Scaffolding in Assisted Instruction

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On-The-Job Training, developed as direct instruction, is one of the earliest forms of training. This method is still widely in use today because it requires only a person who knows how to do the task, and the tools the person uses to do the task.
This paper is intended to be a study of the methods used in education in Knowledge Society, with more specific aspects in training the trainers; as a result of this approach, it promotes scaffolding in assisted instruction as a reflection of the digital age for the learning process. Training the trainers in old environment with default techniques and designing the learning process in assisted instruction, as an application of the Vygotskian concept of the zone of proximal development (ZPD) to the area of computer literacy for the younger users, generate diversity in educational communities and requires standards for technology infrastructure, standards for the content, developed as a concepts map, and applications for personalized instruction, based on ZPD theory.
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Knowledge Management

One of the first active learning philosophies began in the fifth century BC and other Chinese philosophers (such as Kung Fu-tse) followed Lao-Tse by using a method that closely resembles what we now call the case method or case study.
In 300 BC, Socrates engaged his learners by asking questions, known as the Socratic Method. Plato, who was a student of Socrates and the teacher of Aristotle, wrote down the Dialogues, and he called this process the dialectic, and considered it the pinnacle of learning. Aristotle was the first to observe that "association" among ideas facilitated understanding and recall. He believed that comprehension was aided by contiguity, succession, similarity, and contrast. Although we often view the term *technology* as hardware items, it is actually a system of practical knowledge. Technology is derived from the ancient Greek word techne, which can be translated to refer to art, craft or skill. Plato viewed techne and scientific knowledge as being closely related, and Aristotle went a step further by asserting that techne was the systematic use of knowledge for intelligent human action [Clark, 2000].
Knowledge management comprises a range of practices used by organizations to identify, create, represent, and distribute knowledge for reuse, awareness, and learning across the organizations [Wikipedia, 2007]. Ten years ago, knowledge management become an official discipline in higher education. Using knowledge management techniques and technologies in higher education is as vital as it is in the corporate sector. If done effectively, it can lead to better-decision making capabilities, reduced "product" development cycle time (for example, curriculum development and research), improved academic and administrative services, and reduced costs [Kidwell et al, 2000].
Today's economy runs on knowledge, and most companies become learning organizations. In the same time, companies develop organizational learning. As a result, knowledge management can be studied from two perspectives:
- Knowledge can be viewed as "Object"; in this case, researchers and practitioners are involved in the construction of information management systems, artificial intelligence, and reengineering; they are building knowledge systems.
- Knowledge can be viewed as "Process"; in this case, the point of view relies upon the concepts from philosophy, psychology, and sociology, and the researchers and practitioners are involved in education; first of all, they are involved in assessing, changing and

improving human individual skills and behavior.

This duality of the knowledge, 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.

Pedagogical content knowledge

Cognitive psychology suggests that a mental-model consists of two major components: knowledge structures (schema) and processes for using this knowledge (mental operations). Four elements describe a schema: ① *general*: a schema may be used in a wide variety of situations as a framework for understanding incoming information; ②*knowledge*: a schema exists in memory as something which a person knows; ③ *structure*: a schema is organized around some theme;④ *comprehension*: a schema contain slots which are filled in by specific information. A major concern of instructional design is the representation and organization of subject matter content to facilitate learning. The careful analysis of subject matter content (knowledge) can facilitate both the external representation and use of knowledge for purposes of instruction (knowledge objects) and the internal representation and use of knowledge by learners (mental-models). Cognitive development requires social interaction, and learning is restricted to a certain range at any given age. As each level of learning is achieved, the teacher sets new targets within a new zone of estimated ability of the student. This process of helping is termed "scaffolding".

Vygotsky takes Piaget's notion that development leads learning, but approaches it from the opposite direction, arguing that, in fact, learning leads development. Vygotsky noticed that children's levels of learning are more accurately reflected by what they can do with help, rather than what they can do on their own. This led him to develop the notion of a "zone of proximal development" (ZPD), which represents an individual student's potential level of learning if helped by teacher.

"Pedagogical content knowledge", or knowledge of subject matter for teaching, is specific to the teaching profession. This domain of knowledge consists of an understanding of how to represent specific subject matter topic and issues in ways that are appropriate to the diverse abilities and interests of learners.

Learning Objects and Scaffolding

One of the most important impacts of technology to the social context was the possibility of developing and implementing standards, as general 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.

We use Bloom Taxonomy for detailing learning process for student: knowledge, compre-

hension (internalizing), application (externalizing), analysis (processing), synthesis (structuring) and evaluation (systematize). This learning process develops specific competencies, in reverse order: educational, technological, computer and information literacy. Finally, we define levels of evaluation in the results of the educational process: novice, advanced, competent, analyst and expert [Apostol & Zamfir, 2006]. 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, favors 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/she has seen and/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 Fig. 1).

Fig. 1 – Knowledge and scaffolding in assisted instruction

When the computer is used to instruct in traditional subject matter areas, it becomes a tutor. The efficiency with which this is done depends upon how expertly the specific program was designed. Among the problems intrinsic to teaching programs is that of individualization: whereas a human teacher is able to respond to the needs of the student on the basis of observation and interaction, a programmer must anticipate potential needs and build strategies for dealing with them into the program.

In assisted instruction, the teachers educated using the principle of computer literacy, become programmers; 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, pg. 50-55].

The term computer-assisted instruction is commonly used to describe what take place in the tutor mode, but 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 serves 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.

For the third computer use, the roles are reversed: the machine becomes the tutee and the student becomes the tutor. The student teaches the computer by programming it. In this approach, learning about computer is seen as a discipline unique unto itself: it is the beginning for training the trainers.

Next step in this approach is categorization of the applications, based on the three modes we interact with computers and the four levels for the gradual improvement of the content. As a result, we build projects in order to individualize learning for each student.

Each project consists of the following items: the e-glossary, one or more e-statements, a checking-application for the student (for each e-statement), a global checking-application for the teacher, and a database including the previous items and the results of each application.

This structure of the project in assisted instruction is the basement for using learning on-line as an expansion of the campus-learning process and for the individualized learning, as far as the diversity of the students is growing up continuously. The impact of the students' diversity can be solved including in the project: pre-tests, preparing the scaffolding for an individualized teaching process, and post-tests, evaluating the scaffolding or the students.

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