ABSTRACT

The purpose of this chapter is to describe the wide literature review made on computer mediated learning. Online Education system may include models and methodologies based on learning theories that support individual styles and contexts. The use of e-learning environment is limited only by the creativity. If we just decide for providing online contents, even if they are well constructed, at long term it may become uninteresting and based only on theory. We cannot state that e-learning has either more or less quality than traditional learning. E-learning quality depends on the instruction design and on the students engagement. In this review of literature, the authors combine different points of view. A theoretical model that emerged from the inquiry made will be showed and may support the integration of technologies, in order to enhance the learning.

INTRODUCTION

The MIPO model (Model of Integration by Objectives) described in this chapter presents a b-learning instructional design that relates information which is practical, as well as applicable to a number of situations and can also be enriched with practice. It gathers ideas from different authors and gives an approach to the instructional design. As a result, we have incorporated behaviorism, cognitivism, constructivism and socio-constructivism approaches into this model in order to get the benefits of each one.

An effective instructional design model is both flexible and adaptable. There are not two designers approaching a problem in the same way and there are not two problems exactly alike. This model is based on what we know about learning theories, information technology and blended-learning.
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The information, concepts and procedures here presented may give support to teachers and instructors, instructional designers and planning teams – anyone who wants to develop effective e-learning instructions.

BACKGROUND

“Learning is an individual, dynamic and interactive process of knowledge construction. In this process, earlier experiences that influence present actions and allow the cognitive re-building are used” (CNS, 2006). The process is personal because adhesion is always optional. It is dynamic because we can see the changes in behaviors. Aguiar Falcão (2006) adds the following features: global, continuous, gradual and cumulative process. Learning is a global process because it demands the interaction among different kinds of knowledge. It is continuous because it is a human and a character-construction feature. It is gradual because it drives from the simplest to the more complex knowledge and skills. At last, it is cumulative because we associate all the knowledge with activities in order to produce new behaviors. In a cognitive point of view, learning demands the use of a set of mental skills, processing information, requires time spent and uses a lot of mechanisms which are associated with memory. Learning is a set of psycho-physiological mechanisms and both cognitive and emotional mental operations that will be visible in further behaviors. We can define Learning as a process of change (Rodrigues & Ferrao, 2006).

Whenever learning is targeted for adult people and is mediated by computer, it is called as a general term - electronic learning or e-learning. E-Learning is a general term used to make reference to computer-enhanced learning. It is commonly associated to the specific field of advanced learning technology, which deals with both the technologies and associated methodologies in learning, using networked and/or multimedia technologies (Wikipedia, 2007). According to Khan (2005) e-learning is an education environment which uses digital technologies in order to provide a good instruction design, centered on students, interactive and available for everyone at any time.

Hybrid learning or b-learning is the term used to make reference to the combination between traditional and online classroom (Dias, 2004). B-Learning term intends to enhance the best of b-learning but also the traditional classroom (Moran, 2003). In the traditional classroom, it is easier to promote interpersonal and affective relationships, as well as organization of the groups and the teaching-learning process. It is also easier to explain activities sequence, methodologies and schedules. First face-to-face meeting helps tutor to provide start references about subject and present the state of the art. After that, tutors can promote a virtual session using these environment advantages such as: time and space flexibility and the variety of available communication tools. The existence of a new face-to-face meeting might help to summarize process, the deep understanding and the guide towards a new stage of learning (Moran, 2003).

E-Learning Systems

The online environment where we can create, storage and manage the teaching-learning process is named Learning Management System (LMS). A LMS is a web application in which we can manage the teaching process in the perspective of administration/management, pedagogical/Education and also technical, using basic communication tools such as: e-mail, forums, chats, and so on, which support the interaction among participants (Pimenta & Ana, 2004) (Koponen, 2006). For instance, Luvit, Moodle, WebCt, etc.

Technical System

Technical system is the Virtual Learning Environment (VLE). According to the Britain (Britain & Liber, 1999) prototype, we may define two
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groups of features: the resources and the communication tools.

In the resources area, we may find features such as: the course outline (an overview of the course structure), the model of navigation (allows users to move around the environment), notice-board (announcements area that appears as soon as a student logs into the system), a class list and students homepages (for them to know the other students or for tutors to collect some ideas about students backgrounds), calendar (a calendar tool), search tools (to provide help when a course structure becomes very large), metadata (a simple information about an object). It is important to categorize and to search objects, bookmarking (may decrease the amount of time spent navigating to frequently used places), multimedia resources (multimedia resources can be accessed and stored within the learning environment) and file upload area (students should be able to upload their own materials) (Britain & Liber, 1999).

In the communication tools area, we may find two kinds of communication tools: asynchronous and synchronous. Asynchronous tools enable communication and collaboration over a period of time through a “different time and different place” mode. People can interact according to their own schedule. To give a good example, we can outline the e-mail (which can be used to email either the tutor or individual students on the course), the conferencing tools (such as forums, blogs and wikis that provide the means for students to engage in collaborative exchange about topics on the course) and assignments (provide a means for students to return completed assignments to the tutor for grading and feedback) (Britain & Liber, 1999). The synchronous tools enable real-time communication and collaboration in a “Same time, different place” mode. People can interact at the same point in time. The relative importance of such tools in a system depends largely on the intended use of the system itself. As an example, we can outline instant messaging, audio-conferences, web-conferences, application sharing, and so on (Britain & Liber, 1999). The interaction between people without any face-to-face contact allows new kinds of socialization (Santos, 2003). The way as the communication systems come into the screen influences the dialogue and the level of interaction (Vick et al., 2006). However, it is neither the interface, nor the contents that will determine the level of interaction but the dynamic of collaboration promoted (Santos, 2003).

Synchronous text communication promotes a social environment and the relationships among participants. Rodrigues (2004) outlines some of the main advantages:

- Allows communication and immediate feedback among participants
- Allows direct communication among students
- Promotes the spontaneous dialogue
- May reproduce the class environment

The same author also outlines some disadvantages of using a synchronous communication:

- Punishes who has not a good written expression and has more difficulties using keyboard
- Demands online presence according to a calendar
- Communication may become chaotic, especially if it involves a large number of students

Synchronous communication must be seen as a complement of asynchronous communication due to the limits of its pedagogical application. In order to be effective, it must be used under a set of conditions, namely the reduced number of participants, a good time management, the identification of participation roles. This kind of communication is useful to the construction of social relationships, but it is not satisfactory to the pedagogical process. On one hand, we may have more adhesion by those who are more ac-
quainted to these technologies and on the other hand we may also get contributions but out of time (Morgado, 2005).

Management System

The learning management system includes administration support of the course, management of tutors and learners and management knowledge systems (Koponen, 2006). Pimenta and Baptista (2004) outline the following management system features:

- Students management
- Contents management
- Profile and views management
- Activities control

Education System

The education system includes models and methodologies based on learning theories that support individual styles and contexts (Koponen, 2006). The use of e-learning environment is limited only by creativity (Souza, 2005). The use of an online environment, with the objective of simply making contents available, even if they are well constructed, in a long-term may become uninteresting and based only in theory. We could not state that e-learning has more or less quality than traditional learning. E-learning quality depends on the instruction design and students engagement (Duffy & Kirkley, 2004).

E-Learning Development Models

A course development model, also named instruction model, intends to be a guide in order to manage, plan, develop and implement a learning process (Kemp et al., 1998).

There are more than 100 learning development instruction models but the main differences among them refer to the number and the names of the steps and the sequence of recommended actions (Kruse, 2006). Nearly all are based on the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model (McGriff, 2000). Based on ADDIE model, we will explain the main task that may be performed on each stage, in order to develop a blended-learning course.

B-LEARNING STRATEGY

The model showed in this chapter describes a blended-course instruction design, with face-to-face sessions and online sessions. This model joins different points of view and intends to be practical and adjustable according to different contexts. The revision of literature made helps to integrate the different pedagogical approaches. This model is based on information technologies, systematic analysis and learning tools.

The revision of literature added by personal experience resulted in a new conceptual model (MIPO) which may help tutors to integrate web technology on the teaching-learning process. This holistic model aligns on-line strategies with learning objectives.

This alignment seems to be crucial: imagine a teacher who states that it is important to make students understand the main contents and also to make them achieve critical thinking skills on the matter. If we only see the teacher giving information, the learning activities are not aligned with objectives. Students may understand contents but it will be difficult to achieve the ability to develop critical thinking. On the evaluation process, if the teacher asks students to remember and understand contents, he is being honest but if he asks students to have a critical attitude, he is being inconsistent because he did not promote the development of this kind of skills. In this context, there is not a consistence between learning activities and learning objectives.

The investigation process made enhanced the importance of creating learning contexts to guide students in order to reach defined goals. Based on
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the ADDIE structure, the Mipo model suggests a progress in 5 phases (analysis, design, development, implementation and evaluation) and also adds a dynamic formative evaluation and adaptation, in order to reach defined objectives.

Each phase of the mipo model is set up by some items that were identified as the background of the majority of the authors in the literature review and arranged with personal experience.

In the Mipo model, the first phase of the integration process is the analysis of the system. Teacher acts as an architect who, before starting a project, analyses contextual requirements. Later, the results are reflected on the space organization, that is to say, on the instruction design.

Analysis

The analysis phase is the base for all the other phases of instructional design. During this phase you must define the problem, identify the source of the problem and find possible solutions. This stage may include specific research techniques such as needs analysis, job analysis and task analysis (McGriff, 2000). Kemp, Morrison and Ross (1998) also enumerate within the analysis phase the need for identifying learner features, contents and tasks. During this phase, it is important to consider the context, the pre-requisites, the tools and the skills demand to achieve the objectives. These objectives must be classified according to domain skills such as: intellectual skills, verbal information, psychomotor skills and attitudes (Dick & Carey Lou, 1996).

The holistic context analysis gives us good information about students’ preferences. Klein et. al. (2003) give to this stage the general name of “nonrecurring activities”.

Context

The context describes the environment where learning will happen, namely by identifying the unit, the course, school year, class environment, duration, schedule and the number of students enrolled.

Learners’ Features

In the process of identifying learners’ features Kemp et. al. (1998) outline a few elements: age, motivation, expectation, experiences, special talents, ability to work in certain environments, and others.

Instruction Needs

Kemp et. al (1998) underline the importance of describing instruction needs:

- Means of helping teachers to design instructions, select and organize activities
- An evaluation guide
- Students’ guide

Contents

A blended-course may use many learning objects that may be used in different courses in similar contexts. For instance, applets, animations, static images, electronic documents, web pages/web sites (Campbell, 2004).

Prerequisites

The process of prerequisites identification scaffolds student’s knowledge.

Tools: (LMS/VLM – technical system)

The identification of available tools, such as LMS, will influence the posterior instruction design. The outputs of this phase will be used as input of the next one (McGriff, 2000).

These elements are summarized in Figure 1.
Design

The design phase uses the outputs from the analysis phase to plan the strategy to develop the instruction.

The instruction design is the phase that demands the biggest effort and it is crucial on the learning success. The acknowledgment of the frequency of lecture model used on present classrooms, underlined by the European Comitte (EU, 2004) justifies a deep study in order to clarify and simplify the process and also cause change to happen.

In the instruction design phase of Mipo model, the teacher acts as an architect who organizes the space and its elements. The instruction design phase consists in explanations about learning objectives details, evaluation mode, contents sequences and instruction strategies. This phase includes the specification of objectives, instruction strategy and the sequence of contents (McGriff, 2000) (Kemp et al., 1998). Figure 2 represents the main tasks of the design phase:

Objectives

The instruction design should be directed according to the objectives and to a particular group of students (community) (Dick & Carey Lou, 1996) (Campbell, 2004). These features are identified during the analysis phase and detailed on the design phase. The objectives are what we want students to learn and also both the starting and final point of the learning process (Barreira & Moreira, 2004). The learning objectives specification process conducts the development of an important guide to be used both by teacher and students. The description of the Learning Outcomes as a starting point may help to overcome the difficulties usually felt on this processes. The use of a taxonomy may help the learning objectives specification, regarding cognitive, psicomotor or affective perspectives.

Bloom (1975) suggests the objectives taxonomy in order to organize the learning outcomes. According to Bloom, the concept of taxonomy overcomes the concept of classifier. A classification can be considered valid when it fits some criteria. A taxonomy must be linked to theoretical models (Bloom et al., 1975). Bloom suggests a taxonomy of learning objectives sorted in six levels: Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation. Although the
Bloom taxonomy of cognitive knowledge has been considered the most well-known, there are many others that we can consider. Rajadell and Serrat (2000) and Barreira and Moreira (2004) outline some of them such as the taxonomy of Guilford, Ebel, Herber, Orlish, and so on.

According to MIPO model, after defining objectives we should design the evaluation process.

**Learning Evaluation Process**

Making decisions about what to evaluate is useful to understand clearly the learning objectives. Evaluation should be designed in order to provide students a way to demonstrate their knowledge (Morgan & Oreilly, 1999).

To offer an online course without evaluation is nothing more than posting on a static website (Born, 2003).

Evaluation can be classified in two main groups: formative and summative. In the summative way, the evaluation occurs at the end of the instruction. In the formative way, the evaluation occurs during the instruction process and it consists of a continuous collection of learning thoughts. Both these techniques are important in order to get students’ evaluations. Formative evaluation includes all activities designed in order to motivate students, enhances understanding and provides students information about their own progress (Born, 2003). Usually, this kind of evaluation does not have assessment. Self-evaluation questionnaires and peers or tutors feedback help students to know about their own knowledge (Morgan & Oreilly, 1999).

The evaluation process may be done either by formative or summative mode and either on face-to-face or online, with or without supervision (Born, 2003).

**Sequences of Contents**

According to MIPO model, after defining objectives and designing learning objectives, we should establish the sequences of contents.

Sequencing is ordering contents in order to help students to achieve the objectives (Kemp et al., 1998). There are many methods to support the contents sequencing. The most well known suggests a sorting according to the prerequisites and the level of complexity. The learning context, the matter on study and other features may influence this process (Kemp et al., 1998).

The procedures sequence suggested by MIPO model establishes a contents definition after learning specification. This organization avoids the specification of learning objectives based on the contents. This scenario usually results in sentences such as “understand the content A” and in a lowest level of knowledge (first or second Bloom level). Despite the importance of these levels, if the learning objectives consist in achieving a higher critical thinking level, it is important to explicit it on the objectives definition associated with analysis, synthesis and evaluation.

The design of the evaluation process has the objective of making clear the way how students will demonstrate their knowledge. The definition of the evaluation questions nature, the criteria and the standards of evaluation must be based on learning objectives and showed to students. These procedures construct scaffoldings, in order to make students able to evaluate their own assignments. The evaluation may be formative or summative in an online or face-to-face mode, with or without a supervisor.

The specification of learning objectives and the design of the evaluation mode support the identification and the articulation of the contents.

**Instruction Strategies**

In the MIPO model, the last step of the design phase consists in the instruction strategies description, illustrated on the learning activities, influenced by external factors and aligned with pedagogical models. These prescriptions constitute a guide according to the contents and the objective (Kemp et al., 1998).
Learning is an active process in which students build significances relating old knowledge to new one. A well designed instruction strategy should help them in order to find those relations (Kemp et al., 1998).

The items described below give support to the design of the instruction strategy activity. The reflection based in the literature review is promoted and gives added value to the main topic to be considered.

**Influence Features**

In the study of the art made we identified some features that may be considered.

Motivation comes up as a crucial element that influences the way as people participate on learning activities and develop self-regulation, time and task management. This motivation may be achieved by linking the class and the individual success (Cotter & Martins, 2006). Motivation scaffolds learning construction because it promotes attention and participation. Give positive feedbacks, promote activities with a balanced complexity, help students finding the importance on the study matter, create an open and positive atmosphere and help students feeling that they are important on the learning community are some of the major features that may be used in order to increase students motivation.

This process may become more sustainable if we add more features such as: frequent contact with students; promotion of students cooperation; use of active learning; give prompt feedback; give correct time to achieve objectives; communicate to students the great expectations; respect differences; use of contextualized activities.

Students’ motivation, general principles for the learning success and group organization are, according to many authors, important features to consider on the design strategy phase. Nevertheless, learning something new or developing a deep study on a subject is not a linear process.

The way as we learn, individual learning styles and multiple intelligences characterize the singularity of the learning process. In this sense, we should consider these features when we are designing instructions.

David Kolb (1984) defends that we learn in a circle way. We reflect and interpret an experiment based on previous and present situations. Theoretical concepts help integration and synthesis, in order to allow new tests and applications. Learning is a process in which knowledge is created by changing experiences. This definition enhances some critical learning process features in an experiment way. This point of view enhances knowledge construction opposing contents perspective.

Kolb (1984) suggests an experimental learning cycle divided in four phases: concrete experience, observations and reflection, forming abstract concepts, testing in new situations. The four phases of the experimental learning cycle are not necessarily in sequence. When we are looking for an experience sense, we use previous experiences and theoretical contents or even new experiences. At the beginning, concrete experience enhances curiosity, we look for new ideas and also for old knowledge in order to find a solution. When old knowledge does not match with actual experience, it is reviewed. In this phase, we consider concrete experiences and we try to use real case studies and practical activities in context work. A student learns when he does and writes down observations, as for instance, when he performs some programming experiences. Experiences lead to the reflection. This phase enhances reflection preferences and may integrate discussion. For instance, when a student thinks how to program and sees others programming, he reflects on the best way to program. He analyses the experiences made and the results obtained. The contents read may improve his concepts of reality in order to clarify what he did. Conceptual models are redesigned according to a practical abstraction. In this phase, students preferences go towards reading
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activities, information analysis and theoretical models study. For instance, when a student tries to understand the concrete experience of reading a programming manual. When we find a practical usefulness, we improve knowledge construction. In this phase, we try to find a new situation to use acquired knowledge. Students prefer to play games, to do practical exercises and simulations as a computer program.

Felder and Brent (2006) show a model similar to Kolb. They defend that teachers and students have a specific learning style to give and receive information. This model has four dimensions: Sensing-intuitive, visual-verbal, active-reflective, sequential-global.

The sensitive dimension is focused on external inputs such as to see, to hear, to taste, to touch or to smell, in a practical perspective. The intuitive dimension is focused on internal inputs such as thoughts, memories or images looking for theories and math models. Everyone is both sensor and intuitive, but everyone has a preference that may be soft, moderate or strong. Most of the undergraduates are sensors. Most professors are sensing learners but they teach intuitively, emphasizing fundamentals, theories and mathematical models. This shows the balance between sensitive and intuitive changes from one field to another and from one situation to another (Felder & Brent, 2006). This duality is related to the concrete experience and abstract concept of the Kolb cycle.

The active-reflective dimension reflects the level of preferences by doing something physical. Dealing with the same kind of material, some people prefer to reflect on it, while others actually prefer to act. All classes have both active and reflective learners. Most classes, except for labs, are passive, the active learners do not act on the material presented and the reflective do not think much during the lectures (Felder & Brent, 2006). This duality is related to observations and testing of Kolb cycle.

In the visual-verbal dimension, visual learners ask for knowledge demonstration, while verbal learners ask for knowledge explanation. Most people are visual learners while 90%-95% of most courses contents are verbal (lectures, readings) except in art and architecture (Felder & Brent, 2006).

The sequential-global dimension shows the differences between preferences for building understandings in logical sequential steps and preferences for absorbing information in order to get a big picture with interrelations and connections to other subjects and personal experiences. Most students, instructors, courses, curricula and textbooks are sequential. Not strictly a mistake, but the global minority is extremely important with multidisciplinary holistic systems thought (Felder & Brent, 2006).

The multiple intelligence theory increases the concepts of learning styles (Gardner, 2000). This theory is generated based on biological skills to solve problems. As a human being, everyone has a skills repertory to solve different kind of problems. According to Wenger, (2002) it is important to develop curriculum strategies that promote the learning among different intellectual profiles. Every year, new technologies that may be used to increase the opportunity to success of learning according to a particular style come up. Intelligences may be developed, but they also demand their own learning strategy using features such as domain skills and age Wenger. Psychologist Gardner (2000) identifies seven distinct intelligences that determine how a person processes external information: Verbal-linguistic, Logical-mathematical, Visual-spatial, Bodily-kinesthetic, Musical-rhythmic, Interpersonal, Intrapersonal.

This classification can be joined with Kolb (1984) and Felder (Felder & Brent, 2006) theories, because each person combines the use of learning styles and different skills to different situations. Features as culture, motivation, emotional feelings, previous experience, personality are also important. Whenever possible, teachers should give value to diversity, responding to students preferences but never forgetting the learning
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objectives. We should also consider pedagogical models in order to scaffold interactions (McGriff, 2000) (Kemp et al., 1998).

LEARNING THEORIES

The learning strategies designed may be based on influences features, learning styles, multiple intelligences, but also learning theories. In this context, we do not want a large description about pedagogical models but instead a brief summary enhancing most important aspects. Pedagogical approaches include many theories argued by different authors that many times defend different aspects related to the same idea. Today’s theoretical design approaches can be seen as derivatives of behaviorism, cognitivist and constructivist viewpoints (Allen, 2007).

Behaviorist Approach

According to the Behaviorist approach, learning is viewed as a behavior acquisition through mechanical relations between stimulation and answer. Learners can be more or less passive in this process. These theories enhance “know-do”. Behaviorism is based on Brandura, Pavlov, Skinner, Thorndike, Watson and other inquiries. They defend contents segmentations in order to be learned in a gradual way. The perspective is focused on the teacher and does not promote information searching. Skinner (1981) psychology is based on action, the repetition leads to the automation. Skinner suggests rewarding answers as a stimulus to new future learning. Knowledge is evaluated by the automatic answer to an external feature in a certain context.

On the web the Behaviorist approach may be applied using Practice and Drill applications, where the computer tests and gives feedback immediately.

Cognitive Approach

In the cognitive perspective, learning is viewed as a dynamic codification process and information recognition. Students learn by interacting with environment. Learning is more complex than answer stimulus. It implies students cognitive changing and in a way that they can understand the reality, selecting it and organizing it. In the cognitive perspective, teacher plays the most important role. He should plan activities for moving from a short term memory to a long term. Previous students’ knowledge is crucial to get new understandings. Knowledge construction is not stimulated since the teacher is the one who gives all the information and student should construct knowledge by reflecting, peers exchanging, writing, answering questions and practicing.

Constructivist Approach

In the constructivist perspective, we give more importance to students’ learning abilities than to professor teaching. The cognitive perspective underlines the importance of students to build their own mental concepts. There are many theorists defending this perspective such as: Bransford & CTGV, Bruner, Dewey, Grabinger, Lave & Wenger, Papert, Spiro and colleagues, Shuman, Vygotsky and so on. Constructivism is based on a theory where everybody constructs their own perspective of world, guided by individual experiences and schemes. This theory is based on the importance of students to solve different kind of problems (Schuman, 1996). Jean Piaget (1974) uses assimilation, accomodation and balance mechanisms that came up from biology in order to explain knowledge construction. Facing a new stimulus, we tend to arrange it in our old structures, but that is not always possible, so it implies a new structure organization and accommodation (Piaget et al., 1974). When we cannot accommodate new external stimulus we lose our internal balance. These principles enhance a
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multiple knowledge representation, a flexible and continuous mental scheme and student’s active engagement.

The open architecture of PC systems helps the implementation of students control in order to construct their own knowledge. The technology evolution provides the notions of hypertext and author tools such as HTML, flash or quicktime. These tools give support to the implementation of educational games and simulations using the constructivist approach (Gillani, 1984).

Socio-constructivism Approach

In the socio-constructivism theory, knowledge is viewed as a social construction. Learning is a social process and not only a cognitive and individual process. Students build their own knowledge influenced by culture and social interaction. Development is only possible through social interaction. It is important to establish groups in which there is an element with a bigger level of knowledge, Ley Vygotsky (Vygotsky, 1998). In this perspective, collaborative learning plays an important role that initially was used in children education but now is also used in any age groups. Vygotsky identifies two levels in knowledge construction: the real development that is reached after a few learning cycles, and the proximal development zone in which the progress depends on peers’ interaction. This concept supports collaborative learning in scholar planning, where cognitive development is done by social activities (Lave & Wenger, 1995). In this perspective, learning is viewed as an activity within a certain context and culture opposing the majority of classes’ activities that use abstract knowledge (Lave & Wenger, 1995).

According to Lave and Wenger (1995), contextualized activities promote the sense of community. Social interaction is a critical element to situated learning. Students participate in a knowledge and skill community that demands newcomers, in order to get a movement towards an integral participation. Lave and Wenger suggest that learning can be viewed as a human historical transformation. This transformation is cyclical and represents the development of a community of practice. The term community of practice was introduced by Lave and Wenger and it refers to a group of people who share a certain interest and improve their knowledge by interaction. Community of practice and learning community are difficult to define due to their own organization, spontaneous and informal nature (Wenger, 2002). Learning community may be viewed as a part of the community of practice because the main objective is to learn through social interaction (Afonso, 2006). A learning community demands a collective participation in classroom or in an online environment in which every group member, including teacher, is involved in a knowledge construction. The community identity is reached by members’ engagement towards a common objective. According to Wenger (2002) there are three main features in a community of practice: domain, community and practice. Domain is the topic of interest, of knowledge and debate that identifies the community. The domain legitimates the community existence. Community is related to the relationships established in group in order to share opinions. It does not imply heterogeneous points of view, it is based on the respect by differences. Practice is the knowledge created, shared and maintained by the group using tools, information, works, good practices and ideas. To answer the question “How to create a community of practice” Wenger (2002) suggests the use of social and situated learning and social and identity theories.

The dynamic nature of MIPQ suggests the use of enunciated features balanced with objectives and context. If we use workgroup activities, we should consider the group size, the way we make groups and the group cohesion. We should try to maintain the same group from the beginning until the end of the activity. In the literature, we saw many differences in the good group size. We agree, through experience, that we should have
groups formed by 3, 4 or maximum 5 elements. Some authors agree that the group size influences the level of knowledge, but we think that we can overcome these barriers using active learning techniques. By using active learning, we try to achieve the highest level of knowledge, such as analysis, synthesis and evaluation. We try to engage students in the act of promoting reading, discussion, writing and reflection on attitudes and values. The difficulties felt on the process of changing avoid the use of this technique. Namely, because subjects may end up not being all covered, more time preparing and performing activities may be spent, difficulties in using it with large classes may appear or finding educational resources may be difficult. The learning strategy design based on network contextual activities may promote learning success.

Based on influences features and pedagogical models selected, the instruction design includes also activities definition in order to reach learning objectives.

The design of learning activities uses the needs analysis for each objective (Laurillard, 2006).

**LEARNING ACTIVITIES**

Engestrom (2001) groups a set of concepts that are based on an individual and social practical model. Activity concept has participants’ domains (subject, object), mediation tools (tools, rules, division of labor) and a particular environment (community). This model represents also the relation between domains. Activity concept has the following interacting components: subject, objectives, community, rules, division of labor, results and tools.

Subjects are individuals or a group of individuals who participate in an activity.

Object or objectives can be the specific direction to an activity sharable materials to be transformed or modified by the participants in an activity or abstract things such as plans or ideas. According to Engestrom (2001), the objective of the learning activity must be a subset of learning objectives.

Community is a group of people who interacts with the environment to reach objectives. The community element needs cohesion in order to get productivity. This cohesion increases according to the group development (Salmon, 2005): access and motivation, online socialization, exchange information, knowledge construction and development.

Rules are conventions, social relationships or schedules that govern community members’ behavior. The rule element of Engestrom activity theory includes norms and schedule, to be followed by all participants.

Division is the distribution of subjects’ roles, powers and responsibilities. The tailor model (Schofield et al., 2006) enhances the crucial role of teacher (the tailor) in the educational process. He can provide students Internet resources and allow them to construct their own knowledge (clothes). Tutor is the one who provides the scaffold which students (costumers) may adapt to their own style.

The learning activity design demands the division of labor by participants according to the kind of work, complexity, relation with communication media and also among peers. In the peers relation, it is important to consider the tutor availability to have more or less conversation with the students and the possibility of personalization offered by web technology.

In a virtual community, the literature review enhances four main tutor competences: understand online processes, have technical, communication and subject knowledge, and know students features. Tutor action is constructed according to the ability to mediate the process between students and social knowledge, organized in a cultural way and giving students the opportunity to develop personal and social skills (Trindade, 2002). Tutor must help students on matter contextualization, increasing students’ universe and helping them in
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the construction of learning significance (Moran, 2005).

Based on the four dimensions of tutor roles proposed by Berge and Collins (Berge & Collins, 2000) (pedagogical, social, management and technical) it is possible to outline the following main tutors tasks:

- **Pedagogical:**
  - To use many pedagogical methods in order to keep the discussion on topic and act as a facilitator and guider of learning (Berge & Collins, 1996) (Garrison & Anderson, 2003);
  - Design e-learning group activities (Schofield et al., 2006); In the traditional education, the author and the designer of instruction are many times the same person, but on e-learning environment we must make the difference (Schofield et al., 2006). The development of web resource is more expensive than the classic development (Schofield et al., 2006). Tutor may adapt the resources available according to their own requisites (Klein et al., 2003).

- **Social:**
  - It is important to create a user-friendly environment in order to promote learning throughout a good group feeling;
  - Moderator acts as a chief of discussion (Berge & Collins, 1996) (Berge & Collins, 2000); interactivity and learning community facilitator (Schofield et al., 2006);
  - On an online workgroup activities the needs of moderation and the participants skills change according to the stage of group development (Salmon, 2005).

On the theme of community development, Tuckman (1965) identifies four phases: forming, storming, norming and performing. These phases define the level of exchange information. The interaction among students who participate on a learning activity progresses in five stages (Salmon, 2005): Access and motivation, online socialization, information exchange, knowledge construction and development. On the first stage - access and motivation - participants access to the platform individually and become acquainted with technology environment. This is an essential requisite.

On the forming phase, participants tend to be polite without a great confidence on the group (Tuckman, 1965). This phase may be connected to the on-line socialization stage of Salmom model. On the second stage - online socialization - participants interact in order to construct their own individual identity and find their peers.

On the storming phase, participants interact more actively and talk about their own feelings and opinions. Many times, this scenario results on disagreements. This phase may be connected to the information exchange stage of Salmom model. On the third stage - exchange information - the participants give relevant information about the course subject to the colleague.

After this phase, on norming phase, the group achieves a sharable understanding, they also establish norms and group procedures. In this phase, the group is stronger and cooperative, this scenario may be connected to the third stage of Salmom model. On the fourth stage - knowledge construction - the group discusses the course subject and interaction becomes more collaborative. The level of communication depends on the understanding established.

Finally, on the perform phase, the community works more intensively, participants try to get more benefits from the system. This phase may be connected to the development stage of Salmom model. On the last stage - development - participants try to obtain more benefits of the system in order to reach their own personal objectives.
On this stage they reflect on the way they are learning.

According to the “five-step” model, without a help from the moderator, usually the group development stops at the second level - online socialization. Tuckman (1965) agrees that the tutor needs of skills change according to the different level of group development (forming, storming, norming, performing). The accomplishment goes from a motivation orientation towards a work orientation. Tuckman defends that there must be someone with authority, outside the group, to play the role of the activity moderator. During the forming stage, it is important to have a clear leadership in order to help the group to deal with work and simultaneously with interpersonal relationships. At the storming stage, it is important to help the group to solve conflicts and at the norming and performing stage, it is important to guarantee the focus on work development (Tuckman, 1965).

Management

Moderator establishes the schedule and the activity pace, acting as a manager that organizes procedures, administrates and manages messages exchanging (Berge & Collins, 2000)(Berge & Collins, 1996)(Schofield et al., 2006). According to Shea (2004), the tutor has to maintain the learning pace in order to get a significant interaction in an asynchronous environment. In order to make students engage in learning construction, participants need to work together and manage time efficiently. Probably, at the beginning of the course, more face-to-face sessions will be needed. During the progress of the course, the students will be more acquainted and the need of face-to-face session will be lower (Moran, 2003).

Technical

Technical tutor role dimension (Berge & Collins, 1996):

- Tutor should be acquainted with technology in use and promote a good use by students (Berge & Collins, 2000)(Berge & Collins, 1996).
- Tutor must be the chief of learning with technology (Schofield et al., 2006). If tutor or students are not acquainted with technical mechanisms, they will need more time to solve technical problems making them out of discussion. In this way, it is important that all participants have technical orientations.

The “result” element of Engestrom activity theory represents the final product, that is to say, if student learns or not. Usually tutor and course designers make a good value on different kinds of online interactions but rarely get a hoped adhesion (Bento & Schuster, 2003).

The online participation taxonomy is showed by Bento and Shuster (2003) in four quadrants. The quality may be evaluated using a formal, informal or self-evaluation mode.

The quadrants I and II share the low participation feature, represent invisible students who do not participate actively on discussion. Students included on quadrant II, in spite of being also invisible, act as learning witnesses. They are actively engaged on contents (great contents interaction) and ongoing discussion.

As the low visibility (quadrant I and II) is not necessarily bad, the high visibility (quadrant III and IV) is not necessarily good. Quadrant III and IV share the high visibility feature that interacts frequently on on-line discussion.

Students on quadrant IV represent the good participation, what tutor wants. These students are good on social aspects but they are also good on contents interactions. Their online contribution is significant and frequent (Bento & Schuster, 2003).

Beyond online discussion analysis Morgan and Oreilly (1999) outline other ways of online evaluation, namely:
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- Peers evaluation and self-evaluation
- Online quizzes
- Digital Portfolio

In activity theory, the “tool” element may be the LMS, the contents or the communication media used to support the activity. Regarding tools element, it is important to consider the constant changing on interactions and contents formats.

There are many ways of interaction Schofield, Sackville e Davey (2006) beyond considering the kind of interactivity proposed by Moore (Moore, 1989) student/contents, student/tutor and student/student adds three ways of interactivity: student/technology, students/tutor and interpersonal interactivity (self-reflection and meta-cognition by the online presence). Hirumi (2006) adds three more ways of interactivity: student/instruction, students/others and students/environment.

The challenge is planning and managing each interaction in a significant way at distance, using communication tools (Hirumi, 2006). Community members should have technical skills, in order to participate on the tasks, should have interpersonal skills, ability to work in groups and to share information (Cotter & Martins, 2006). Students/other interaction allows students to acquire, analyse and apply information from a variety of human resources (Hirumi, 2006).

The relation among the elements of activity theory enhances the importance of considering the ability to achieve the objectives by the community using the available tools (Engestrom, 2001).

To sum up, an instruction strategy’s design includes the elements shown in Figure 3.

Development

The development stage is based on previous phases of analysis and design. The purpose of this phase is to generate the lesson plans and lesson materials. During this phase, you will develop instruction lessons and all media and support documentation that will be used. This may include hardware and software (McGriff, 2000). Materials and procedures development must be added to the importance of planning instruction messages and its distribution.

Figure 3. Instruction strategies design
For each lecture, it is important to develop or adapt material, develop presentations, organize lessons, seek for cooperation and represent it on eLearning platform (Klein et al., 2003). Klein et al. give the general name of “recurring activities” because this fact must be repeated for each lecture.

The following tasks should be performed on the development phase (see Figure 4).

**Implementation**

The implementation phase refers to the delivery of the course. The purpose of this phase is to promote an effective and efficient delivery of instruction. This phase must encourage learner’s understanding on contents. It is important to provide a good support in order to achieve the objectives defined (McGriff, 2000) (Kemp et al., 1998).

The following tasks should be performed on the implementation phase (see Figure 5).

**Evaluation**

The evaluation phase measures the effectiveness and efficiency of instruction. Evaluation should occur throughout the entire design process, within the phases, between the phases and after implementation. Evaluation may be formative or summative (McGriff, 2000) (Kemp et al., 1998).

The following tasks should be performed on the evaluation phase (see Figure 6).

**Formative Evaluation**

Formative evaluation occurs during and between the instruction processes. The purpose of this phase is to improve instruction before the implementation phase (McGriff, 2000).

Dick et al. (Dick & Carey Lou, 1996) outline the tasks of this evaluation phase. They suggest that the description of each phase must include: its purpose, the description of developed contents or selected contents, the summary of tutor presentation and tools used in the formative evaluation.

An idea may seem good, in order to answer the needs but in fact may be useless. This scenario enhances the importance of formative evaluation. Its function is to notice teacher whether the instruction is suitable or not. If an instruction strategy shows weakness, tutor should correct it before it finishes (Kemp et al., 1998).

The formative evaluation intends to check the accuracy of every element of the mipo model. Between the analysis phase and the design phase, it is important to ensure that both global and transversal objectives are covered by the learning activities. For each objective it is possible to have either one or more learning activities. Nevertheless, it is possible for an activity to cover more than only one objective defined in the previous phase.

On the formative evaluation, we should answer questions such as “do the learning strategies cover
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all learning objectives?”, “are there activities that do not cover any objectives?”, “have students all the information?” etc.

Throughout the next phases, we should check if both development and implementation are proceeding according to the analysis and design done.

Summative Evaluation

Summative evaluation usually occurs after the implementation process. This type of evaluation assesses the effectiveness of the instruction. Data from summative evaluation is often used to make decision about instruction (McGriff, 2000). In the redefinition of ADDIE model proposed by Dick et. al. (Dick & Carey Lou, 1996) it is recommended to sum up data from formative evaluation phase in order to identify the weakness on the contents and on the directions followed by tutor. The use of the same contents on a further edition of the course are questioned. Every phase of summative evaluation and the decision made must be described.

In the wide view of the model enunciated by Kemp et. al. (1998) the oval shape suggests a cyclical process which demands a continuous planning that uses the management project techniques. Kemp et. al (1998) add to the enunciated phases the importance of having constant support services and management according to project management.

In order to demonstrate the importance of developing a continuous process, Schofield, Sackville and Davey (2006), suggest the “bespoke tailoring” model. They use a metaphor of a tailor who is designing a suit for his client fitted to his body and during this process he makes a dynamic adjustment.

Schofield, Sackville and Davey (2006) add that technology and tools, model of pedagogy, parameters of interactivity and learning community are the four elements that need design, conceptualization and final product adjustments (Schofield et al., 2006).

In the summative evaluation phase, we should check the learning results and collect all students’ perceptions on the learning strategies done, in order to improve further course edition.

There are many instruction models with more or less details, but in general we have three main features: identify learning objectives, develop the instruction and evaluate the effectiveness (Carvalho, 2003).

FUTURE TRENDS

On the next step, we will apply this conceptual model in order to validate it especially on computer science education units in the Portuguese higher education context.

We will use action-research and cases study methodologies in order to find out the benefits
and the weaknesses of this model (Peres & Pimenta, 2008).

CONCLUSION

In this chapter we introduced our point of view on how to construct a well-designed b-learning environment. This model joins research results, experiences and multiple theories.

At the higher education context, besides everything that has been said about the use of e-learning technologies, we attested the idea defended by the European committee (EU, 2004). Our higher institutions continue to use the traditional education schema promoting an environment based on providing information. This scenario is the best for many students, teachers and institutions.

However, in this study we could see many different experiences on the e-learning domain. Many times the changes occur on the technologies and without any methodological or pedagogical support. For instance, whenever printed documents are replaced by digital contents, using the same communication schema (emitter-receiver) but with more sophisticated tools.

If an institution adopts an LMS, it does not ensure the integration of web technologies on the educational process (Parlamento Europeu, 2002).

Acknowledging that Internet increases places and moments of communication and also the access to the information (Parlamento Europeu, 2002) was a study that enhanced the wide unexplored field.

Updated technologies help the construction of a huge set of learning strategies and methods options, as large as our imagination. All technologies should be viewed as work tools and not as an end itself. More important than choosing a tool is the selection of the learning strategy, in order to achieve the defined goals.

We believe that the existence of a model that supports the complex management process of b-learning may promote the systematization, the usefulness and the organization of the web classroom integration. The MIPO model intends to be a dynamic and flexible structure that offers a large set of orientations in order to conduct a combined learning process.

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