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INFORMATION TECHNOLOGY AND THE COGNITIVE DOMAIN

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Abstract: *The purpose of this article is to map the context within which learning could occur, that is, the organizational learning processes and structures that can create or improve learning in a learning organization. Such an approach produces definition for learning organization and integrates the basis concepts into a model of organizational learning in the technologically environment, based on assisted instruction.*

Key words: *learning organization; organizational learning; assisted instruction*

Literature overview

Actual researches in the cognitive domain, focused on learning about learning, both as individual or as organization, imply information technology and two effects of it: diversity and globalization.

[Pedler *et al.*, 1991][2] define learning organization as a form of organization that enables the learning of its members in such a way that it creates positively valued outcomes, such as innovation, efficiency, better alignment with the environment and competitive advantage. [Finger & Brand, 1999, pp.137] conceptualize the learning organization as a strategic objective, like, increased profitability or customer satisfaction.

[Armstrong & Foley, 2003] relate that there is a little opposition to the premise that organizational learning is a competence that all organizations should develop in fast-changing and competitive environments, based on [Nonaka, 1991], [Senge, 1992], [Hamel & Prahalad, 1994]. In the same time, the authors distinguish between *organizational learning*, which concentrates on the observation and analysis of the processes involved in individual and collective learning inside organizations, and the *learning organization* literature that has an action orientation, and it is geared toward using specific diagnostic and evaluative methodological tools which can help to identify, promote and evaluate the quality of learning processes inside organizations. Their conclusion is based on the documented researches of [Esterby-Smith & Araujo, 1999].

[Phillips, 2003] outlines a ten-principle learning organization benchmarking and implementation model and describes the methodology used to establish its validity. The model is derived from the work of major thinkers and writers in the field of organizational learning and the learning organization, and attempts to outline the ideal learning organization. (1) *Will*: The organization maintains a passionate and enthusiastic commitment to continuous improvement through continuous learning. (2) *Leadership* is continually

mindful that the vision is understood and shared at all levels and removes obstacles where necessary. (3) *Strategic thinking and vision*. Employees are encouraged to become system-thinkers. (4) *Communication*. (5) *Learning and development*. (6) *Innovation and decision making*. (7) *Change management*. (8) *Intellectual capital and knowledge management*. (9) *Measurement and assessment*. (10) *Reward and recognition*.

[Örtenblad, 2004] presents an integrated model of the learning organization, based on empirical research of the learning organization literature, as well as on practitioners' understandings of this concept. The model includes four aspects which cannot be treated as separate: learning at work, organizational learning, developing a learning climate, and creating learning structure. The author considers that the concept of the learning organization has been quite ambiguous, since it was first coined by [Garratt, 1987]. Örtenblad's integrated model is not a theory, but the author considers that it would increase the possibilities that the term "learning organization" can become an academically accepted concept, while it is now more practice-oriented.

[Sicilia & Lytras, 2005] are introducing the concept of a "semantic learning organization" as an extension of the concept of "learning organization" in the technological domain. The authors consider the learning organization as an ideal form of system in which learning behaviour improves and adapts, and managers are supposed to be coaches instead of directors. This vision contrasts to the old one, in which the knowledge is considered to reside in the company, mainly in the form of procedures, rules, and other means for shared representation. The article develop the idea that certain kind of technology can be considered as better drivers or facilitators for achieving the status of learning organization. The "semantic learning organization" extends the notion of learning organization in the technological dimension, so that it can be considered as a learning organization in which learning activities are mediated and enhanced through a kind of technology that provides a shared knowledge representation about the domain and context of the organization.

[Curado, 2006], in a literature review, explores a new idea, presenting the possible relationship between organisational learning and organisational design. Analysing different ways of thinking organisational learning, the author highlights that the nature of the organisational learning is, implicitly or explicitly, associated to the meaning of individual learning. Related to [Cook & Yanow, 1995], the papers concludes that this way, a relation between organisational learning and the theories of cognition can be established. As a result, this perspective on organisational learning is referred to as the "cognitive perspective".

[Thomas & Allen, 2006] consider that the need to create and apply knowledge has contributed to the prescription of a learning organisation. The two researchers appreciate that what are central to the concept of a learning organisation are both organisational learning, defined as the intentional use of learning processes to continuously transform the organisation, based on [Dixon, 1999] and the related concept of knowledge, based on [Argyris & Schon, 1978], [Revans, 1982], [Schein, 1993], [Senge, 1995], [Pedler et al., 1997].

[Dymock & McCarthy, 2006] fix as a purpose of their research to explore employee perceptions of the development of a learning culture in a medium-sized manufacturing company that was aspiring to become a learning organization. This objective was based on [Senge, 1990], the Senge's concept of the learning organization, as a goal, a state that could be achieved.

Basis for a new model

Basis for a new model results from the earlier theoretical and practical researches in didactics assisted design [Zamfir, 2003], [Zamfir, 2004], [Zamfir, 2005]; theory and practice interact in the educational space, and the learning system becomes the engine of the learning society. The idea was developed first in 1971, in information technology domain, when the microprocessor was created in order to solve a more general problem, and then it was included as a computer in a personal computer. We have to use concepts from computers science to create teacher professional development models that help mentors integrate technology into the curriculum. The basic structure of a personal computer consists of hardware (physical resources), firmware (logical resources implemented in physical resources), software (logical resources) and dataware (informational resources). Each part is based on an architecture which generates different effects in different approaches: logical, technological and functional. Technological development in the areas of information storage, retrieval, and communication, can be expected to alter the logical and functional directions, and by default, the manner of teaching and learning.

When people know their level of competence, they could learn what they need to know in order to meet specific job requirements and performance standards. Notions are shaped by the paradigms we hold. In this sense 'paradigm' means the 'working model' of what we do, why and how that we exist as intellect entities. Such a working model is Bloom's Taxonomy for the cognitive domain. The cognitive domain involves, as an entry, knowledge as a process, and offer, as an output, knowledge as an object.

[Zamfir, 2007a] develops an overview of the main activities of this permanent cognitive restructuring: configuring and maintaining the infrastructure that makes technology works. From this point of view of the cognitive restructuring, three kinds of infrastructure are likely to emerge: technological infrastructure, conceptual infrastructure of the new study programmes, and the cognitive infrastructure of all the participants involved in the learning process. Technology is usually 'embedded' in a device or an approach that, potentially, changes the way an activity is carried out. A device with embedded technology may be able to be used to carry out certain functions within an activity. Thus it may be useful to think of technology more in terms of functionality rather than devices. The context generated becomes infrastructure. In relation to teaching and learning, appropriate infrastructure has potential functionality in areas such as clarifying the zone of proximal development for a learner, scaffolding learning activities, mediating learning while in progress [Robertson & all, 2003]. Considering pedagogy to be the activities that assist understanding, and teaching to be scaffolding learning activities and mediation of learning experience, technology could be used in activities for developing learning objects, or as tools, in order to contribute to the completion of tasks. Tasks are undertaken in order to achieve a result or outcome.

[Zamfir, 2007b] analyses knowledge management from the point of view of assisted instruction and highlights that the duality of the knowledge (as an object or as a process), developed as a dichotomy generated different terms to distinguish between the types of knowledge: formal and informal, explicit and tacit, know-what and know-how. According to these concepts, there is knowledge that can be or not, easily expressed, captured, stored and reused. It can be or not, transmitted as data and is found or not, in databases, books, manuals and messages. [Nonaka, 1991] consider that "the two complementary entities interact with each other in the creative activities of human being and call this interaction the knowledge conversion process". This process consists of four stages:

socialization, externalization, combination and internalization and it reflects transfer tacit between individuals, translate into procedures, spreads throughout the organization and translate into individual.

The Vygotskian-inspired, sociocultural-based, learning-centered model is so radically different from the two most dominant models of teaching and learning (teacher centered and student-centered) that most people have never consider it. [Wilhelm & all, 2000] This is because this new model is two-sided and requires mutual effort and responsibility on the part of learners and teachers, whereas the dominant models are one-sided and place nearly complete responsibility for learning with the student.

Man has always lived and worked in some type of social network. An application of this model is the communities of practice, which became communities of competence, as self-organizing systems. The roles of corporate university, an enterprise academy and a community of competence are similar. It's about a process for total developmental integration – a totally inclusive people, learning and business and process idea.

Workplace learning basically operates with the concepts of learning environment and learning processes. Learning in the workplace includes the learning environments of the workplace and the employees' learning process. Technology influences what activities are possible and what activities may achieve.

Assisted instruction paradigm

In a world of a continuous change, one of the most prevailing behaviour is that of convergence. Concepts converge to form completely new concepts; people converge into new local, global and virtual communities; professional skills converge to create new professions. Technology converges to create new technologies and products; the personal computer become tool, tutor, and tutee and now is a real context in education.

One of the most important impacts of technology to the social context was the possibility of developing and implementing standards, as well defined levels of knowledge, in the cognitive domain. First of all, there were developed hardware standards, which generated software standards and dataware standards, for data processing. In information technology, the most important impact was about standards for users. In education, the new conceptual framework that characterize teaching as a complex cognitive skill determined in part by the nature of a teacher's knowledge system to explain patterns in participants' planning, teaching and post-lessons reflections is based on assisted instruction for a personalized process.

Based on the classic structure of levels in producing education (Pre-Assistant Lecturer, Assistant Lecturer, Lecturer, Senior Lecturer and Professor), we add new specific competencies (information literacy, computer literacy, technologic literacy and education literacy), and now, the teacher processes data, structures information, systematizes knowledge, developing educational objects.

Categorization, as a central topic in cognitive psychology, in linguistics, and in philosophy, it is crucial precisely in learning. Concepts categorization enables the student to classify (or to recognize the classification of) objects or concepts that belong to a group. This characteristic accelerates the thinking process, favours the immediate selective perception and facilitates generalization and learning. This is the pyramid of concepts and represents the basis for knowledge, comprehension and application. Categorization, together with

processing and analogical reasoning, has a special role in the inference of non-explicit (tacit) knowledge that the learner can infer from what he has seen or heard.

Conceptual categories are higher order concepts, and they express the specific role of concepts in their contexts, and in concepts mapping they are visual elements relevant to analysis, synthesis and evaluation. These entities have a special role in processing explicit knowledge that the learner can receive in a pedagogical dialog.

Scaffolding in assisted instruction consists in developing and using dedicated applications in order to synchronize tacit knowledge to explicit knowledge in the zone of proximal development (see Figure 1).

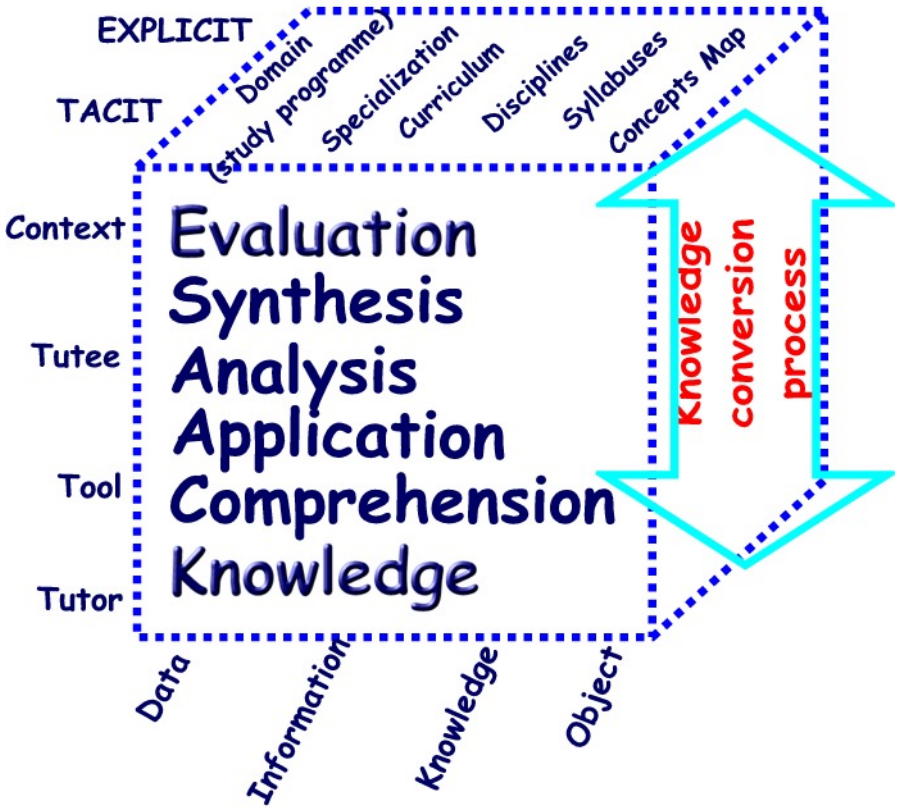

Figure 1. Knowledge and scaffolding in assisted instruction

Modelling, coaching and scaffolding are all types of support in education. Modelling can be part of a scaffolding process. Modelling provides an example of the required performance, whereby the most important steps and decisions are stressed. The goal is imitation of the performance of an expert by the learner. When the model is faded, which means that students should follow their own thoughts instead of following an example, modelling is a part of scaffolding process. Coaching can also be part of a scaffolding process. In coaching learners performs the required performance by themselves. A coach can give hints, prompts, and provides feedback to a learner. A good coach will be a scaffolder of students learning. This means that the coach will be receptive to the current level of performance of students, and will realize that the students should become self-reliant in performance of a task. Therefore this coach will fade the support that is given. So, in the case where coaching is faded, coaching is a part of the scaffolding process. But fading is not an explicitly mentioned part of the coaching process.

When the computer is used to instruct in traditional mode a subject matter area, it becomes a tutor. In assisted instruction, the teachers educated using the principle of computer literacy, become competent users; they develop, adapt, and optimize their applications, based on their observations and interactions. They can eliminate the routine, when it is necessary, by recording it in procedures, or they can activate the routine, in the other cases [Zamfir, 2004, pp. 50-55].

In a traditional approach, the term computer-assisted instruction is used to describe the tutor mode; with advanced users, the content, gradually refined (data, information, knowledge and objects) is based on a glossary, permanently enhanced: as a pyramid of concepts for knowledge, comprehension and application, and as a concepts map for analysis, synthesis and evaluation.

In the tool mode, the computer solves a practical function in getting a job done. It may become a paintbrush, a typewriter or an electronic spreadsheet. The widespread acceptance of tool applications such as database management caused schools to rethink the meaning of computer literacy. At this level, we optimize the convert process in the dichotomy tacit-explicit knowledge.

When computers are tutee, the roles are reversed: the student becomes the tutor. The student teaches the computer. In this approach, learning about computer is seen as a discipline unique unto itself: it is the beginning for training the trainers. There are three disciplines in this programme: Information and Communication Technology, Informatics Didactics and Computer Assisted Instruction., as they reflect the reference mode to the computer: tool, tutor and tutee.

When the computer becomes a context, it integrates all forms of education (formal, nonformal and informal) in a single one. The context means student desktop, teacher desktop or workplace office. The student desktop could be placed at home, in the classroom or in the office. This approach leads to the workplace learning concept; for an institution it could mean organizational learning. An educational institution is the first one which becomes learning organization.

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