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ASSISTANCE TO PROJECT-BASED LEARNING SUPPORT: FROM LEARNING MODELS TO PLATFORMS

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ABSTRACT

For the research domain we study, Technology Enhanced Learning Systems (TELS), these systems do not consider pedagogical and computer science aspects be unrelated. One of the teachers' major objectives is to define the way of designing, adapting or choosing the accurate platform to support the pedagogy they need to implement. Therefore our work aims to propose an approach to help the teachers to choose a platform of e-learning and deploy their lessons according to the objectives of a Project-Based Collaborative Learning (PBCL) framework. We focused on the choice and adaptation strategy rather than on the design development aspects. In this publication, we define an MDA based approach in order to establish a methodological framework of our research project and therefore meet with our objectives. We will also report on our research progress and propose a state of our work in PBCL modeling.

KEYWORDS

Project-Based Learning (PBL), Collaborative Learning (CL), Technology Enhanced Learning System (TELS), MDA.

1. INTRODUCTION

The new training policy (more and more people have access to learning all lifelong) has led to a growing interest in the creation of new pedagogies and learning modes. The need to provide learning modes more in line with demand is not recent; in the past this was hindered by the lack of communication tools and less developed technology. Nowadays, information technology evolution and globalization internet access lead to think of learning mode in a different way. Moreover, the impact of exponential IT development along with software evolution will have a significant impact on the development of learning modes.

One of the teachers' major objectives is to define the way of designing, adapting or choosing the accurate platform to support the pedagogy they need to implement. As a result, the platform must take into account learning modes and implementation modes; as such, this tool has to be effective to respond to the teachers' demand and pedagogical choices in a real context.

Our research context is focused on definition, specification, design, implementation and experimentation of academic learning supported by ICT, especially, Project-Based Collaborative Learning (PBCL). It should be noted that the fields of psychology and education use preferably the term 'cooperative' instead of 'collaborative'. This is part of the Technology Enhanced Learning System (TELS) Engineering domain, a multidisciplinary knowledge domain including sciences of education, pedagogy, cognitive psychology, didactics, linguistics, computer science and software engineering. However our strategy is to assist in the choice and the adaptation of accurate platforms, rather than in the area of design and development. In particular, we recommend in the educational engineering field, the Model Driven Architecture (MDA) oriented approach in the software engineering domain [1]. Indeed we support a design approach based on

models, so-called Model-Driven Engineering (MDE). In the MDE software process methodology, refining models develops a system. The model's transformation technique is a key principle within this approach. It allows traceability between the different models produced at the different levels of abstraction.

In TEL systems, most of the problems reported in the literature [2] show that training supported by ICT is often the simple transposition of face-to-face situations where teachers provide the learners with their knowledge (behaviorist pedagogy). This kind of pedagogy tends to place learners in a rather passive situation and therefore does not encourage them to participate actively during the course. On the other hand, we think that proposing a tool to support learning situations is not sufficient, and therefore it is necessary to define a coherent and effective learning method. Such a method must result from a deep analysis that takes into account social science disciplines such as sciences of education, cognitive pedagogy, psychology, didactics, linguistics, and must be supported by ICT.

We work in the context of professional learning in the academic world (young adults training in continuous or traditional learning, remotely or face-to-face). We notice that in addition to assimilation in specific domains such as computer science, marketing, etc., the students also need to be helped to acquire further transversal skills such as team work, project management, communication, etc. Professional training focuses on the acquisition of these skills thanks to new active learning practices assisted by the Educational Information and Communication Technologies (EICT) and adapted to the academic context.

Project-based Collaborative Learning is often recommended in the academic world. Many experiments are being undertaken in several academic programs in order to implement a project-based learning pedagogy. Most of the commercial or open sources learning systems are available, for example, at <http://thot.cursus.edu>. However none of them seems to meet the needs of learning. We need technological methods as they exist in academic trainings programs.

In the following (Section 2), we present the framework of our research approach. This is MDA oriented. In Section 3, we introduce the Project-based Collaborative Learning concepts (PBCL) we deal with. In Section 4 we report elements of our PBCL metamodel development and conclude with the work we have plan for the future.

2. THE RESEARCH FRAMEWORK

Figure 1 illustrates our project methodological framework as introduced above. Our approach is based on the Model Driven Architecture framework [1], for which we have defined two modeling levels: model and metamodel. We consider according to [3] that the metamodel (M2) shows the concepts and rules for a given field interest, in this case Project-Based Collaborative Learning and educational platforms. Model (M1) is in conformity with the metamodel which aim to describe a specific situation.

We want to focus on parts (1), (3) and (6) of the framework we propose. Parts (2), (4) and (5) are the subject of another research work that will be undertaken by the NOCE team of the TRIGONE laboratory [4]. In the first part of our research work (1) we propose a metamodel from PBCL pedagogy. This model represents a generic learning situation. This metamodel will describe the concepts of a PBCL pedagogical situation and their relationships to permit defining a model of teacher's specific learning situation.(3). According to these models we will provide a decision tool to permit also the designer to select the platform that matches with his/her specifications and install the platform so that it meets his/her pedagogical requirements. The platform chosen should be adapted to meet these requirements (6). In practice, the installation could be limited by the choice of the platform and by the configuration difficulties of existing tools: blogs, wikis, forums, etc.

Both our research work and the work carried out by the NOCE team are based on the pedagogical situation describes in the *Mepulco-Université* method [5]. The NOCE team is more involved in the metamodeling/modeling process on the platform side (4) (2) (5). They focus on the technical side more than we do, and in that way our work is complementary.

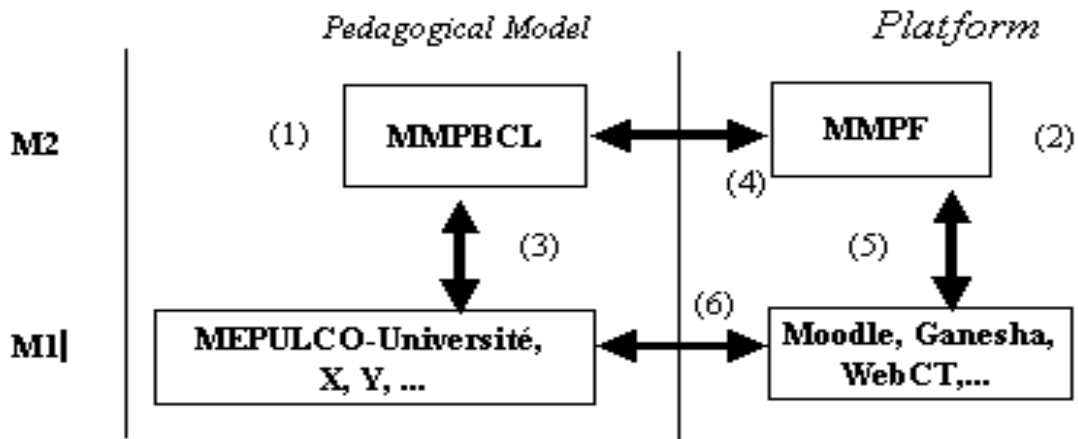


Figure 1. The research framework

Our prime objective is to develop a PBCL metamodel. Figure 2 illustrates the metamodel place within our research framework. The PBCL metamodel represented in the center of the figure will be built from informal models, recommendations in natural language and semi-formal models written in Unified Modeling Language (UML) [6]. UML language one enables to specify various abstraction levels and several PBCL concerns.

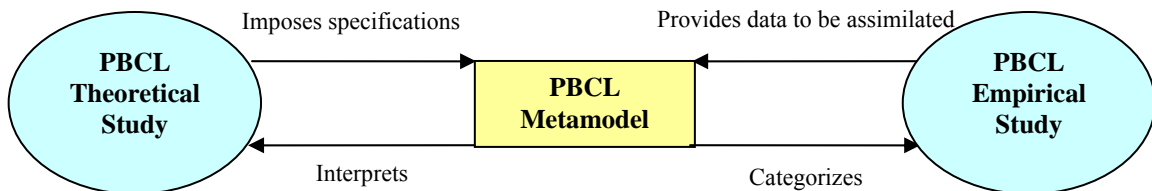


Figure 2. Basis of the PBCL metamodel construction

This approach enables again to treat the learning aspect and the technological aspect separately, while ensuring a strong cohesion between both of them, thanks to the PBCL model based on the theoretical and practical study of Project-Based Collaborative Learning.

It is noticed that the difference between a model and a metamodel is not structural, but relative to a given context. Thus, in a given situation an object will be considered as a metamodel although it will be a simple model in another context. For example, a class diagram is a metamodel if compared to an objects diagram; although it will be considered as a simple model if compared to the analysis process system. Please note that, for more convenience and if there is no ambiguity, we will often use the term of model.

3. PROJECT-BASED COLLABORATIVE LEARNING (PBCL)

Project-Based Collaborative Learning has been part of the pedagogical culture since Dewey, Decroly, Freinet, etc. and is opposed to the behaviorist pedagogy which is based on a unilateral and passive transmission of a teacher's knowledge to his/her student. It is difficult to define an accurate Project-Based Collaborative Learning since it implements so many processes and practices [7]. Among the existing literature on this topic we have taken the characteristic from George [8]. This author describes the Project-Based Collaborative Learning approach according to six criteria we briefly comment on below:

1. Project-based collective learning is not an easy field to be involved in. That is why learners' feeling is very important to make the project become their own and not only the teacher's.
2. Social context has an impact on the success of the training and the project. It has been proved that such a criterion enables negotiation, simplification and socialization of the action.
3. The great importance of common work: it is necessary to succeed all together by producing a common end product.
4. Follow-up and achievement with current project management techniques: such criteria require specific skills and project management tools that are sometimes lacking [5].
5. Teachers should act as mediators more than "knowledge providers". They should not do learner's job [5].
6. The evaluation of the project is completed by a public presentation and a mark.

It is recommended [2, 5, 8] that projects must be rooted in reality. The work must be inspired by concrete life themes (needs, lacks, socio-cognitive conflict, etc.) and initiated by learners themselves. Another part of this pedagogy consists in considering learners as part of a group; however in terms of organization the team members must not be too in order to provide productive work and for a better result when performing collaborative tasks and defining organization. In this case we refer to collective learning.

4. ELABORATION OF PROJECT-BASED COLLABORATIVE LEARNING (PBCL) METAMODEL

Through this part we introduce the PBCL metamodel scheme as built according above concepts and theories. We present this metamodel as a diagram class in UML language. These diagrams serve to explain the concepts, not to show all details. The metamodel can be presented in three different views. The goal of the general view, figure 3, is to point out the *structure of the project* in a PCBL context. The second view, figure 4, is to focus on the *learning aspects*. This view of the metamodel proposes a framework that enables the creation of training session. The third view, figure 5, is related to the *production part of the project* itself. Please note that the PBCL model as introduced in this presentation is a static one, i.e., a generic scheme which does not take into account specific scenarios.

4.1 The Conceptual Model

The diagram class in figure 3 proposes the main structure of the projects. The concept of tasks is supplemented by figures 4 and 5. A project is broken down into a succession of steps [8, 9, 10] or activities "*Each step of the project plan can be defined as a number of actions that learners need to accomplish*" [11].

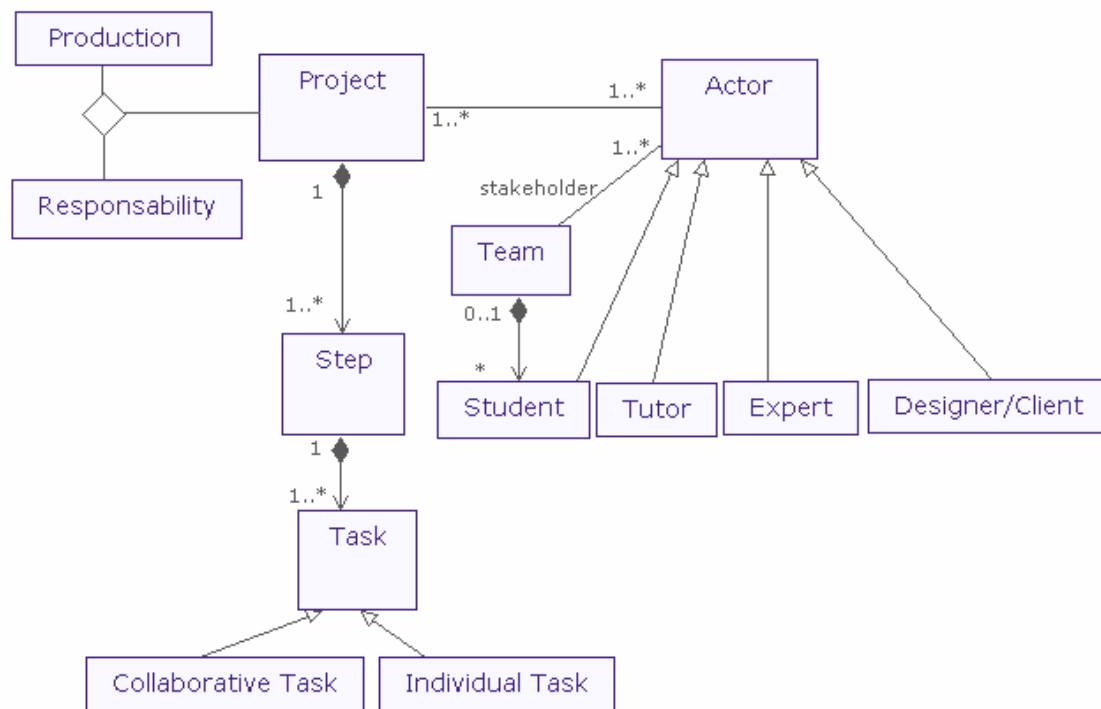


Figure 3. General view of the PBCL metamodel

We break each project step down into one or more tasks and specify whether each task is individual or collaborative. Generally PBCL projects implement two main actors: the teacher and the student [8, 12]. However, with the PBCL productions, new actors are implemented in the projects: experts, project coordinators, and sometimes the clients themselves. [5] differentiates four types of actors: the student, the tutor, the expert and the designer/client. Concerning the tutors, Moodle distinguishes the editor of the teacher-course from the teacher-tutor. We consider the actors of the project in a common class: actor. The general responsibility of each actor is defined by his membership to a sub-class: student, tutor, expert and designer/client. Students can be alone or from part of a team. We call team a group of students engaged in the same project task. This team works with one or more actors. Not to complicate the diagram, we do not reveal all links as for example the link between team and task. The designer/client intervenes “upstream of the project”. He can be a teacher or an external actor. He is the actor responsible for the project design and is the owner or the client of the project. He must be able to define a project plan that sets out the different project steps, along with tasks that students need to undertake in each project step. The tutor is responsible for monitoring the progression and the planning of the project. The expert is here to help the teams, and solve their problems in case they lack technical skills. In order to learn, the students are encouraged to share, organize, plan and achieve individual or collaborative tasks.

For each main "Production" of the project "Responsibility" is defined: creation, realization, validation, etc. We also think the metamodel should not impose constraints. The project metamodel must give the actor freedom to appropriate the project, because the actors can create new relations in the project themselves.

4.2 Creation of The Project and Organization of Its Learning Activities Into Steps

According to [12] and [13] the description of the project includes the presentation of the learning objectives, the domain in which the students are involved, the name and contact of the tutor, and the tasks to be performed (the tasks are presented in textual form and the student will be responsible for defining them in terms of time). The learning stakeholder is mainly the student or the team of students. For each task, it should

define quality model in terms of learning objectives. These learning objectives are broken down into "factor". To evaluate the success, the tutor must preferably define a process of notation (Metrical).

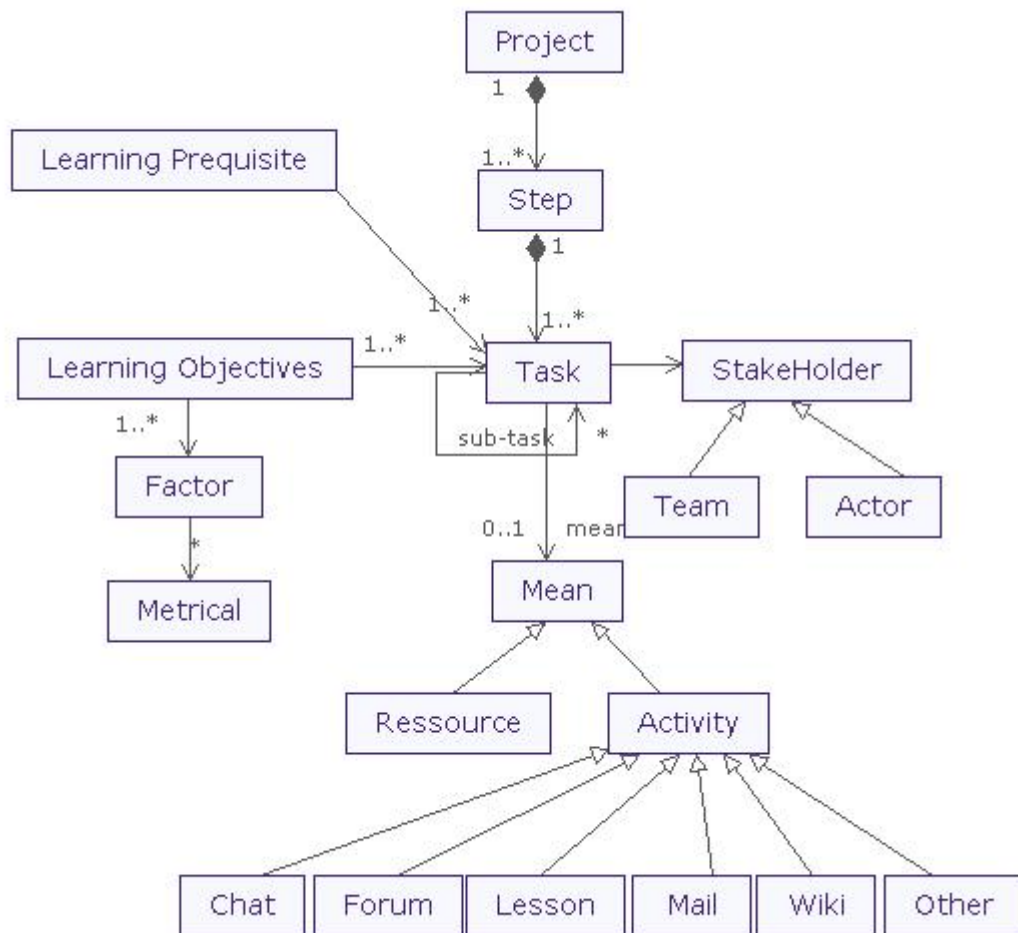


Figure 4. Learning view of the PBCL metamodel

Within this framework, each student plans his tasks [5]. Planning shows the structuring of the various tasks in sub-tasks [11, 12]. These are selected from existing tasks already defined by the student or suggested by the designer/client. The student selects a task among those proposed by the Designer, or can create a new specific one.

4.3 Definition Of Tasks Plan

Figure 5 shows the PBCL task structure. If the students or the designer want to define a task, they must define its objectives, then define who are the main actors, which communication tools [10], the required resources, the beginning and the end of task, the expected results or products and their nature, individual or collaborative, [14] as shown in figure 3. The tests define if the production is accepted.

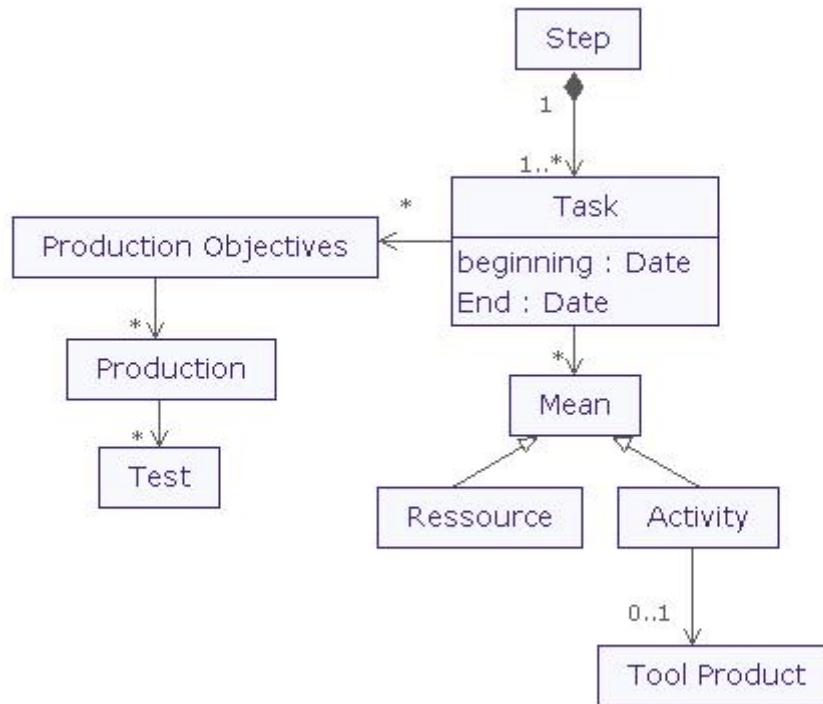


Figure 5. Production view of the PBCL metamodel

5. CONCLUSION AND PERSPECTIVES

In this paper we have introduced the methodological framework of our current research on Project-Based Collaborative Learning and its support. We have introduced the first steps of the modeling work based on the MDA approach. We think that this approach is valuable in the context of pedagogical engineering.

In the future we would like to continue to study the PBCL metamodel and transfer the concepts of management projects from the industrial context. In addition we would like to extend our PBCL metamodel with use cases of above class diagram level. Then, we will use the metamodel to describe existing pedagogical situations like the Mepulco-Université method. Further more we would be interested in the platform selection process and experimentation.

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