Designing Visual Tools to Scaffold the Process of Learning How to Learn Together

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Introduction

This interactive event will be presented by a group of researchers who contribute to the R&D Project Metafora - Learning to learn together: A visual language for social orchestration of educational activities - http://www.metafora-project.org

The project, launched in July 2010, will result by the end of its 3-year duration in the creation of a Computer-Supported Collaborative Learning (CSCL) system to facilitate 12 to 16-years-old students' planning of activities in science and mathematics. The project follows a design-based research paradigm to investigate whether and how it is possible to foster collective planning in mathematics and science classrooms. The aim of the project is that students will, first and foremost, learn to learn together addressing a "challenge" posed by the teacher involving a relatively complex science or math problem through iterations of planning the learning activities, enacting them and discussing its results, in a social constructionism context. Working in groups of 4 to 6 students during a period of 2 to 3 weeks, the students will plan, organize and engage in learning tasks, working sometimes as individuals and sometimes collaboratively.

The Metafora environment will offer a space for collaborative planning and collaborative problem solving where students will gather and discuss their plans, findings and emerge with an agreed solution, using in the process software tools to support planning, discussion, microworld for inquiry based learning , as well as other "domain tools" such as simulations.

The use of a specially-designed visual language will permit the students to communicate with one another in planning their learning and also to be precise in that planning and in enacting the planned activities. The system will also intelligently follow up the student activities and produce useful information for them and for their teacher.

Theme of the Session and Expected Outcome

The session explores an example of the design of new tools to support learning by researchers, teachers and students working together. The context of this collaboration was the need for a set of visual tools that could support students planning complex learning together in order to become more aware of the key components of learning to learn together. During the interactive event we will present and discuss our special implementation of "design workshops" which were developed by the Metafora team for the design of the Metafora platform.

The design workshops are aimed at incorporating researchers, teachers and students in the design process from the very start. In order to have some understanding of possible learning gains that students might have and possible benefits to teachers while they are engaged with the (forthcoming) tool, there is a need to have a first approximation on how the tool will look – and what kind of benefits it might possibly support. After creating an overview of the platform (a mockup) as a first approximation we engaged teachers and students in short scenarios (1-3 hours) of "real learning activities" of solving a challenge in math or in science, providing them with preliminary means to achieve this goal with the Metafora platform. As Metafora is focused on the use of a modeling language (referred as visual language) for planning a sequence of learning activity by a group of students, we decided to focus on learning scenarios that afford such process. The expectation behind this approach is that short-term trials with teachers and students will help us develop an understanding of the key processes involved in planning activities and in learning to learn together more generally. The outcomes from these workshops support our design-based research approach and –at this stage- facilitate the design of the first prototype of the Metafora tool and particularly the development of the modeling language.

To this end we have designed an activity of collaborative planning carried out by a group of 3-5 students. The planning phase was supported by a set of special cards with visual symbols that entails different learning activities (e.g data collection, hypothesis, evaluation, experimentation using simulations and microworlds, etc.) and connectors. Both sets were presented either with paper and pencils or by using a simple visual editor on the computer. The student were asked to plan together how they are going to solve their challenge (within 2-3 weeks), by using the visual symbols. Preliminary results of the first round of our design workshops directed us to formulate our first set of research questions which tackles mainly two dimensions of theoretical framework: (1) to what extent the use of the visual language for planning scaffolds the process of

learning dialogic inquiry in Science and Math? (2) To what extent the use of the visual language for planning scaffolds the process of Learning to Learn together (L2L2)? These overarching research questions helped the team to develop more specific research questions – e.g., to what extent the use of the visual cards helps students with developing shared understanding over time, and to what extent the use of specific visual symbols supports students' understanding on key concepts of science and math. The emergent of these research questions help us with designing the next iteration of the design workshops which will in turn focus on some more specific issues such as supporting student's work with the visual symbols as well as recommendations for a better set of visuals to support expected learning gains.

In parallel to the use of the visual language in Metafora the team engages in a process that allows end-users to inform our understanding on students' and teachers' needs for awareness and visualization in the system. To this end we present the participants with possible analysis components that may accompany and support the learning process of the students and teachers with the Metafora tool. During the design workshops we present our end users with scenarios and support them in verbalising requirements that inform the development of the analysis components of the system and the various awareness and visualisation tools that can support the use of Metafora in realistic situations.

To summarize: the design workshops that are concerned with the design of the Metafora platform enable us to incorporate the valuable knowledge of teachers and students about learning, with in the actual design of our learning tool.

The expected outcome from this session is to construct a network within the research community that will focus on possible ways to involve researchers, teachers and students with the design of learning tools that promote the emergence of new and updated theories about learning through design-based research.

Eight researchers from the Metafora project will present five different aspects related to the design workshops, preceded by an introduction and followed by a discussion with teachers that participated in design workshops, who will be virtually attending the event.

Table 1: Design workshop's aspects presented in the interactive event.

Topic	Focus	Presenter
Introduction	Overview on the Metafora project and the design-workshop- incorporating students and teachers in the design process, as a part of the design based approach paradigm	Reuma De Groot and Baruch Schwarz
Theoretical background on learning with the Metafora system	Being able to learn together with others in online mediated project teams is often posited as a key 'knowledge age skills'. To teach and to learn this complex skill we isolated some key features in the form of a set of graphical icons for planning and discussing tasks together.	Rupert Wegerif & Yang Yang
Visual language and its possible use- a short demo	How can graphical models created from a visual language support the planning process and the meaning making of the students of what they are going to do? How can visual languages be designed in a multi-disciplinary and participatory process?	Andreas Harrer
Following teachers' and students' work in Metafora	How can Metafora track what students are doing to benefit both them and their teachers?	Bruce McLaren and Manolis Mavrikis
Voices from the field	Sharing key moments of learning by the group within the Metafora design workshops, using videos and transcripts.	Reuma De-Groot and Baruch Schwarz
Learning Scenarios with a microworld	Presenting learning scenarios with a microworld, and the use of a visual language	Chronis Kynigos and Manolis Mavrikis
Virtual discussion with teachers who participated in the design workshops		Reuma De-Groot coordinates

Endnotes

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