Helping Teachers in Designing CSCL Scenarios: a Methodology Based on the LDL Language

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Abstract: When teachers prepare learning activities to be carried out by learners within web learning environments, they encounter two main problems: the modelling and the technical ones. The modelling one is nowadays regarded as being the most important, both in CSCL and Learning Design. We have defined a methodology to help the teachers to model. It is briefly presented here. It is subordinated to the educational modelling language used to produce the models: LDL.

Introduction

There is a broad acceptance in the CSCL community that collaboration is not that spontaneous and that learners need to be scaffolded in collaboration activities. The teacher has to provide them with some guidance to be sure that collaboration will be effective and efficient. Researchers have thus recommended carrying out a scripting phase before the performance of the activity, during which a description of the future activity will be produced.

In order to support this preparatory task, we have defined an educational modelling language (EML) called Learning Design Language (LDL) (Martel et al., 2006a). It is intended for teachers or instructional designers. It has been created to allow them to describe and specify collaborative pedagogical activities on internet. The ambition of LDL is twofold: on the one hand, it provides the teachers and instructional designers with simple means to build the formal description of whatever kind of pedagogical activities and to combine them; on the other hand, it allows the teachers to be able to transform easily these formal descriptions into effective online activities whilst considering the technical environment in which they operates (i.e. the resources available on their school network and on internet).

Using LDL during the preparation phase leads the teacher to create a *scenario*. A scenario is a very codified and formal description of a future activity. It can be considered as a *specification* of this activity. Building such a specification is not that easy. We have defined a methodology and a graphical notation to help the teachers build a scenario. The methodology is subordinated to the LDL language. It is presented briefly in what follows.

The proposed methodology

The proposed methodology distinguishes two steps clearly. Step1 aims at building an informal scenario (a narrative text). Indeed, we think that it is not possible to ask a designer to produce a formal description directly. Step2 aims at formalising this informal scenario. When analysing a learning situation, it is possible to identify activities of different types that are interwoven. We consider four types of activities:

- the *learning type*. Activities of this type are the heart of the learning. Learners manipulate the resources put at their disposal. They produce contents related to the learning objectives. They work individually or collaboratively.
- the *observation type*. During activities of this type, the teacher observes the ongoing learning activities with the aim of supervising and regulating their progression.
- the *assessment type*. Any learning activity is preceded, associated with or followed by at least one assessment activity. The place of the assessment activity in the overall learning flow depends on the kind of assessment desired by the designer (diagnostic, formative, summative, etc.) (Durand & Martel, 2006).
- the *organisational type*. Activities of this kind are dedicated to organisation problems: resources and tools are made accessible; instructions are given; if needed, groups are created; the other activities are started.

We propose to regard these four types of activities as basic elements that are constitutive of every learning activity to model. The overall learning activity results from the combination and the interrelations of these activities. Being activities per se, they can be modelled as independent scenarios. Building the formal scenario of a learning activity is thus no longer a matter of defining a unique scenario, which encapsulates everything. It becomes a matter of defining *at least four* scenarios, corresponding to the four different kinds of activities identified. As a consequence,

it becomes a matter of describing the relationships between these scenarios. It is also a matter of describing each scenario in terms of the concepts proposed by LDL. Once again, this leads to splitting the methodology into two phases : (1) identifying the activities and (2) modelling each identified activity.

Formalizing the informal scenario: (1) Identifying the activities

At this stage, the designer has first to analyse the overall activity to identify the activities that constitute it and that correspond to the four types of activities mentioned above: organization, learning, observation and assessment. This has to be completed with the description of who is to be involved in each activity. This is a matter of identifying the *roles*. Furthermore, for each activity, the designer has to identify the participation modes.

What is meant by "participation modes" is the overall way participants will exchange and interact in an activity. They describe the kind of situation a designer wants to carry out with her/his students. They allow one to distinguish *individual participation* from *collaborative participation*. The former is characterized by participants having individual activities and no relationship with each other, the latter by participants acting in the activity as interdependent and engaged partners involved in a common quest. In collaborative participation, we distinguish *frontal* situations from *open* ones. In frontal situations, participants have individual activities and no relationships with the other participants, except with a person having a particular role who oversees, stimulates, coordinates and controls. A course at university in a lecture hall is a typical frontal situation. In open situations, participants can cooperate freely with the other participants. It is the case for example of a panel session in which participants are invited to discuss and express freely their opinions and points of view. Note that in real educational practices, these various forms can be combined with each other to produce hybrid educational situations that can evolve over time.

Once the designer has identified the activities and the participation modes for each of them, s/he has to position these activities with respect to each other. This means that s/he has to:

- define the learning flow. This leads to both the building of the activity schedule (specification of the order according to which the activities will have to be performed) and the definition of synchronization points between these activities;
- define the objects the activities may share. Two kinds of objects can be shared: *arenas* and *positions*. Both are LDL concepts. *Arenas* represent the places where the activities and exchanges will take place (activities are situated). A *position* reflects the participants' reactions and perception of the activity. It is a general concept which covers different notions such as the participant's point of view (for example, "I have finished this exercise"; "we have answered this question"; "this exercise is too complicated"), her/his availability, a mark (we consider it as the position of a teacher on a learner's work), etc.

Formalizing the informal scenario: (2) Modelling each activity

It is time now for the designer to go deeper into each activity and to build a model (i.e. a scenario) for each of them. This is done by using LDL concepts. We have made a particular analysis of what a learning activity is. From our point of view, it is not a process which can be broken down into a succession of tasks to be carried out. Rather, we draw a parallel with a conversation, in which locutors speak to their interlocutors, who make an interpretation of what is said and may react in turn (Austin, 1955). Just like a conversation, we consider an activity as *a set of exchanges and interactions* between the users involved (the participants). And as in a conversation, every exchange *involves at least two participants*: an *addresser* who acts and whose actions are aimed at an *addressee*. It should be noted that the addresser and the addressee may be the same person in a given exchange. The exchanges may be *organized and structured* by the designer in *a given learning context* (the activity is *situated*). This context includes not only adequate learning objects (contents and services) and the learning objectives but also a set of *rules* that scaffolds the activity. In addition, an activity progresses through individual and collective *positions* taken by the participants within their exchanges. These positions have an influence on the progress of the activity, as they are indicative of the participants' reactions and perception of the activity. So the teacher observes them with the aim of adapting the situation, by modifying the context, the exchanges or even the way exchanges are structured.

LDL has been defined within this particular interactional vision of learning activities. It also takes into account their intrinsically evolutionary nature and the need for observation and regulation. Within this vision, designing a scenario consists in describing (1) what the participants' interactions will be, how and when these interactions will be connected throughout the activity (this is represented by the *interaction* and *structure* concepts in LDL), (2) where the activity will take place (the *arena* concept), (3) who the participants in the activity will be (the *role* concept), (4) the rules the participants will have to comply with (the *rule* concept) and (5) what the

consequences of the participants' actions and points of view on the activity will be and how they will be able to express these points of view (the *position* concept, which is linked to the *observable* one).

Discussion and Conclusion

Once the formalisation work has been completed, the designer has built several diagrams that specify the scenarios and the learning flow between the activities modelled by these scenarios. As the methodology is based on LDL and involves the description of scenarios by means of LDL concepts, it is possible to make an automatic translation of the resultant diagrams into an LDL-equivalent codification (in an xml binding form). Then a computer is able to "understand" this codification. Thus it is possible to operationalise the scenarios and execute the corresponding activities in a given web learning environment, chosen by the teacher who wants to carry out these activities with her/his students. This is carried out by LDI (Learning Design Infrastructure), an infrastructure which deals with both operationalisation and execution of LDL-scenarios. LDI has been developed by Pentila Corp., which is our main partner in this project (see http://ld.pentila.com. Many thanks in particular to Steve Giraud).

Our approach is different from what is usually done in CSCL research. The usual approach consists in embedding scenarios in CSCL tools. The source code of these tools has to be modified by computer engineers to integrate the scenarios. In our approach, on the other hand, we propose to keep the scenarios *outside* the tools. Then the scenario, formalised in LDL, made executable by LDI, becomes a means of organizing the use of whatever services and Learning Objects that could be used in learning activities. This approach has several advantages. First, it is easy to reuse scenarios. In (Harrer et al., 2006) a similar argumentation is used applying IMS/LD for the scripting of CSCL activities. Second, people who have to deal with learning activities and scenarios do not have to concern themselves with the technical problems related to implementation. Third, the time between the moment when the formal scenario is produced and the moment when it can be executed on a computer is considerably reduced. This could lead to a new potential use of scenarios, which supplements the ones listed by (Miao et al. 2005): the possibility for CSCL researchers to carry out their experiments more easily and more quickly.

There is another difference between our propositions and the work usually done in CSCL scripting. Instead of building a single scenario that encapsulates the overall complexity of a given learning activity, we rather propose a modular approach. It consists in considering every learning activity as a composition of activities of four types: learning, organisation, observation, assessment. The advantage is threefold. First, it reduces the complexity of the overall situation to be modelled. Second, it provides the designer with some guidance. Third, as it leads to a componential approach, it facilitates the reuse and the adaptation of the scenarios produced.

The methodology was practically tested on the example of the planet game, a case study that was used as a benchmark/competition in a workshop we organized during last ICALT (Martel et al., 2006b, Vignollet et al., 2006). We now need to validate it. For that purpose, we have to do some experiments with teachers, giving them the role of "scenario designer". If we wish to do that in the best conditions, we in fact have to provide an authoring tool to support the design process. This tool has to be simple and intuitive enough to be used by teachers. We have specified such a tool. It is currently under development and should be operational next summer. This will allow us to start a validation phase with teachers and, why not, CSCL researchers. Are you interested in this ? …

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