



Chapter VI

UML-based Modeling of Educational Components for Cooperative Problem-based Learning Situation Design

Abstract

As common learning situations, Problem-Based Learning Situations (PBLs) require accurate template models in which the roles of tutor and learner participate in varied codified cooperative activities. This chapter discusses the use of the UML formalism to first build such customizable models, and next to derive Educational Components (EC) from models. The chapter contributes to reduce the lack of flexibility in “open” learning tools where distribution of components applies with some difficulty. It purposefully

introduced the designer role for problem-based learning situations. This designer aims to assemble educational components in order to offer computer-aided learning supports. Model examples and techniques for the implementation of components are also briefly evoked.

Introduction

Our work copes with learning situations involving cooperation between tutors and learners. Within this context, computer-aided learning hinges on software or platforms whose customization allows implementing scenarios embodying such cooperation. Hence, computer-aided learning software design is greatly constrained by technological and technical choices. We especially agree with (Earle, 2002) on the need for educational system designers to consider pedagogy in all phases of development: from modeling in particular to implementation.

Because of the monolithic aspect of learning platforms and software, as well as the specificities of education based on Problem-Based Learning Situations (Meirieu, 1988), we propose in this chapter an approach using the notion of Educational Software Component (Roschelle et al., 1999). PBLs rely on various cognitive models of pedagogical activities for tutors and learners (individual activities, cooperative activities, support activities). These cognitive models can be specified once and for all and captured within components. Our component model takes place in the “model as component of an educational artifact” depicted in (Baker, 2000): “computational model corresponding to some human cognitive ability used as an AIED system (Artificial Intelligence for EDucation)”. These components have a dual vocation, splitting their re-use into two viewpoints. Pedagogically, they facilitate the learning designer work. She/he can just be a teacher and may want to add/remove basic pedagogical components in order to assemble a new learning situation. Technically (second viewpoint), they offer enough flexibility (parameterization, high degree of tuning) and naturally support distribution.

We focus in this chapter on the UML presentation of our model of educational components. The Unified Modeling Language is a visual language for specifying, constructing and documenting the artifacts of systems. It is a general-purpose modeling language that can be used with all major object and

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