A Design Rational of an Editor for Pedagogical Procedures

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Abstract: The scenarisation of learning activities seems to be a promising way to answer CSCL challenges. The success of the corresponding Learning Design field depends largely on its ability to offer eLearning professionals well-adapted tools. Whereas a number of languages are coming to maturity in this field, the associated authoring tools are still too difficult for instructional designers to manipulate. This paper presents the specification of an authoring tool based on particular scenarios which are here called Pedagogical Procedures.

Introduction
Learning design (Koper, Tattersall, 2005) seems to be a promising way to support the overall process of elaboration and delivery of learning activities. On the one hand, it provides models to describe pedagogical activities, and languages to formalize the descriptions produced (the scenarios). On the other hand, it also provides means to interpret the languages and transform the models of activities into actual activities running in virtual learning environments.

Although the results obtained in this field are significant, there remains progress to be made in order for the instructional designers to be able to get hold of them, to appropriate them and to put them into practice naturally. One of the reasons for this difficulty is that the modeling languages proposed are very abstract and the associated authoring tools, though offering graphical interfaces, are based on the manipulation of those concepts (modelEditorNew for LDL (Martel, Vignollet, 2008), Recourse (http://www.tencompetence.org/ldauthor/) for IMS-LD, MoColade (Harrer & al., 2007), etc.). The current instrumentation of the design phase thus seems to be inadequate for instructional designers (too far from their “world”) (Griffiths & al., 2005).

In order to actually support instructional designers more effectively during the design phase, we have identified particular scenarios, called Pedagogical Procedures (PP), and the concepts used by instructional designers to express them. Then, we have defined the corresponding model and educational modeling language intended to model them. As this language proposes concepts that are meaningful and eloquent for instructional designers, it can be considered as a Domain Specific Language (DSL). A PP graphical editor has been developed. This paper presents the work done on PPs.

What are Pedagogical Procedures?
The scenarisation of learning activities is a design activity which relies on an intuition shared by a lot of teachers: some learning activities are better than others in leading to effective learning and promoting the construction of knowledge by the learners. These learning activities considered more efficient than others are passed on by teachers from generation to generation. They take on the status of “recipes”. When they are correctly applied, these “recipes” favor learning. For example, in the French primary education system, all the teachers know and frequently use the La Martinière procedure (Rossignol, 1951). It is intended to develop pupils’ mental calculation abilities and to facilitate the acquisition of basic notions in calculation. Because of its efficiency, it has been raised to the rank of official procedure for carrying out mental calculation by the French Ministry of Education. The point here is not to discuss the supposed efficiency of these “recipes”, but to emphasize their existence and the fact that teachers acknowledge and endorse this existence.

The term "Pedagogical Procedure" can be bracketed with several other terms that have long been used in the field of educational technologies but we propose to define a more precise and more "formal" codification than the usual ones.

Definition of a pedagogical procedure
Pedagogical Procedures are specific scenarios that are distinguishable from others by their relatively codified character and the degree to which they are shared in the teacher community. So, for instance, by its systematic repetition, its implementation rhythm and the way it mobilizes the learners’ attention, the La Martinière procedure mentioned previously allows teachers to obtain indisputable results in the field of mental calculation. For this reason, these particular scenarios inspire confidence in teachers. They willingly use them for two main reasons: first, their implementation is facilitated by the codification; second, these scenarios are little disputed by the academic authorities insofar as they have gained popular recognition in the teaching community.

A pedagogical procedure is made up of a sequence of instructions given to the participants of a learning activity, that describe what they will have to do in the activity to reach the objectives set by the teacher. The
pedagogical procedure defined as a sequence of instructions given to learners is codified as well as the instructions of a recipe.

A Pedagogical Procedure is defined as follow:

A Pedagogical Procedure is a particular scenario which contributes to the organisation of the learning activity. It is not linked to one particular subject or domain. It includes a set of instructions given to the future participants of the activity which describes what they have to do. Considering learning objectives, the application of these instructions leads to a quasi-certain result as only scenarios validated by teachers’ experience can be considered as Pedagogical Procedure.

Examples of Pedagogical Procedures
When observing actual learning situations, several pedagogical procedures can be easily identified as they are frequently used within these situations (Villiot-Leclercq 2007). It is impossible to establish an exhaustive list of PPs, in particular because they are regularly revised and modernized.

For convenient and methodological reasons, we have selected eight PPs to be part of a reference list of PPs: “Case Study”, “Guided Case Study”, “Debate”, “Treasure Hunt”, “Controversy”, “Conduct a Survey”, “Give a Talk”, “Role-Playing Game”. Of course, they are in accordance with the definition given in the previous section. Among the selected PPs, some are simpler and more intuitive than others. For instance, Controversy is a complex one. It has been elaborated and codified by Bruno Latour at the Ecole des Mines de Paris (http://www.macospol.eu/streaming2/) and it is now disseminated at MIT (http://www.demoscience.org/) and in several engineering schools.

Of course, making an inventory of these PPs together with their description in terms of participants, phases, instructions and artefacts is not enough. They have to be described formally if we want them to be usable within a LD approach in which they are supposed to become computational objects.

The building of Pedagogical Procedures
In order to transform these descriptions into formal models via an editor, we have to consider the way in which an instructional designer could build a PP by manipulating the ingredients it is made of: participants, phases, instructions and artefacts. An important part of the effort put into the development of this editor is dedicated to the analysis and the understanding of what an instructional designer is ready to do to formalize a scenario. We also have to identify the entities and the relations that s/he can easily use to express the scenario, whilst keeping it as intelligible as its textual description.

Thus, the conception process of this tool has integrated a participatory design phase involving instructional designers and computer scientists about the way to build a PP using a small number of entities. This phase is very important. Indeed, a study on teachers’ design practices (Henri & al., 2007) has shown the gap that exists between on the one hand the formalized and sometimes normalized methods instrumented by tools, and on the other hand, actual practices. These authors call for a design phase that is better adapted, less linear and more compatible with various design approaches as for them, the linear and sequential progress suggested by the “traditional” learning design approach incites the designer to determine the pedagogical orientations at the very beginning. For their part, these authors defend the idea that a new approach could attempt to respect the central importance granted to the contents while establishing a direct link between contents and pedagogy.

The construction of a Pedagogical Procedure (PP) begins with the selection of the participants who will receive the particular instructions in this procedure. Based on the metaphor of the orchestra, every participant will have a different partition (score). Interpreted in concert, these scores will allow the participants to play “the (musical) piece”. In the mind of the designer, a PP is formed of all the instructions given to all the participants. A PP does not need to be completely specified to be valid.

As shown in Figure 1, the investigations about the construction of the PP are made through spaces which can already prefigure the interface of the editor. An instruction is represented by the initial artefact, the action to be realized, and the final artefact, the result of the application of the instruction to the initial one. The instructional designer has also to clarify the nature of the artefacts involved in the instructions. For that purpose, s/he selects them from a palette of artefacts. In the case of the “Give a Talk” PP, the artefact Subject is the result of the instruction Chose a subject. It is also the initial artefact of the instruction that follows, Search for information. It highlights the need to clarify the links between the instructions. To allow it, operators are given to the designers.

The stages detailed above are only a fragment of the instrumented method proposed by the creators of this editor. This method results from the instructional designers making explicit their building rules for a pedagogical scenario.

If we refer to the expectation of the designers, it must be possible to build a PP starting from objects, or from instructions. These conclusions only serve to strengthen the necessity of offering multiple entries to the