from the selected items from pedagogic projects, subjects were developed with the objective of simplifying the analysis to reach the objective proposed by this work.

4th step: Technologies relationship used in distance education:

The last step relates to the technologies used in programs and distance education courses. (Telephone, radio, audio-conference, audiocassette, television, teleconference, video, TBC (training based on computer), CD ROM, Internet, videoconference, prints, presential teaching[6]).

5th step: Percentile values definition

For each solution (conclusion) presented by the specialists to the technology alternatives (4th step), they were determined by the group denominated percentile values of reliability degrees. This degree indicates the reliability of this alternative and it can vary from 0% to 100%.

5. A SPECIALIST SYSTEM DEVELOPMENT, STARTING FROM THE PROPOSED "MODEL"

The application of the "model" in a manual way becomes almost impossible. The reasons are the multiple and varied possibilities of alternative choice of answers and the relationships with the technologies, besides the necessary complex interpretations given by the specialists.

The use of a computational tool based on Artificial Intelligence, which tries to capture and simulate the human specialists' behavior, will aid the execution of the proposed "model", minimizing the final user's work. Resulting from the implementation of the "model" on this tool, results in a specialist system.

5.1 SPECIALIST SYSTEMS

Specialist systems are softwares capable to treat complex problems from the real world, which need a specialist's interpretation, and at the same time they must reach to the same conclusions as the human specialist, in case it confronted with the same problems.

According to NOGUEIRA et al [6], several technological and partner-economical factors come favorable in the use of specialist systems, among which we have: the difficulty of access to human specialists in certain areas, the storage and formalization of several human specialists' knowledge, support tool to the decision making by specialist, professionals' training and impartiality in the decision making.

The tool was developed by the group SINTA (Applied Intelligent Systems), which acts close to the Artificial Intelligence Laboratory (LIA) of Universidade Federal do Ceará and it is freely available[7].

***EXPERT* SINTA**

"*Expert* SINTA is a computational tool which uses Artificial Intelligence techniques for automatic generation

4 PPPs Specification: items/caracteristics denominated of having emphasized importance in a pedagogic project, denominated by the specialist's group on pedagogy from UnC Concórdia.

5 Extension courses: they are short-duration courses, could also be denominated as, training courses, training, qualification or requalification.

6 TeachingPresential: this item is inserted in the technologie listing, due to existence of some alternatives of incompatible answers with the EAD modality.

7 ExpertSINTA is available in the electronic address http://www.lia.ufc.br

of specialist systems. This tool uses a representation model of knowledge based on production rules and probabilities, having as main objective simplify the implementation work of specialist systems through the use of a shared inference machine, the automatic construction of screens and menus, the probabilistic treatment of production rules and the use of sensitive explanations to the base context of modeled knowledge." NOGUEIRA et al [6].

Expert SINTA generates the specialist systems automatically, implementing the programming language guided to objects Borland Delphi, giving a visual support of easy operation. It allows the modular development of knowledge bases through an interface of easy manipulation and utilitarian servants for purification. This provides an economy of time for the knowledge base developers and also better use by the final user, when allowing the inclusion of explanatory hypertexts about the possible solutions found by the system.

6. SEEAD – DISTANCE EDUCATION SPECIALIST SYSTEM

Starting from the developed "model", it was made the application on the computational tool *Expert* SINTA. This way we obtained the SEEAD - specialist system for distance education.

SEEAD can be applied in Centers and EAD Center, teaching institutions or companies that work with distance education and which need a tool for specialist aid in the definition adapted of technology(s) to be used in a certain distance course.

6.1 SEEAD DEVELOPMENT[8]

1st step: Variable definition:

The first step to the Specialist System Development for distance education is the creation of variables and their respective values.

- ***The defined variables are ("model" subjects):*** Pedagogic Conception, Productive Process. To know, Characteristics, Abilities, Course objectives, Methodologies, Public of the proposed course and EAD Technologies
- ***Each variable has values, which correspond: to the alternatives of questionnaire answers.***

Ex:
Variable = Pedagogic Conception
What is the following pedagogic conception for the teaching institution?
Values = *a) Traditional*
b) Associative/connective/ behaviorist
c) Constructive/cognitivist/ structuralist
d) Humanist
e) Socio-cultural

After each variable insert, its instantiation is defined, in other words, if the variable is uni-valued (only a value or numeric) or multi-valued. That last one can receive more than a value in the execution.

In the case of SEEAD, all the variables were defined as multi-valued, because they can receive more than a value in its execution.

2nd step: Defining the objectives

The objective of a consultation to a specialist is to find the answer for a certain problem. Likewise is the SEEAD objective. The difference is that in the system the "problems" are represented by variables.

Among the declared variables, the one denominated "EAD Technology" represents our objective in the system. This variable, denominated "objective variable", will control the way on which the inference machine[9] will behave.

In case the system is put into operation without none defined aim, nothing will happen, in other words, it would be as speaking with a specialist without having anything to discover.

3rd step: Rules Elaboration

The rules are used in *Expert* SINTA to model the human knowledge, which becomes ideal for solutions problems, on which a certain solution should be reached starting from a solution group.

In SEEAD, the rules make the linking of variable values ("model" answers alternatives) with the variable-objective values (EAD Technologies), using a group of conditions in SINTA (IF, THEN, OR, AND) to make this link.

The SEEAD-Specialist System is constituted of 72 rules. For each established rule, they were designated to the percentile values (CNF–reliability degree), according to the obtained data by consulted specialists. The percentile designated by the specialists to the variables values will make the calculation automatically with the reliability degree for the system's user, when they answer the questionnaire.

4th step: Development of Texts for the questions

After having defined the variables and values, it was developed an interface in which the user will use to answer the subjects. This process begins with the separation of variables, the ones that will become questions, from those that are denominated remaining - objective variable = EAD Technologies.

The next step is to describe the subject related to the selected variable and to set the option "Use CNF." This option has as purpose to give the opportunity to the user; when they answer the question, define the chosen alternative reliability degree. This percentile will make calculation automatically with a certain CNF by the

8 To the development of the research regarding to the SEEAD development, there was a participation of two student from the Baccalaureate course on Computer science at UnC– University of Contestado – Concordia: Jackson Roberto Altenhofen and Ânderson P. Rosa Rodrigues (grant holders of the project).

9 Inference Machine: it is part of the structure of the responsible system for the deduction on the knowledge base.

specialists, and the result, in a percentile accumulation, it will define the technology to be used in the course or proposed programs in EAD.

5th step: Results Visualization

In the result presentation found by SEEAD, we can have a complete visualization of the System: results, research historical, the reached values and the system, which presents all the rules (knowledge base).

6th step: Additional Information about the base

It exhibits the definition of explanatory information about the base, the authors' indication and help context definition, which can be vital for the specialist system use.

7. CONCLUSION

The ease of use and the technological ways access, do not always mean that the presented course will reach the objective proposed in its pedagogic project, though. The technology choice for a course in the modality at distance should be very well analyzed and defined with base of specialists, before starting a teaching and learning process. In case that doesn't happen, the promoter institution, cannot obtain the expected result with its course. And the student will have his learning prejudiced.

We identified and defended here that the technology choice for each course in distance education modality is of fundamental meaning, because it contemplates mainly in the teaching and learning process.

This way, the present work's concern was to show the development of a Specialist System, where pedagogic political projects specifications are used to aid in appropriate technology choice for courses in modality at distance. The purpose is to solve or minimize the possible risks in the use of a non-appropriate technology.

The use of a tool–Shell (ExpertSINTA) to the SEEAD development facilitated the system construction, to treat about a computational tool group based in Artificial Intelligence techniques for Specialist Systems automatic generation. This resource uses a representation model of (specialist) knowledge, based on production rules and trust factors, having as main objective simplify the work of specialist systems implementations.

The SEEAD implementation – Specialist System for Distance Education - it will make its user obtain similar results to the one that would get close to human specialists when coming across with a problem, in that case, the appropriate technology for the proposed course.

The results obtained starting from SEEAD–Specialist System for Distance Education (still in experimentation and research phase) –demonstrated coherence with the specialists' conclusions. However, its use was limited, for the time being, just a teaching institution and the analyzes of one group specialists.

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