IMS-CLD: A NEW SPECIFICATION FOR LEARNING SCENARIOS IN COPES

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Abstract: In the present work we focus on the problem of capitalization of techno-pedagogic knowledge, both tacit and explicit in the domain of e-learning. We attempt to solve this problem within the framework of a CoPE (Communities of Practice of E-learning) which is about considering a virtual space of exchange, sharing, and resolution of problems encountered by the actors of the e-learning during all phases of an online learning system life cycle. The purpose of this article is to propose a new specification for learning scenarios in CoPEs, called IMS-CLD (Learning Design in CoPEs). This language is an extension of IMS-LD (Learning Design) language, enriched with CoPE's concepts in order to capture the richness of interactions, which are inherent to collaborative activities and more particularly within CoPEs. IMS-CLD aims at facilitating the communication between the LMS (Learning Management System) on one side and the CoPE's environment on the other side. After providing a detailed description of the elements of IMS-CLD, we present a case study in order to depict their use through the specification of learning scenarios in a given CoPE.

1 INTRODUCTION

"The Communities of Practice of E-learning" (CoPEs) is considered as a subcategory of Communities of Practice (CoPs). This new concept, which we have defined in a previous work (Chikh & al., 2007), represents a virtual space for exchanging, sharing, and resolving problems encountered by the actors of the e-learning during all phases of an online learning system life cycle. The advantages culminate in the emergence of a collective techno-pedagogic intelligence. Thus, the CoPE is considered as a thinking space which aims to favor practices of reuse and exchange among actors in terms of techno-pedagogic knowledge and know-how.

There is a strong relationship between CoPE and LMS (Learning Management System). We distinguish two exchange types : (i) the exchange LMS⇨CoPE, which aims particularly to support discussions inside CoPEs with real problem situations encountered in LMS, making the CoPE's space more active; and (ii) the exchange CoPE⇨LMS, which consists in testing the solutions obtained in the CoPE's space directly in LMS, prior to reifying them in the CoPE memory.

The feasibility of exchanges LMS⇔CoPE is possible through formal modeling of learning situations in both sides of the exchange. IMS-LD (Learning Design) specification allows modeling only the learning situations for LMS. Accordingly, a new specification for learning situations within CoPEs is more than necessary. Therefore, we propose in this paper the IMS-CLD (Learning Design in CoPEs) specification, which is essentially inspired from IMS-LD.

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2 COMMUNITIES OF PRACTICE OF E-LEARNING

The CoPE definition is obtained by the adaptation and enrichment of the CoPs concept developed by Lave and Wenger (1998). A CoPE is a group of professionals in an e-learning environment who gather, collaborate, and organize themselves face to face and mostly virtually in order to:

- share information and techno-pedagogic experiences related to the development and use of online learning systems;
- exchange and cooperate in order to solve collaboratively techno-pedagogic problems;
- learn from each other and develop competencies in instructional engineering;
- build (improve and/or create) together techno-pedagogic knowledge and model the best practices to be followed in the realization of the online learning system;
- promote the application of e-learning standards such as: IMS-LD, IMS-LIP, IMS-LOM and so forth;
- define terminology, glossary, or ontology conciliating the various views and articulating them around the above mentioned standards. According to Pernin (2006), this is essential if we are aiming at large-scale sharing and improvement of the practices concerning building activity scenarios.

The exchange inside the CoPE involves two dimensions during the acquisition phase of an online learning system life cycle: (1) The "Product" dimension relative to the design components: roles, activities, resources, services, tools, and properties, etc.; (2) The "Process" dimension relative to the instructional design approaches, methods, techniques, and tools.

3 REUSING IMS-LD IN COPES

The IMS-LD specification (IMS Global Learning Consortium, 2003) is a standardized learning design language that was based on the work of Educational Modeling Language (Koper, 2001) at the Open University of the Netherlands. It makes the focus of e-learning shift from emphasizing learning objects to emphasizing learning activities (Tattersall, 2004).

IMS-LD aims at representing the 'learning design' of 'units of learning' in a semantic, formal and machine-interpretable way (Yu et al., 2005). A unit of learning in IMS-LD is represented as a piece of theater, composed of acts. Each act contains a number of activities which are proposed to roles in an environment with a set of services and resources. Group and collaborative learning in IMS-LD has been described by associating multiple people and/or multiple roles to the same learning activity. This is done through a service activity (Santos et al, 2004). Hernàndez et al. (2004) have proposed an extension of the IMS-LD service specification consisting of a special type of service called *groupservice*, which includes collaboration-related capabilities.

The learning situations in CoPEs are characterized by their collaborative aspect and particularly their informal character. The most common situation types are: the problem situation, the decision situation, and (3) the project situation. A formal modeling of these learning situations is necessary to make them machine interpretable. However, the learning scenarios in CoPEs, being interactive, aren't a priori established by the designers, but generated from free interactions of members. We put forth three possible solutions of formal modeling of learning scenarios in CoPEs. The difference among them resides in reusing IMS-LD or not.

Solution 1: creating a new language, completely independent of IMS-LD. This solution assumes that learning in CoPEs is entirely different from that in e-learning. This hypothesis is very weak with regard to the strong similarity between these two kinds of learning, especially the collaborative learning in e-learning.

Solution 2: merely reusing IMS-LD. This solution presents some limits due to IMS-LD's incapacity to fit learning specificity in CoPEs.

Solution 3: extending IMS-LD in order to include CoPEs' particularities. This solution takes advantage of IMS-LD semantic interoperability and favors exchanges between CoPEs and LMS platforms accordingly.

4 IMS-CLD SPECIFICATION

IMS-CLD extends IMS-LD by adding new elements and enriching some existent ones. The objective is to increase its expressing power in modeling learning situations in CoPEs. Below the components of IMS-CLD are presented.

1. The **«C-role»** component takes care of the definition of roles in CoPEs. We distinguish four generic roles:

- support members, who contribute to the continuous and effective CoPE function;
- learner members (experts or participants), who contribute to the CoPE activities;
- visitor members, who are external CoPE members with limited access rights;
- guest members, who are invited by other CoPE members.

Figure 1 shows the C-role elements which are specific to CoPEs.

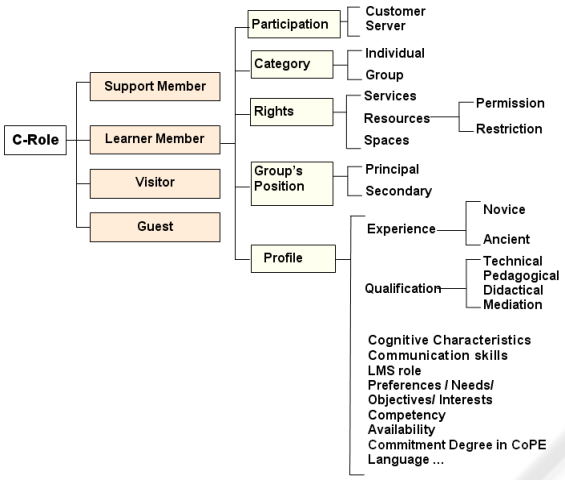

Figure 1: Information model of « C-role ».

- «Participation» enables the «Server» and «Client» to interact. For example, the server can support the client by stating the problem differently and giving some hints or directly providing the answer;
- «Category» indicates an individual or a group role;
- «Rights» defines the access rights of a role to other services, resources, virtual spaces, and activities;
- «Group's position» shows the role importance in the group: «Principal» or «Secondary»;
- «Profile» describes members' profiles with IMS-LIP (IMS Learner Information Package), which we adapt to CoPEs: technical / pedagogical qualifications; cognitive characteristics such as intelligence, perception and creativity; communication skills; preferences, needs and objectives; competencies (academic background, professional experience); availability; commitment degree; etc. Based on the information gathered from these profile details, a specific competency would emerge.

2. The **«C-activity»** component defines activities in CoPEs which are classified into four activity-types: «Analysis-activities», «Design-Activities», «Implementation-activities», and «Utilization-activities». These activity-types correspond respectively to the life cycle steps of an online course.

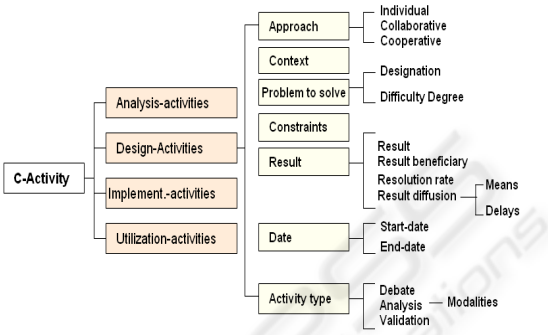

Figure 2: Information model of « C-activity ».

Every activity is described with data that is either already defined by IMS-LD or specific to CoPEs. Figure 2 describes the elements that have been added:

- «Approach» that indicates if the activity is individual, collaborative or cooperative;
- «Context» that indicates, for example, that the activity takes place in either an industrial context or a school context;
- «Problem to solve» that can be used to index activities for an eventual retrieval;
- «Constraints» that can be technical, organizational, temporal, and so forth;
- «Result» that includes beneficiary, resolution rate, dissemination means and delays;
- «Date» that indicates the start and end dates of the activity (Mbala 2002);
- «Activity-type» that may be classified into debate, analysis, validation, etc.

3. The **«C-environment»** component defines where CoPE activities take place. We present below the three elements which compose «C-environment»: «C-service», «C-resource» and « C-space».

a. «*C-service*»: in addition to the four basic services predefined in IMS-LD, we adopt a particular service called *Groupservice* proposed by Hernández-Leo et al. (2004) as shown in figure 3.

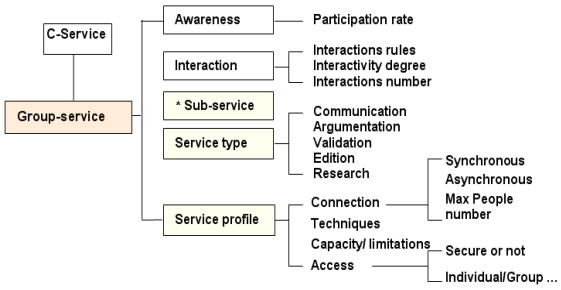

Figure 3: Information model of « C-service ».

Moreover, we have added three new elements:

- «Service type» that specifies the nature of the required service: communication, argumentation, validation, edition and research aspects;
- «Service profile» that indicates the technical characteristics: the capacity and limitations of a given service, and information about connexion and access;
- «Sub-service» that gives the possibility to define more specialized services.

b. «*C-resource* » defines the resources used by a CoPE. We propose the classification related to activities' types that were defined earlier: «Analysis-resources», «Design-resources», «Implementation-resources», and «Utilization-resources». The resources generally represent either inputs or outputs for a given activity. We associate with the resources the following attributes:

- «*Type*» that could be technical, pedagogical, mediatic, or didactic;
- «*Source*» that indicates the resources' source;
- «*Validation*» that indicates if the resource has been validated or not yet;
- *«Category»* that corresponds to the four classes of resources defined previously.

c. «*C-space*» is related to a *work space* and helps in organizing and performing activities. We propose the classification corresponding to activities' types defined previously: «Analysis-space», «Design-space», «Implementation-space» and «Utilization-space». Every space type is composed of three sub-spaces: «Problem solving sub-space», «Decision sub-space», and «Project sub-space». In addition, we foresee another space, « Free-space », that treats general questions and can be divided into other sub-spaces related to particular themes. The spaces will be accessible according to the access rights.

4. The **«C-method»** component defines the progress of the activities in a CoPE. We have adopted the same information model of the «*Method*» element of IMS-LD. However, we have enriched the «*Play type*» of the "Play" element. Indeed, we distinguish in CoPEs three types of plays «Problem based learning», «Decision support» and «Project Management», corresponding to the three types of learning situations: problem situation, decision situation, and project situation respectively. We propose for every type of play a certain number of acts:

a. Play of type «*Problem based learning*» which aims at finding solutions to problems encountered in the acquisition and utilization phases of an online course. Its learning objectives are:

- to favor transfer and knowledge integration;
- to make this knowledge operational and to adapt it to new situations;
- to acquire skills (analysis, synthesis, critical thinking, group work);
- to create a collective intelligence and a shared vision of resolution.

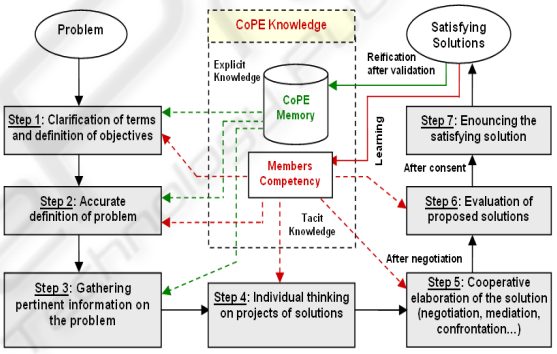

Figure 4: Play of type «Problem based learning».

Figure 4 above presents a play of type «*Problem based learning*» in seven steps considered as acts. This process is triggered by the problem at input. It is about finding one or many satisfactory solutions. The knowledge used in this process can be either explicit (CoPE memory) or tacit (members competencies). This resolution takes advantage of the CoPE resources (tacit and explicit) and uses both individual and collaborative approaches.

b.Play of type «*Decision support*» which addresses the choice among many alternatives during the acquisition phase of an online course. For example: which type of learning situation to select in a specific module of a given course or which role to select to assure a moderation activity in a group (tutor/learner-moderator).

The play of type «Decision support» is based on the decision model of reference of Simon (1977). This model is structured in four phases:

- A phase of «Intelligence» that aims in gathering and organizing necessary information;
- A phase of «design» that aims in constructing alternatives and deducing their consequences;
- A phase of « choice » that aims in evaluating the consequences of the different alternatives, selecting the most favorable alternative, and then confirm the conditions of that alternative;
- A phase of «Review» that checks if the real consequences of the selected alternative are conform to decision maker's expectations (feedback).

c. Play of type «Project management»: a learning system is characterized by three models: a knowledge model to describe learning objects, a pedagogic model to specify the processes or learning scenarios, and the mediatic model to define the pedagogic materials and the technologic infrastructures as learning support (Paquette, 1997).

The proposed play of type «Project management» is based on the engineering process of MISA method (Paquette, 1997). This play of type is structured in three levels: phases, steps and activities. The engineering process is composed of five phases which will be considered as acts:

- to accomplish the analysis and the preliminary design;
- to elaborate the architecture of a learning system;
- to design pedagogical materials;
- to realize and validate materials;
- to prepare the setting of the learning system.

5 CASE STUDY

This case study concerns a CoPE developed and done within the framework of the project of distance education CoseLearn "Coopération Suisse en matière de eLearning" that was initiated by QualiLearning company which consists in promoting e-learning in a number of French-speaking countries in Africa (www.coselearn.org). The main aim of this program is to promote e-learning by progressively implementing a Virtual Campus in more than 50 partner universities. CoseLearn program leads to the professional diploma of "Master International En e-Learning" (MIEL) (International Master in e-Learning).

The CoPE is made up of principal actors of the project (professors, tutors, and administrators) and master candidates (university teachers and computer centre engineers). The learning situation encountered within the framework of this CoPE covers the three types of learning situations: problem situations, decision situations, and project situations.

The problem situations consist in finding answers to the various questions encountered by the candidates during all their training and instruction, namely during the duties stated in various subjects as well as during the final project. The decision situations identify essentially the possible alternatives for the design and development. The criteria and/or the arguments necessary to the selection are also identified. Finally, the project situations address the exchange of the practices. These practices will be deducted using a viable know-how in terms of construction of the online education courses (best practices).

In case of the problem-situations type, Moodle is used as a technical environment and is plays the role of an LMS and a CoPE. Let's consider, for example, a question asked by a learner member: *How to write a Java applet to allow part of an online course on LMS Moodle to communicate with a simulation software in order to automatically capture the simulations' results?*

The answer to this question requires the collaboration of the learner members of the CoPE (master candidates) within the framework of a play of type «problem based learning». Here is some supplementary information about this learning situation:

- The learner-members have a techno-pedagogical qualification;
- Participation of support-members: moderator, manager and reporter is required;
- The collaboration takes place in the «Problem-solving sub-space» of the «Design-space». The collaboration takes the form of discussion of different alternatives, offered by Java and related to applets. A discussion is also done about the way Moodle is communicating with the simulator;
- The CoPE memory contains, among others, interesting resources on Java applets, Moodle, and the simulator;
- The results of this collaboration will be saved in the CoPE memory.

An XML code has been generated with IMS-CLD schema. In this scenario, two sub-roles of learner-member role were created: «Pedagogical participant» and «Technical Participant». Other sub-roles were created such as: «Moderator», «Reporter» and «Manager» of support-member role. Since the problem to solve is part of the design step, the activity type «Design-activity» was used. An

«Activity-structure» was created to group activities that have to be executed sequentially such as the "clarification of terms" activity and the "definition of the objectives" activity. Resources of various types have been used. The play is composed of seven acts matching the seven steps of resolution defined previously. Each act can be composed of two role-parts. The first one relate to the activities done by the learner members. While the second one is about the support activities done by the support members.

6 CONCLUSIONS

The present paper constitutes a logic succeeding of our research work (Chikh & al., 2007) which goal is the capitalization of techno-pedagogic knowledge, tacit or explicit, in terms of e-learning within the context of CoPEs. We have proposed a new specification language of learning scenarios within a CoPE, baptized IMS-CLD. This last extends IMS-LD and favours exchange between the technical environment of CoPEs in one side and LMS systems in the other side. We have also defined three types of plays: «Problem based learning», «Decision support», and «Project management». Finally, we have achieved a case study, where we have modeled a problem situation in a CoPE, created within a framework of the "Coselearn" training project in e-learning. We foresee in a near future to validate this new language with other learning situation-types and implement an editor and a player for this language using respectively «Reload Learning Design Editor» and «Reload Learning Design Player» for IMS-LD.

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