JOURNAL OF APPLIED QUANTITATIVE METHODS

Quality-Quantity Paradigm in Assisted Instruction

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Abstract: The purpose of this article is to introduce and develop an approach educational research oriented, in order to integrate assisted instruction in assisted didactics design, based on a quality-quantity paradigm. In this context, the analysis focuses on a methodological approach, permanently reframed by the conceptual, analytical and theoretical updated frameworks. This manner reflects the versioning process of the hardware and software development, and highlights the educational technology concept integrated in a classical teaching-learning activity.
Key words: e-education, standardized instruction, concepts map, individualized learning, zone of proximal development

Introduction

Scientific research in e-education consists of recursive processes as a theoretical feature and evolves as iterative activities as a practical feature. This statement forces reconsidering the theory – practice relation, emerging new methodologies grounded on quality-quantity paradigm in assisted instruction. Such an approach requests conceptual delimitations and redefined notions dedicated to merge the learning process in e-environment.

Considering *the article* as the basic action of a researcher and the main paper types (conceptual paper, case study, general review, literature review, viewpoint), we define the working model of this approach, developed as a paradigm, as we can see in Figure 1. Conceptual framework is analyzed in order to obtain the construct named analytical framework and the same conceptual framework is synthetized in order to obtain the construct named theoretical framework. An analytical framework is developed as an iterate process finalized as a case study while the theoretical framework is developed as a recurrent process finalized as a case study. The case study could develop the conceptual framework, the analytical framework or/and the theoretical framework, so the working model reflects a perpetual research activity.

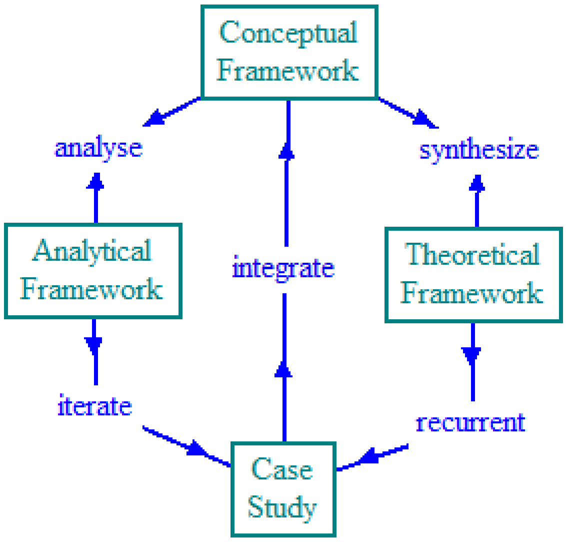

Figure 1 – The working model developed as a paradigm

Scientific research activity, using a meta-language, represents a recursive process for education, and scientific research activity, using an object-language, represents an applied process in technology. Both types of languages develop subjects in the background of a specific group of working terms, expanded as a meta-subject. The group of working terms has a double function: a descriptive one (knowledge function) and an explanatory one (understand function). At the same time, two main theories about metacognition are reviewed, each of which claims to provide a better explanation of this phenomenon [Arango-Muñoz, 2010]. The author considers that we have to distinguish two levels of this capacity - each having a different structure, a different content and a different function within the cognitive architecture. From the point of view of the meta-representational theory, metacognition refers to 'thinking about thinking', i.e., to the self-ascription of mental states carried out by forming a second order thought about a first order one, and more generally forming an (n+1)-order thought about an n-order thought. The control view on metacognition claims that it is mainly a capacity to evaluate and control our cognitive processes and mental dispositions by means of mental simulation. The author highlights two levels of metacognition: the high-level, theory-based metacognition and the low-level, experience-based metacognition.

Conceptual framework

Classical education includes instruction, considered as an interaction between teacher and student, while e-education assumes assisted instruction, developed as a process based on interactivity between student and teacher, mediated by personal computer; e-education includes the classical form, and it is developed as an extension of the previous one; e-learning represents just an electronic support for this process [Zamfir, 2009b].

The basic structure of a personal computer consists of hardware (physical resources), firmware (logical resources integrated in physical resources), software (logical resources) and dataware (informational resources). Each part is based on an architecture which enables configurations with different effects in different approaches: logical, technological and functional. Our activities mean 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 programs, 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. This generated context 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. 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 [Zamfir, 2007].

One of the most important impacts of technology to the social context was the possibility of developing and implementing standards, as well as defining levels of knowledge, for the cognitive domain. This was the first condition of a base for the standardized instruction. Scaffolding in assisted instruction consists in developing and using dedicated applications in order to match tacit knowledge to explicit knowledge in zone of proximal development.

Based on the 'knowledge cube' proposed in [Zamfir, 2008], Figure 2 presents the concepts map for a practical and theoretical interaction in assisted instruction, where the personal computers become an educational context and sustain producing learning objects. This metaphorical construct leads to the 'workplace learning' concept, a basic one in organizational learning.

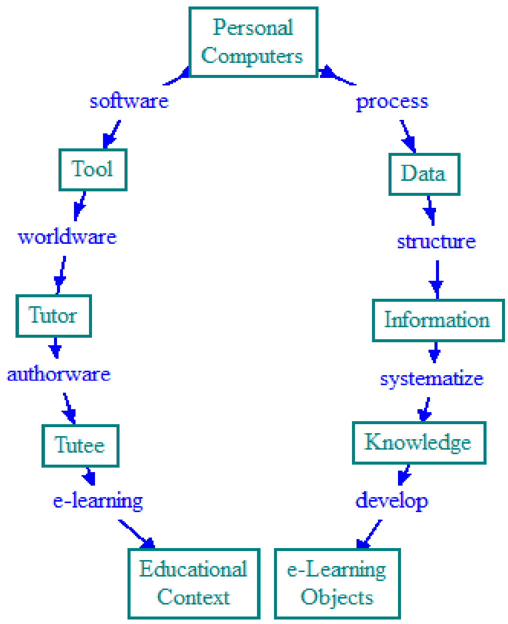

Figure 2 – The working model in assisted instruction

Theoretical framework

Based on a volume which introduce and discuss the foundations of research [Grix, 2004, p. 18-34], we present the idea that while discipline specific terms and concepts exist and have theirs uses, generic research terms and concepts have the same fundamental meaning in whatever discipline they are used. So, the author promotes the tools of research, that have as their role to describe and finally to explain, and they are concept, paradigm, ideal type, typology and model. In a distinct section of the same volume [Grix, 2004, p. 100-115], the author affirm that the role of the theory in social research is complicated by the fact that it is utilized for different purposes by different academic perspectives working in different philosophical traditions within the human sciences.

[Zamfir, 2009a] introduce a theoretical framework for scientific research in e-education, based on the technology domain, which is synthetized in Figure 3. A general analyze of the role of technology in the sustainability transitions of the society is presented in [Paredis, 2010]. This approach builds on insights from recent traditions in the philosophy and sociology of technology, in particular the social construction of technology and actor-network theory, which include the education perspective as a default contextual one. Also, the article studies the different conceptualizations of technology in the sustainability debate.

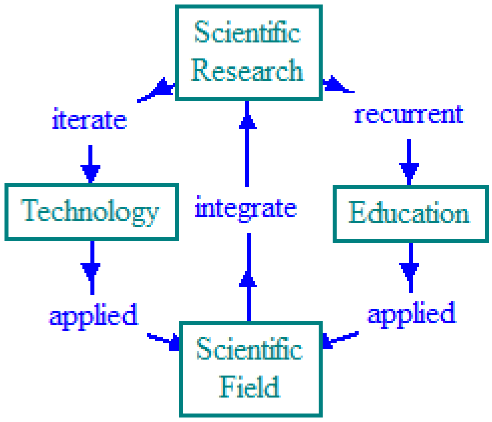

Figure 3 – A theoretical framework for scientific research in e-education

As soon as knowledge developed by scientific research is recorded in technology, from a social perspective, the difficulty lies precisely to teach the knowledge workers in order to understand and apply available technology [Zamfir, 2010], and, as a key of this question, to train the trainers in a dynamic technological infrastructure.

Based on the classic structure of levels in producing education, Figure 4 reflects the specific competencies for teaching in assisted instruction and offers a typology for the students' stages in learning activities.

According to [Sicilia, 2006], organizational learning can be considered as systematic behavior oriented to acquire capacities for dealing with the needs and challenges of organizations in competitive environments. Competencies understood as the workplace capabilities of individuals or groups can be used as one of the approaches for managing such capacity-acquisition behavior. The management of competencies through information technology for improved effectiveness and efficiency require significant tasks and reliable solutions in the information systems discipline. For an educational organization, the dynamic content has a double impact in recalibrating competencies: both for the trainers and for the students. Developing this theoretical framework, the explanation becomes part of the body of the content knowledge that constitutes the research field.

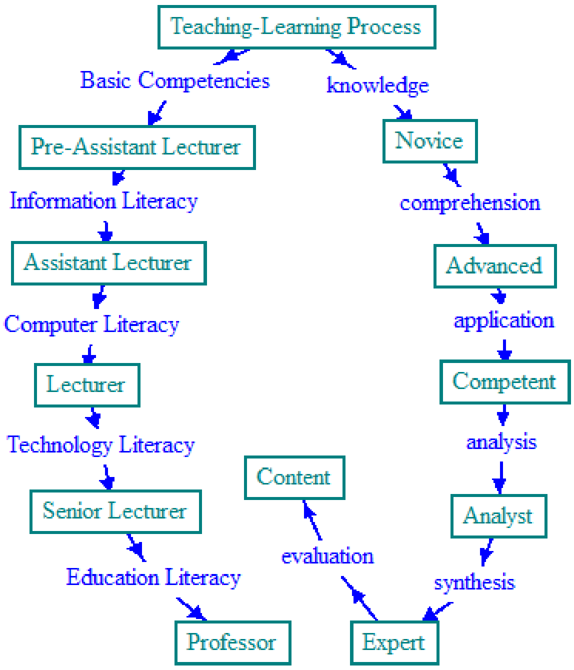

Figure 4 – Levels of competencies in assisted instruction

Analytical framework

The central concept in assisted instruction is the learning process, considered as a chain of experiences rather than being specific to particular disciplines. [Davies, 2008, p.11-15] started his analyze with David Kolb's definition: *Learning is the process whereby knowledge is created through the transformation of experience*. Building on the work of Dewey, Lewin and Piaget, Kolb put forward a model of learning from experience which consists of four discrete phases: concrete experience, reflective observation, abstract conceptualization and active experimentation. Considering Kolb's cycle helpful in illuminating the ways in which we learn from experience, [Davies, 2008] considers that it presents only a partial picture of the various elements that are usually involved, but he mentions the work carried out by Kolb in the United States, and Peter Honey and Alan Mumford in the UK, into learning styles or types. Both approaches give names to the various phases of the cycle. Kolb has Diverger, Assimilator, Converger and Accommodator, whilst Honey and Mumford have Activist, Reflector, Theorist and Pragmatist. Taking the four phases of the cycle, they said that individuals may have preferences for and particular abilities in, one or more of the phases.

Integrating Kolb's model of experiential learning in the concepts map approach, specific for this research, we consider necessary to highlight connections for the four phases and the result is presented in Figure 5. Connections are made with the levels of Bloom's Taxonomy for the cognitive domain, and the model illustrates the generic student. For a trainer, the last connection, represented by analysis, includes also synthesis and evaluation, two fundamental activities in assisted didactics design. This approach replaces the idea that individuals may have preferences for particular abilities in one or more of the phases with the necessity of improving the basic competencies of the student.

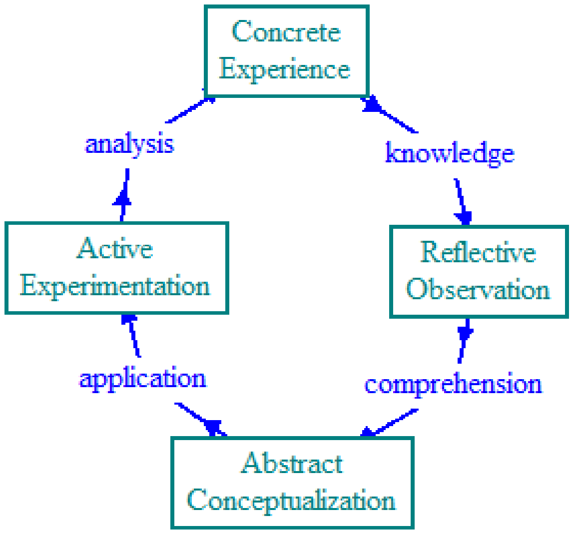

Figure 5 – Kolb's model of experiential learning integrated in concepts map approach

The second base concept in assisted instruction is the teaching process, developed on a pyramid of concepts to know, understand and apply and extended on a concepts map to analyze, systematize and evaluate the content of the discipline.

The content in teaching-learning activities implies the language (see Figure 6), and the language means content statements (nouns, verbs, adjectives, adverbs) and grammatical statements (pronouns, prepositions, conjunctions, determiners) as terms. The terms are entries for the cognitive infrastructure of the trainer, where they are transformed in concepts for a particular discipline; and the results of the design process are the learning applications. The same image could represent an application based learning in assisted instruction as soon as the cognitive infrastructure is a student's one. When all the components of the proposed structure are reflected in a virtual space as digital resources, we define e-learning, as a learning support or as an assisted instruction environment.

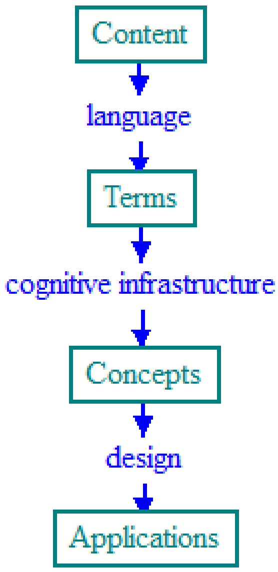

Figure 6 – Application based teachingin assisted instruction

The cognitive construct presented in Figure 6 reveal a quality-quantity paradigm in assisted instruction: quantitative components (content, terms, concepts and applications) are connected through qualitative processes (language, cognitive infrastructure and design). As any working model, developed as a paradigm, this one's purpose is twofold: first, a quantitative structure for teaching-learning activities is offered, and second, a qualitative functionality in order to turn the theory into practice is promoted. Our world is one of constant and increasing rates of change; in this world, one of the most prevailing trends and traits is that of convergence. Concepts converge to form completely new concepts. The individual's cognitive infrastructures "absorb" concepts as basis, threshold, or aggregate. At the same time, the concepts are classified as being perceptual, relational and associative. Vygotsky's work showed that the individual's thinking emerges through interaction with the environment. 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 individual'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. Scaffolding in assisted instruction consists in developing and using dedicated applications in order to match tacit knowledge to explicit knowledge in the zone of proximal development. This approach invokes active learning design and ensures student-centered learning [Zamfir, 2008]. This is why the concepts give this paradigm stability through convergence

Case study

First application of the approach described in this article is the e-Class. Qualitative components of this concept consist of the technological infrastructure, including e-services (network, web, and e-mail), conceptual infrastructure (content, including software applications) and cognitive infrastructure (teachers and students); these elements determine the quantitative components of the e-Class: the numbers of the students, considering that each student uses his own personal computer. The concepts map of the e-Class is presented in **Figure 7**, and the structure highlights quantitative objects and connections reflecting qualitative processes, as a didactics overview.

In general, the key feature of a teaching-learning process is signified by the threshold concepts. A threshold concept can be considered as akin to a portal, opening up a new and previously inaccessible way of thinking about something. It represents a transformed way of understanding, or interpreting, or viewing something without which the learner cannot progress [Meyer & Land, 2003]. In assisted instruction, the key feature of a teaching-learning process in an e-Class is reflected by the granularity of the e-learning objects. As soon as the teaching-learning process is knowledge's application, and e-Class is an assisted instruction's application, the granularity of the e-learning objects is determined by the assisted didactics design when converting tacit or personal knowledge in explicit or codified knowledge. Such a process is defined in the image presented in Figure 8.

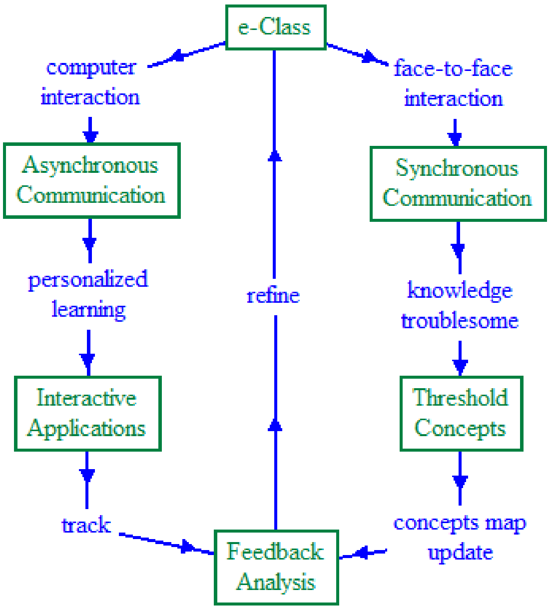

Figure 7 – The concepts map of the e-Class

The conceptual framework designed for constructing explicit knowledge from data was developed from [Zamfir, 2010], and highlights the difference between learning objects and e-learning objects.

Conclusions

As any studying framework in educational research, this one's purpose is twofold: first, developing a teaching-learning environment individualized oriented, and second, developing a teaching-learning environment, training the trainers oriented.

Considering e-Class being an extension of the traditional class, the quality-quantity paradigm becomes a documented model, and the learning environment grows into an appropriately measurable one.

Next step of this approach is a quantitative one, qualitative implemented: developing interactive applications with high granularity of the e-learning objects, based on a conceptual infrastructure of the updated study programs.

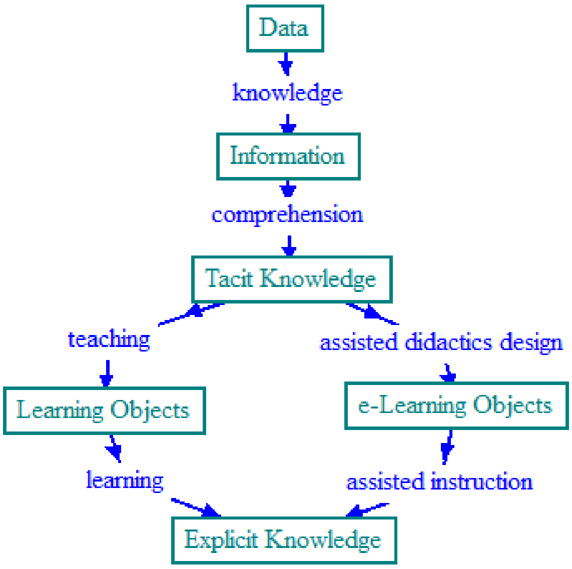

Figure 8 – Conceptual framework for developing explicit knowledge

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