Models and tools for a contextualized observation strategy in a TEL environment

Mohand Akli Ouali, Sébastien Iksal, Pierre Laforcade
LUNAM Université, Université du Maine, LIUM (Laboratoire d’Informatique de l’Université du Maine) Avenue Olivier Messiaen, 72085 LE MANS CEDEX 9, France {mohand_akli.ouali, sebastien.iksal, pierre.laforcade}@univ-lemans.fr

Abstract—Many researches are interested in the observation of learners’ activities within a Technology-Enhanced Learning environment. This work is about how observation can be improved. We originally propose the concept of observation strategy. Such approach leads teachers-designers to design and specify the targeted observation, and all its components, as a dedicated artifact in relation with a learning scenario. We present and discuss in this paper the issues and challenges of the research work we are conducting.

Keywords—TEL environment; observation; observation strategy; visualization of indicators.

I. INTRODUCTION

Distant TEL environments, such as learning platforms, offer to teachers the opportunity to deliver didactic resources to students as well as to support various pedagogical activities (discussion, collaborative writing, etc.). Sometimes, teachers can also use these tools to define an a priori learning scenario that sequences the learning activities according to specific objectives, defines roles and tools restrictions, and so on. During presential courses, teachers can directly observe the concrete realization of activities and easily adapt the situation if needed. Non-presential pedagogical situations are more difficult to observe and adapt. The observation is restricted to what the TEL environment used is able to trace, and to what the teachers are able to interpret with such tracks of learners’ actions. The use of external tools is sometimes required in order to capture specific pedagogical information or indicators. Our research works are concerned with the observation of learning situations and the visualization of indicators when using a TEL system. The observation is defined in [3] as a process to gather facts in order to analyze them. In a TEL system, the observation is then based on the processing of data collected during the realization of learning situations.

Our research work originally proposes to consider that the efficiency of an observation activity is related to the definition and formalization of an observation strategy. This efficiency mainly relies on the relevance of various choices: for examples, the observation means implemented and/or used, the visual widgets selected for representing the calculated indicators, and so on.

A. The observation in a TEL system

Any process that delivers TEL learning situations should include a specific phase about observation and uses analysis, in order to notify teachers-designers of the quality of the deployed situation [2]. By interpreting the results of an observation, teachers, or tutors, can guide the learning activity by trying to encompass the potential dysfunctions related to the learning scenario designed. They can then introduce personalized support and provide educational materials adapted to the different learners behavior. A teacher-designer can also exploit the observation traces and indicators in order to modify the learning scenario for upcoming realizations (reengineering). Many research works propose solutions requiring the intervention of an IT expert to assist teachers in defining their observation needs, or in the interpretation of the observation results. It could also be interested to provide learners, during the learning session, with some specific visual tools indicating to them relevant information about their progress or knowledge acquisition. These objectives require the specification of a strategy for monitoring and analyzing learning situations.

B. Overview of an observation strategy

The concept of observation strategy is related to how the observation is organized. Indeed, this organization is concretely drives by various observation needs for different actors and different objectives. It is also intimately linked to how the learning situation is organized, the learning scenario, and its actors and pedagogical objectives. But for a same learning situation, various strategies can be defined according to the actors targeted, their observation needs, the considered tracks, the elicited indicators, the distribution and representations of the results, and so on. Such strategies should try to answer to these questions: does the right actor observe the right information? At the right time? With the right format? Does it correspond to his observation needs or does it help him in realizing his objectives? Does the information presented (indicator) is at such an abstract level from the TEL environment tracks to be useful?

II. SCIENTIFIC POSITION

A. Research context

This research work is part of the editorial chain supporting the observation within a TEL system proposed by [7]. In this context, the teacher-designer is considered as the
most appropriate actor to define and specify what is required to observe during the learning situation realization. This leads us to consider the design of the observation activity as a specific phase into the global instructional design process. To this aim, the teacher-designer has first to explicit his observation needs. Then, the learning scenario to perform can be analyzed, driven by the observation needs, in order to detect what observe, when observing it, how tracking and calculating it, how representing the result, for who for what.

In previous research works about the reengineering of TEL systems, [2] proposed a formal language for describing pedagogical indicators: the UTL Language (Using Tracking Language). It allows the definition of an observation need, and the specification of indicators from raw data independently of the language used for the definition of the related learning scenario and independently from the tracks formats.

Our specific research work aims to provide the actors of a learning system (especially the teacher-designer), with a homogeneous set of tools for 1/ defining observation strategies, 2/ calculating and displaying observation results with an ergonomic and intuitive visualization interface. These tools should be used before, during and/or after the learning session. The underlying idea is to propose two separated but communicating tools allowing the formalization of observation strategies independent from the concrete TEL-system used. With the first one, teachers-designers can then specify the organization of the observation by using a language and semantics closed to his pedagogical practices, handling pre-defined indicators, and available visualization tools etc. The recipient actor of the observation results can use then the second tools to visualize the results of the indicators’ calculation from his visualization interface, at the right time and to the right format, according to the strategy specification.

We concretely propose the elaboration of a dedicated language, coupled with UTL, for specifying observation strategies: UTL will take over the concrete calculation of the indicators. In order to ease the specification of observation strategies, especially by non-IT teachers, we propose to develop a dedicated graphical authoring-tool, and a widget-based observation dashboard for facilitating the interpretation of the observation results.

B. Existent observation techniques and tools

Many research works have dealt with some observation aspects. Some of them are focusing on the display of the observation results to the right recipients. They generally provide a set of visualization tools allowing a better understanding and interpretation of the results. The following research works also deal with the calculation of indicators and the results visualization: “GISMO” (Graphical Interactive Student Monitoring System for Moodle) [8], “Classroom” [5], “CoAT” (Collaborative Analysis Tool) [1], “ABSTRACT” (Analysis of Behavior and Situation for mental Representation Assessment and Cognitive activity modeling) [6], “Tatiana” (Trace Analysis Tool for Interaction Analysis) [4], etc.

The works mentioned above have developed specific tools for displaying the results of the indicators calculations. These tools focus on the understanding of the calculation results by the related recipients. Some of these tools allow the monitoring of learning situations in real-time [5]. Others ones limit the visualization to the end of the learning session [1]. Some tools combine several viewing format for a same indicator [1]. The tools from [6] demonstrate the added value of a computer-assisted analysis of traces but they focus on very specific data and require further developments to adapt their techniques to TEL Systems. Some works are very TEL-system-dependent and only focus on specific generated traces. It does not allow the exploitation of their tools and techniques on other platforms [8]. It is also important to notice the lack of research works taking account the context of the pedagogical scenario in their tooling. Some specific works [4] have been validated by a large panel of experimentations but present nevertheless some ergonomics and ease of use failures.

III. ISSUES AND OBJECTIVES

A. Problem

To accomplish efficiently the activity of observation, an organization of that specific process which includes the collect of data, the analysis and also the perception, is needed. The state of art we have performed has highlighted a real need in terms of organization of the observation activity strategically. That is why we decided to focus on the concept of observation strategy. One of our objectives is to formalize these observation strategies and to provide process and tools to the teacher for specifying his own strategies according to the pedagogical context and to his observation goals. So we consider the following questions:

- How to help the teacher or instructional designer to organize his activity of observation strategically?
- How to take into account the observation objectives of the teacher or the instructional designer?
- In what kind of form the results of the observation should be returned?

We propose to base the observation of learning situations on the role that the teacher or the instructional designer should play in this activity. The process starts from the needs and expectations of the teacher in terms of strategic organization of observation and proposes means enabling him to manage this activity. It is important to allow the teacher-designer to define his observation strategies depending on the visibility he wants to obtain from the learning session and this according to his observation goals. Our process must enable the teacher to capitalize observation strategies defined in order to allow their future use as well as to specify other observation strategies from strategies saved by adding some indicators and eliminating others. Another important aspect of the work to be done is the proposal of solutions for the perception of indicators defined during the description of the observation strategy by the teacher.

B. Objectives

Our goal in terms of solutions in this work consists in the proposal of a language for specifying observation strategies
by teachers or instructional designers. A language can be very complex to understand and use directly, and especially by designers without high computer knowledge, so it will be necessary to provide tools adapted to the teacher with a graphical editor for defining observation strategies and also a kind of dashboard to render the indicators following the strategy specified.

IV. PROPOSALS

A. Observation strategy

1. Definition

The observation strategy consists of a set of indicators, their perception mechanisms (form of restitution of these indicators) and the recipients of these indicators. It is composed also of its context of use (in connection with the pedagogical scenarios), the objectives of the observation (learner assessment, adaptation of the pedagogical scenario, monitoring the learning session etc.) and time of observation (during the session, after the session, the completion of an action, etc.).

2. Architecture of the specification process

The architecture of the specification process of observation strategies (Figure 1) consists of three main components: a specification language, an editor and a dashboard. The specification language of strategies, elaborated by taking into account the domain specificities of the teacher, handles three types of information: the indicators described and calculated using the UTL language, a learning scenario and mechanisms of indicators perception. These information are connected with association rules. The teacher handles the specification language through the strategies editor. This editor allows a high level of abstraction from the technical environment so that the teacher has only to consider indicators, mechanisms of perception, etc. He will never use the technical language. The dashboard is required for the diffusion of indicators, in the specified form, to the concerned recipients.

B. First prototype of strategy editor and dashboard

The implementation of this prototype of indicators visualization comes from the desire to translate the idea of form of restitution, by offering to the teacher an interface to select the groups and/or learners to observe. This prototype, which is a demonstrator and not the expected result in this research, also allows the teacher to select indicators to display and the mechanism of perception. The objective is to take some indicators calculated during an experiment and return them visually. The development of a prototype is part of a process of initiation to the difficulties and problems of indicators perception.

V. CONCLUSION

We presented in this paper the problem of observation of learning situations and perception of pedagogical indicators. We discussed in the first instance the notion of observation in a TEL environment and the unfolding process of an observation activity. We are interested in a second time to the research context in which this work takes place. We have presented and discussed thereafter, a set of proposals concerning the observation and visualization of indicators. Thanks to that study, we identified the need for a strategic organization of observation. We decided to propose: a language for the specification of strategies, a graphical editor for the teacher or the instructional designer in order to facilitate his work by guaranteeing a maximum of autonomy and a dashboard of observation to provide a better restitution of the observation results.

VI. REFERENCES