THE ROLE OF INFORMATION AND COMMUNICATION TECHNOLOGY IN THE LEARNING AND COGNITIVE DEVELOPMENT PROCESS

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Abstract

Based on previous research, in this study we try to re-analyze the morphological-structural dynamics of dynamic heuristics in learning and cognitive development; the characteristics of the mental idea of people who oppose any type of learning; the role of interrogation psychology and "perspective" in the cognitive process; how information and communication technology is perceived as learning technology and what is its value in the educational process, but also the social aspects of learning situations improved by technology.

Keywords*: Dynamic heuristics; Cognitive development; Interrogation psychology; Information and communication technology; Learning technology.*

1. Morphological-structural analysis of dynamic heuristics in learning and cognitive development

W. A. Koch argues that the rudiments of cognitive adventures, conscious thoughts, the most elaborate forms of scientific reflection all seem to follow a particular path of dynamic heuristics, and Schuh explains that morphology at the macroscopic level has formed the basis for the most recognized taxonomic characters. He points out that "Recently, DNA and amino acid sequences have become standard character sources for several groups, enhancing classical morphology. Behavior and behavioral products occupy a place in character data sources" (Schuh, 2000, p. 29). M. Johnston argues that, given what we know from psycho-physical perception, it follows that Revelation and Explanation can not be true together (when it comes to the external explanatory causes of our categorization, psycho-physical experience narrowed these possibilities).

In the successive and continuous unleashing of cognitive mysteries, continues Koch, in the "methodical" construction of the cognitive maps of the world, or its parts, the human modeling and analogy capacities seem, without exception, to is subject, in one way or another, to the law of the metagenetic path. It is required that man start from the "near-hand" structure to reach through varied strategies of "transposition" of structures to the "furthest possible edge" of the uninterrupted string of a special cognitive map (Koch, 1983, p. 483). The "near-hand" structure may vary according to the evolutionary nature of the particular way of thinking; will be characterized by the first terms of the following combination: "the most familiar

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structure of everyday life" vs."least familiar", "least complicated structure" vs. "the most complicated structure", "the most recent phenomenon - in terms of conscious or unconscious evolution" vs. "the furthest phenomenon - as an evolutionary emergence". "There seems to be some sort of irreversibility in the order of the steps made in this metagenetic method", and behavior is the process by which organisms control their internal sensory data (Powers, 1973, p. XI).

S. Carroll, and he's collaborators shows that: a) preserved regulatory circuits can be restored for new roles during the development of the new morphology (a large number of genres can be launched into a new structure with only a small number of regular changes); b) evolutionary changes in gene organization can facilitate the morphological diversification of a new character. "As regulatory evolution alters genetic interactions in a developmental program, new patterns can occur both in and between species" (Carroll, 2001, p. 159).

Those who emphasize that the human behavioral repertoire is not a pile of independent units, "behavior is produced by mental mechanisms that play a role in different behaviors", are K. Sterelny, and P. Griffiths. Such behaviors may be altered only by altering the underlying mental mechanisms and as soon as these mechanisms are used for different purposes, any change in them could have other consequences. Therefore, individual behaviors are unlikely to have histories to remind themselves of oneself, or to have the importance of independent adaptation (Sterelny and Griffiths, 1999, p. 321).

W. T. Mitchell discusses the notions of mental entities or ideas and claims that these are the ones that provide the materials of thought. To the extent that these ideas are understood as images (as pictorial signs, printed or projected in the average consciousness), this conception is truly an iconology, a theory of image (Mitchell, 1987, p. 164). However, the one that is even more explicit at this point of our analysis seems to be Fodor, who explains that it is plausible that a new phenotypic property is an adaptation that has nothing to do with its complexity. "In the present case, what matters for plausibility is that the architecture of our minds is an adaptation and at the same time how much it would have been required to involve genotypic alteration for it, from the mind of the nearest monkey whose cognitive architecture was different to ours" (Fodor, 2000, pp. 87-88).

2. Characteristics of the mental idea of people who oppose any type of learning

We have tried to deepen the problem of the relationship between the mind and the brain in order to understand the characteristics of the mental idea of those who oppose any type of learning or assimilation and thus critically analyzed the views of some specialists in the field such as K. V. Rao, C. Frith, K. Wilkes, Th. Nagel, J. M. Kaas, K. Sterelny, R. Levins, D. J. Buller, and M. B. Couch.

Thus, K. V. Rao considers that vigilance is a knowledge of particular objects, events or phenomena and necessarily presupposes consciousness, and Th. Nagel. Notes that it is unclear what needs to be done in relation to the central characteristics of the mental idea the people who oppose assimilation, the understanding of people's ways of being, as physical systems.

To the extent that mental activities can be both conscious and unconscious, explains Rao, the mind has a wider meaning than consciousness; memory ensures the continuity of experiences, or the connection of previous perceptions and responses to the current event. There is no one-to-one invariable relationship between stimuli and voluntary muscle responses. For example, when asking a question, we give the answer in a "normal" manner. "If the same question is asked again, the answer will be louder, believing that the first time has not been heard properly. In any case, if we believe that the same question has been resumed only by the amusement, we may not give an answer at all. The role of the mind in increasing the intensity of the second response or suppression altogether is obvious" (Rao, 2003, p. 95).

J. R. Anderson argues that it is not possible to use behavioral data to develop the theory of the level of implementation of the concrete and specific terms we aspired to. "There are many mechanisms that can evaluate the same input / output functions. Consequently, by identifying the behavioral function, we will not identify the mechanism. So, behavioral data will never tell us what is in mind at the level of implementation" (Anderson, 1990, p. 24).

C. Frith develops as far as possible a psychological explanation, but in parallel it should be a complete explanation at physiological level. "Both explanations, he says, should always be modified so mapping from one to the other is easy. In addressing the relationship between mind and brain, there are two clear components in any attempt to specify neuropsychology or schizophrenia. First, a description of schizophrenic abnormalities at the psychological level, and secondly a specification of how the description maps physiological abnormalities on the map" (Frith, 1992, pp. 28-29).

If Wilkes notes that the conceptual apparatus of common sense psychology represents for scientific psychology what is the multi-purpose tool for the universal key, K. Sterelny, in turn, shows that correct psychology for humans is a functionalist psychology: our behavior is the result perceptual inputs, our learning history, and very complex interactions between different psychological mechanisms. "If aggression, rape or xenophobia are the results of interactions between mechanisms, they do not have biological functions, so these behavioral activities will have no Darwinian history." (Sterelny, 1992, pp. 168-169).

D. J. Buller argues that we can not specify the adaptation problems faced by ancestors. As a way of discovering our psychological adaptations, "evolutionary psychological analysis is given by pure assumptions" (Buller, 2005, p. 104). Functionally specialized brain circuits are not present in current individuals "because of evolutionary history in which sequences acted on genetic differences between individuals with certain functional brain circuits, and those without. They are present in individuals because of an artificial response of the brain to its environment" (Buller, 2005, p. 141). Functionally specialized brain circuits have not been modeled by selection on the evolutionary history of our species, but they are modeled by the local environment during an individual's life (Buller, 2005, p. 200). As Couch, emphasizes, when we analyze the states of mind in more detail, we find that there

are differences between important functional states: Correspondence between the parts of evolutionary convergence provides evidence that can be beneficial if the psychological states are of different kinds, then the same state will not have different achievements (Couch, 2004, pp. 198-204).

3. The role of interrogation psychology and "perspective" in the cognitive process

Other authors analyze the learning process in terms of interrogation and perspective, as well as their effect on the cognitive process. In this respect, R. Grallo notes that the phenomenon of question and perspective can play an important role not only in the learning process but also in the emergence and refinement of knowledge. A question is the formulation of a loophole in our understanding, knowledge or practice, he says: if the question is followed by other questions, it becomes an intention to fill that gap - the question becomes an expression of the desire to know (Pera, 2008, pp. 245-248).

Grallo argues that in an interrogation, authentic questions become operators, moving the learning process further: “public” pursuit, for example, involves asking other questions (if the questions are asked by others, that behavior may (can not) to agree with local cultural norms).

In his view, perspectives appear as a solution to a problem, often formulated as a possible answer to a question: perspectives bring together totally different elements in a single solution, in a single or coherent way of thinking. “Perspective frequently gives rise to more questions. The emergence of perspectives can be made more or less confidential or publicity. If prospects are pursued by others, that behavior may or may not agree with local cultural norms. As the intentions of the farthest question change the viewer's point of view, they expand, become more comprehensive, with additional perspectives and appeals to different levels of knowledge” (Grallo, 2007, p. 35).

R. Grallo concludes that while there are occasional studies of the cognitive interrogation process and its point of surrender raises the question, these subjects have not become a widespread focus for systematic study in psychology, nor did they enter into the major theories of learning or intelligence. “Students often experience learning difficulties in different disciplines. For example, obvious things that cause difficulties among study areas for high school or college students are the different branches of mathematics: algebra, calculations, or statistics. Often what is lacking in students is the emergence of relevant perspectives in these fields” (Grallo, 2007, p. 39).

Grallo points out that neglecting interrogation and asking questions is a surveillance of important anchors and contexts for the central foundations of perspectives: by neglecting the role of a question and a perspective, teachers often leave the impression that their discipline is a collection of facts and propositions, not having a clear connection with the world or something interesting about it. He assures that by neglecting the question and the perspective, the teachers model that these phenomena are unimportant, and before they are operators and integrators, they

are the means for solving and learning the problem of human complexity. “In the case of these general questions of interrogation, question and perspective, most remain to be done. For example, it is necessary to locate these cognitive processes in an explanatory complex with other cognitive processes in a demonstration based on unified problem-solving theory. This theory will (1) include cognitive processes in their functional relationships with one another, (2) achieve different levels of knowledge, according to the general intent of the questions being pursued, and (3) provide a taxonomy of interfaces with the complex learning and solving of the problem” (Grallo, 2007, p. 40).

J. Thomas points out that teachers are sculpting their refugees in the academic world by better knowing their specialties than anyone else, which is why "learning has become incredibly fragmented in this process. The more fragmented learning, the more the foundation of the center makes possible the orientation. Eventually, we are so far removed from the center that it is no longer visible or even intelligible” (Thomas, 2002, p. 123).

Awareness of their own existence, their own thoughts and their own environment are important indicators of knowledge, says Rao. Awareness and awareness are not interchangeable. Knowledge includes awareness of the present and memory of sensory inputs and is temporarily eclipsed under the influence of general analgesics. The mind is a brain activity. Ego is a subjective feeling of the self as a distinct entity that excludes all others. “A person recovering from an anesthesia does not feel that he is now a new person. Short periods of unconsciousness do not interrupt its continuity. We propose to use the ego as a simple word for the long phrase the persistence of subjective feeling versus all others. Ego implies a sense of self-based memory-based, and thus it retains unity and continuity through life. It is experiencing the mind, but it is not the mind itself.” (Rao, 2003, p. 82).

The author argues that in this case, consciousness is a more common term used as an Ego equivalent, or which includes the Ego together with other psychological aspects such as awareness, introspection, or others. The signals from each of the organs of perception are received in a centralized neuronal structure. Memory is clearly involved in this process, and the mind plays an important role from the moment when not all responses from stimuli are simple reflexes (Rao, 2003, p. 86).

4. The emergence of information and communication technology as a learning technology

In our researches we tried to determine the psychological and pedagogical effects of the application of information and communication technology in the educational process, the importance of teachers' involvement in learning and training with the help of information and communication technology, the introduction of technology in the practice based on learning, the factors that affect the quality experience of interactive learning.

Thus, we tried to develop a theory that puts a significant emphasis on the correlations between learning styles and technological preferences, the success of

educational programs involving web-based technologies, the recent evolution of e-learning applications, and the increased integration of technology tools into the curriculum. The main idea being to analyze the use of information and communication technology as a tool for learning and as a learning objective, to involve technological change for education, the nature of technology-based activities in which young people engage, and the development of interactive and effective educational courses.

Learning styles provide information about individual differences in the study of preferences (learning styles and preferences influence the efficiency with which each individual learns). Developing web technologies can create exciting learning environments. The individual characteristics of learners influence their preferences in the use of technology (Hunter, 2012, pp. 133-160), since the use of appropriate technology positively influences academic performance. Today's students are ready to experiment with new technologies in the study routine, being flexible in expanding their learning styles (David, 2012, pp. 161-166) and accommodating various instructional strategies (Saeed, Yang, and Sinnappan, 2009, pp. 98-109).

In this way, we highlight the following:

- Improving the use of educational technology can solve some of the difficulties associated with technology integration in schools. (Buzhardt, and Heitzman-Powell, 2005, pp. 13-29).

- Progress in technology creates social changes that require new approaches and practices (Magrini, 2013a; 2013b), education being the key to a radical change. They are common technology-based activities, frequently employed by a majority of respondents, and they can also be influenced by the young person's life stage and the interests they want to pursue.

- E-learning removes the need to travel to a traditional institution or limitation to a specific program of courses. Development in e-learning has led to the creation of a market for the marketing of founders of educational content.

- Technology providers are motivated to offer learning environments (Vogel, 2012, pp. 34-41) to help students effectively learn by providing the customization of the learning experience, based on its context and student characteristics. The number of learning institutions grows in an attempt to capitalize on excess demand for higher education (Wagner, Hassanein, Head, 2008, pp. 26-36). It has been found that the development of technology defies the traditional objectives of education.

- E-learning has become very popular as a teaching and learning method in the education system, being a learning activity involving multi-media computers, networks and technologies. Student style learning is vital in ensuring successful academic performance.

- The quality of learning experience using the educational course will be achieved by conceptualizing and materializing relationships based on identifying and illustrating areas of interaction. The experience of interactive learning is the key concept of interface design for the development of quality educational courses (Kamaruddin, Park, Hyun, 2009, pp. 315-326).

- Information and communication technology acts as a powerful factor in changing the many educational practices we have become accustomed to. These emerging technologies "hit" in the content of the curriculum. Technology influences what is learned in schools and universities and undergoes changes in the way students learn.

- Changes in contemporary learning encourage students to take responsibility for their own way of learning. Increasing the use of information and communication technology as a means of training, changes the strategies employed by both teachers and students in the learning process (Hunter, 2013, pp. 113-123).

- Using information and communication technology in educational change acts as a catalyst for change, these technologies being tools that encourage and support independent learning. The continued use of technology in education will help to increase the temporal and geographic opportunities that are frequently experienced (Rast, 2012, pp. 106-132).

- The use of information and communication technology will play a significant role in several aspects of the design, development and delivery of educational programs in the coming years (Roberts, 2012, pp. 11-25).

5. Social aspects of learning situations improved through technology

The theory we sought to develop emphasizes the development of educational programs based on information and communication technology, the impact of the community on the quality of the produced annotations and the way students learn, the dynamic and reciprocal communication and the resulting interaction with positive effects on learning, such as and the difficulties associated with introducing technology into the classroom.

The main idea consists of an analysis of the assessment of the impact of education on information and communication technology, the predominance of information models of learning, social motivation and institutions supporting learning interactions, and the development of improved learning through technology. The analysis presented contributes to the research of the design of educational programs supported by information and communication technology, the potential of hiring students to create examples of annotations, the effects of teaching through their own tutoring mode, and collaborative intercultural contexts of online learning. These findings highlight the importance of examining support for collaborative learning environments that embrace research and conversation communities, measures where specific learning objectives are achieved through mobile social media games, online learning collaborative situations, design features and choices available in virtual environments (Pera, 2013, pp. 118-123).

Here are some conclusions that we must take into account in the educational process:

- There are potential benefits to learning in many online activities, from collaborative games to forum discussions. Immersion in technology is an important factor that determines us to understand whether people are confident in their technological skills in information and communication (Hunter, 2012, pp.133-160).

- Teachers should select the most appropriate resources of information and communication technology to enable their students to know the necessary learning goals. Teacher's beliefs are strongly influenced by the topic and culture of the school in which they participate (Doomen, 2012, pp. 90-105).

- School leadership is a critical factor in facilitating teacher change (Vogel, 2012, pp. 34-41): they need to support teachers and create a common vision of the use of technology. Schools need to create a common vision, build a supportive culture (Rast, 2012, pp. 106-132) and provide adequate resources to successfully support technology (Ertmer, Ottenbreit-Leftwich, 2010, pp. 221-251).

- Psychology uses learning and educational techniques at various levels of production and support for psychological procedures. Integration of information and communication technology with traditional psychological services in a web-based environment is available to the Internet user. E-psychology is the invasion of Information and Communication Technologies (ICT) in psychology (Drigas, Koukianakis, Papagerasimou, 2011, pp. 1416-1423).

- Combined learning is a special model of education supported by information and communication technology. Increasing experiential learning (Roberts, 2012, pp. 11-25) has led to an increase in the application of games to promote learning (Maller, 2012, pp. 62-73) and engagement in high-level education .

- The dynamics of social games can increase students' motivation and desire to learn. The use of social media games can serve as an effective vehicle for mobile and contextual learning that complements existing information and communication technology tools (Parise, Crosina, 2012, pp. 209-222). The AnnotEx system (Annator example) allows students to update computer programming examples with line-line explanations and review annotations produced by their peers.

- Any improvement in online learning techniques will have an impact on the global online population. Virtual Multiple User Environments (MUVE) and Virtual Learning Environments (VLE) are a valuable contribution to collaborative or problem-based learning (Duncan, Miller and Jiang, 2012).

- Action in a social context leads to excitement and attention (Okita, Bailenson, Schwartz, 2008, pp. 132-139). The extrinsic motivation promotes successful learning and productive behavior. Those who teach inherently will tend to choose difficult tasks, gain more knowledge when they read the material they find interesting, the conditions that support intrinsic motivation also promote greater creativity and better conceptual learning, since intrinsic motivation is associated with greater enjoyment and more active involvement in activities (Cheng, Yeh, 2009, pp. 597-605).

- Students can access courses online remotely. Virtual non-commercial virtual reality environments provide space to support collaborative online activities. Successful use of technology often requires a compatible learning method (Peters, Johansson, 2012, pp. 209-222) to obtain benefits (learning may vary depending on learning situations and technology choices).

- Virtual reality and communication technology can reinforce recursive feedback during two-level learning, the level of the environment (the use of technology-enabled utensils can create unique learning situations) and the level of

social interaction (the use of virtual reality technology can create unique social situations that may have interesting implications for learning). Technology can help visualize to highlight similarities, but also to help participants identify more similar avatars (Okita, *el al.*, 2013, pp. 132-139).

Conclusions

The results of the current study converge with previous research on the use of digital technologies for learning and teaching in higher education, the complexity of the learning process, the optimal use of learning technologies, and the transformative effect of technology on pedagogy as well as previous research on the use of mutual evaluation technology , to ensure the quality of community-based educational content, Internet-based online learning experiences, teachers' recent efforts to use technology to support students in learning, and the necessary features of teachers to enable them to mobilize information and communication technology resources as significant pedagogical tools.

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