Distance Education. A cognitive view

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Distance Education has notably increased in higher education. One way of controlling its content validity consists of analyzing the cognitive abilities and attitudes that are being put into action. Cognitive Psychology offers a basis for taking decisions about design, implementation and evaluation. The idea of "distance" in higher education deserves reflection about its meaning compared to more traditional forms of teaching. Distance Education displays particular response modes in designers, tutors, teachers and students. The teacher becomes a facilitator of learning and assessor of required competences. The cognitive perspective promises to shed light on the nature of the process of searching, accessing, consulting and the use of information. The degree of familiarity with the content and with digital tools, the use of multimedia, the management of the available time, the supervision of progress, the evaluation of input, representation and output may be object of treatment.

Keywords: distance education, cognitive perspective, processes, abilities, attitudes

General remarks

Distance Education (DE) poses questions that deserve expert content and design analysis.

The cognitive approach allows making judgments on the validity of DE in terms of the amount of information and its quality based on the mental processes it demands. The content has the power of generating cognitive abilities, transcending mere information.

It is convenient to begin formulating some questions from the specialized literature and the consultation of existing DE programs:

- Does DE claim to develop new abilities and attitudes, adapt existing ones or a combination of these?
- How can we control the cognitive load?
- How could rehearsal and revision be introduced, avoiding redundancy?
- What is the role of the tutor or mediator?
- How could the information base be considered for widening and enriching?
- What are the strategies to prevent cheating?
- Should cutting and pasting be disapproved of, or could they be considered a way of profiting from the available information in the nets?
- How should feedback be introduced to strengthen meaningful learning?
- Are users prepared for self regulating their own progress?
- What are the means to stimulate the sensorial, working and long term memory?
- If user’s autonomy is considered a priority, how could innovation be put into action?
- In a model centered on the person, what are the resources for attending to individual differences?
- How to combine enactive, iconic and symbolical representation in multimedia?
- Are there pieces of information more adequate to DE?
- Which are the abilities and attitudes suitable for design and use in DE?
- Through what means do the programs achieve the creation and display of positive attitudes?

The cognitive view

The tutor acts as a facilitator of learning and assessor of the required competences. This action is oriented to familiarize the user to the structure and the design of the program. The DE implies horizontal cooperation, collaborative learning and learning through peers. These characteristics introduce changes in the current teaching modes and on the kinds of interaction.

An important variable is the degree of program organization. There are well organized programs but also others not clear enough to orient the transit or navigation line followed by the authors. Meaningful learning becomes difficult whenever the learner has to use routine memory or mere repetition when the site does not present a clear structure and organization. Usually the assistants of graduate courses know the management of digital instruments but do not always see their potential for reflective teaching and learning.

The information process model identifies the phases of planning, input, monitoring and evaluation of outcomes involving mental activities such as content encoding, identification, discrimination, selection and transfer.
The nature of DE emphasizes the synthesis, a high level cognitive ability. It takes place in the text selection, in the design of the screens and in the kind of answers demanded by the learner. Unfamiliar and complex materials call for an effort to synthesize. Synthetic thinking differs from resuming, eliciting a more careful information processing. A good example is the use of simulators. Simulation has been used in direct teaching, but the computer favors a more vivid presentation, closely tied to reality, presenting situations, cases and critical incidents not always affordable by direct observation.

The DE challenges the idea of distance. Compared to the conventional class the electronic device may diminish learner anxiety and the risk of making mistakes. Some studies show that the fear of failure is reduced when the mediator is the machine (Holoyak, 2005). The parameters to conceptualize the idea of distance from the cognitive perspective pay attention to the construct dimensions between physical and psychological presence. The psychological distance is illustrated by the difference between the novice and the expert (Chi, 2006), the extent to which the program seems friendly, tutor quality and respect for the needs, interests and expectations of the learner. Combinations between systems with different degrees of presence lead to the revision of the idea of distance. The distinction real – virtual becomes less evident. The interaction to the program may be intense through the computer. The concept of distance is connected to the idea of presence. The activation of memory, direct or indirect influence, the use of strategies to solve problems, argumentation and conditional propositions enhance mental activity (Kuhn, 1991). Stated briefly, the distance occurs in a different way both in direct and virtual systems.

Cognitive processes and abilities that are pursued in DE may be seen as follows: accessing, active searching, selection, consultation, interpretation, application, synthesis and critical thinking.

Dispositions and attitudes are aimed at autonomy, self regulation, flexibility, interaction and collaboration.

Searching, selection and use of information may be explained in terms of the analytic metacomponents of intelligence (Sternberg, 2007): planning, monitoring and evaluation of the data. The component called knowledge acquisition appeals to a relevant selection of information making the difference between the novice and the expert. The difference lies not in the amount of information itself, but in the ability to know what to search for and how to find relevant data, reducing the entry into blind alleys or non pertinent information. This is the reason assigned to navigation circuits and the indication of links that vary according to the degree of expertise (Ericsson, 2006).

The theory of meaningful learning explains selection in terms of the extent that the new or unavailable concepts can be assimilated to the existing base of knowledge, pointing to the importance of the signification attitude that gives sense to the searching. Cognitive activities such as the organization of the new information into meaningful pieces, grouping and establishing relations, describing connections between concepts and ideas and the ways to use them are examples of meaningful learning. Concept organizers, supra - ordinates principles, conceptual maps, key words and scheme activation are instruments directed to the development and optimization of meaningfulness. The strategy called guided discovery allows to design the transit harmonizing the given information (learning by reception) with extrapolation and inference (learning by discovery), and in this way favors active participation during the process (Ausubel, 2002). In DE the provision of supports for accessing and management of information is a useful indicator. Adults learn by establishing relations to past experiences linking learning to specific needs and applying their previous knowledge to new situations.

The cognitive load depends on the amount that the working memory may sustain during one presentation (Baddeley, 1982), with the restrictions imposed by human retention and the capacity for simultaneous and parallel processing. Repetition and rehearsal are strategies for keeping and storing the material and thus having the information available for ulterior application. Massive or distributed practice controls the weight of the cognitive load. Visual and aural loads are processed separately in the working memory, the first calling for verbal codification and the latter for image codification. Therefore, the stimuli combination in multimedia is an aspect to be considered for diminishing the cognitive load. Recovering elements from the long term memory is understood as rebuilding the saved data.

The automatization of information bits (Sternberg, 2007) facilitates rapid and efficient access. In strict sequences such as the navigation circuits on digital nets literal memory plays a crucial role allowing the use of the “automatic pilot”, thus focusing attention on aspects that demand selective perception and alertness (stimulus salience).

The tutor may be considered a mediator (Vigotsky, 1986), a facilitator through a model (Bandura, 1987), an advantageous peer (Rogoff, 1993), a digital mean (Holoyak, 2005) or a combination of these which calls for communicative interaction based on shared representations coming from the cultural context (Bruner, 1997).

The resources display different kinds of representation: enactive, iconic, symbolic and their combination. The balance depends on the nature of the material and its inherent complexity.

Profiting from information is related to the base of the knowledge, both declarative and procedural (Anderson, 1983).

Research shows the difficulty of modifying the existing base of knowledge. The input is under its control. The guide provided by the system has to take into account the previous requisites (Gagné, 1977) increasing the efficiency and contributing to reduce mistakes and failure. In DE inquiry into the knowledge background makes the planning more realistic and increases motivation. A well designed learning experience can motivate the person to become more engaged with the content. Content management implies storing, indexing, cataloging, friendly interface design and sharable learning materials.
The risk of cheating (falseness) is sometimes seen as a disadvantage of ED. From a cognitive point of view, cutting and pasting demand searching, selection and interpretation of relevant information, abilities that transcend routine copying.

Projects and proposals that include formulation, using varied language styles, paraphrase, illustration, critical analysis of a text, go further than the given information. They are mental activities which put into action creativity, innovation and original – divergent thinking.

The concept of insight gives cues for analyzing creative responses when it is contrasted with the base of knowledge: selecting, comparing or transforming new information from available or existing information (Sternberg, 2007). Conditional reasoning and argumentation enrich reflection and the search for alternatives. Some illustrative questions are: what would you do if...?; based on your knowledge, which are the plausible alternatives for ...?; what objections would you formulate to ...? (Kuhn, 1991).

Self regulation in learning (González Fernández, 2001) has to do with metacognition (Flavell, 1979) where the person is aware of what he or she knows and can do and on the ways for improving performance. The calibration of comprehension (Crandall, 2006), a kind of monitoring, permits the regulation of metacognitive processes. Metacognitive control and its influence on decision making is a critical factor in the design, implementation and evaluation of DE programs. It has to do with the transit from heteronomy to autonomy (Piaget, 1979) stimulating critical thinking and dispositions (Ennis, 1986). The learner satisfaction results on improvement in knowledge, self – awareness, understanding of concepts, achievement of course objectives and changes in practice.

ED is an interdisciplinary enterprise that calls for collaborative work from experts in content and design. Distributed cognition (Salomon, 2005) offers pathways for guiding this shared task and for cooperative learning.

The convenience of the combination between DE and direct teaching depends on the task, the context and the user. It is admissible to find elements in a particular area of knowledge to be preferably treated in one or another presentation. Devices such as forum and simulators are opportunities for practice that enhance activity and self regulated participation, combined with traditional teacher – led activities in a blended learning educational experience.

In DE collaborative learning may be synchronous trough weblogs, message boards, chats, e – mail and teleconference. Interactivity helps to maintain the learner’s interest and provides a mean to individual practice reinforcing knowledge, skills and attitudes.

Cognitive styles and strategies (Sternberg, 2007, Gagné, 1977) are useful for adapting programs to learning rhythms and to individual differences. Going ahead, stopping, going back, going to related links, searching for additional information, identifying the navigation line all contribute to participation, autonomy and progress centered on the activity of the student.

Cognitive task analysis (Crandall, 2006) appears to be a tool to evaluate ED content programs. It basically consists of breaking information into pieces while specifying the involved mental processes and abilities.

The above remarks are intended to shed some light on the controversy about the suitability of ED and direct programs. The triarchy user – task – context may be a starting point to make decisions. It is hoped that qualified ED programs may provide a significant contribution in learning to think, learning to learn and construction of new knowledge.

Final comments

The following considerations come from the author’s experience on courses with different degrees of presence at graduate level (see Appendix):

- Scaffolding is a critical key.
- An orderly sequence favors compromise and transit through the program and reduces abandonment.
- Clarity of instructions stimulates meaningful learning.
- Multimedia increases motivation, interest and attractiveness.
- Group discussion with peers, mediators and teachers displays cooperative - collaborative learning.
- Taking previous experience into account shows existing abilities and metacognition.
- Searching evidence and information enriches communication.
- The design of screens, icons and texts are examples of synthetic reasoning.
- The gap novice – expert is reflected in the user productions. Expertise involves digital management and the knowledge base.
References

Appendix

“Culture and Diversity” is a seminar aimed at elaborating a project of community action in vulnerable social groups representatives of cultural diversity. The groups coming from different areas of the province of Santa Fe (Argentina). The seminar is included in a career called “Educating in the diversity”. The career is sponsored by the Private Educators Syndicate (a labor organization) and recognized by the local official education authority. The project design consists of selection and justification of the target group, theoretical discussion on foundations, hypothesis/ objectives formulation, development of the content and the action strategies, monitoring the progress with online tutorial help, presentation and analysis with teachers, tutors and peers using power point and writing the report which is divulged through the Web site.

“Seminar for writing theses and academic papers”. Assistants are graduate students who apply for Magister and Doctoral degrees and researchers of different disciplines at the Faculty of Informatics, National University of La Plata, Argentina. Graduates present the state of advancement of their projects. On line consultation on writing style, content structure and organization, methodology and referencing is provided. Feedback allows to introduce changes and improvements to the initial version. The authors defend their thesis outline in a simulated jury (teachers, tutors and peers) using PPT. The “jury” asks questions and beg for reasons and explanations.

“Cognitive Psychology Applied to Educational Informatics”. The course belongs to the Magister on Educational Informatics at the Faculty of Informatics, National University of La Plata and National University of the Northeast Buenos Aires, Argentina. Graduates are required to produce a project integrating digital devices and underlying cognitive processes and skills. It implies selecting the content, the theoretical and methodological foundations and derivations to practice. Online tutorial assistance is provided. An oral presentation and a final report are demanded. The kind of themes and technical devices vary in the different cohorts. The 2010 productions consisted of the design of a simulator electronically mediated.

All the projects are produced in small groups (up to three persons). The group organization and the oral discussion pursuing to increase interaction and collaborative learning.