A Model of Collaborative Learning Scripts Instantiated with Mobile Technologies

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ABSTRACT

Scripts are pedagogical methods for triggering productive interactions during computer-supported collaborative learning. SWISH is a pedagogical design model for constructing scripts: it articulates the nature of expected interactions to the nature of task division enforced by the script. This model is applied to mobile learning: different task divisions are supported by a distributed simulation environment, in which the client runs on mobile phones or PDAs. This contribution maps the computational architecture of the learning environment to a model of collaborative learning.

Keywords: CSCL; Pedagogical Model; Mobile Learning; Scripts

INTRODUCTION

Learning in groups is often more effective than learning alone, but not systematically (Johnson & Johnson, 1989). Teachers know that some groups interact intensively while other groups do not benefit from the same dynamics: sometimes, a team member works alone, another one doesn't work at all, etc. This is why computer-supported collaborative learning (CSCL) is not simply about enabling collaboration at a distance but more specifically about designing environments in which collaborative learning is effective. Empirical studies revealed the difficulty of setting up conditions (e.g., group composition) that guarantee that the team works the way it ought to work (Dillenbourg, Baker, Blaye & O'Malley, 1996). The actual benefits of collaborative learning depend on the quality of the interactions that occur among group members. This problem led to the emergence of pedagogical methods, referred to as *scripts*, intended to trigger productive interactions. Scripts are pedagogical methods that structure collaboration by defining sequences of activities, by creating roles within groups and by con-

straining the mode of interaction among peers or between groups. A CSCL script is not very different from a movie script: students as actors will interact in a more or less constrained way. Scripts were originally developed for face-to-face situations (Aronson et al., 1978; O'Donnell & Dansereau; 1992). To promote effective collaboration, a script aims to scaffold productive interactions among peers. The main categories of interactions that have been associated with learning gains are argumentation/negotiation, explanation and mutual regulation (student A regulating the task actions of student B and vice-versa).

The goal of this paper is to present a pedagogical model for designing CSCL scripts and to describe how this model has been translated into the computational architecture of a distributed simulation running on mobile devices. This contribution does not validate the pedagogical model per se or its specific instance through empirical studies; our purpose is to demonstrate the articulation between the pedagogical model and the technology. We first specify the scope of our work, i.e. which type of CSCL scripts we developed (Section 2) and how we consider the role of mobile technologies (Section 3). Then, we present the design model (section 4), the computational environment in which it has been instantiated (section 5) and how the model matches the environment and vice-versa (section 6).

APPROACHES TO CSCL SCRIPTS

We first clarify how our scripts differ from our colleagues' work. Researchers in CSCL have developed micro-scripts and macro-scripts. On the one hand, a script may scaffold argumentation by prompting these interactions. i.e. by encouraging specific utterances. For instance, some scripts display scaffolds such as "Please provide counter-evidence to your partner's statement" (Weinberger, Fischer & Mandl, 2002). On the other hand, the ArgueGraph script (see below) induces argumentation by forming pairs

of students with conflicting opinions. The first approach constitutes a conversational script, also called a micro-script, while the second approach, which sequences learning activities, is referred to as a macro-script (Dillenbourg & Jermann, 2007). Micro-scripts constitute the objective of the learning session - the students are expected to internalize a model of well-formed argumentation - while macro-scripts are pedagogical methods, to be acted and forgotten. Micro-scripts reflect a cognitive psychology approach: they zoom in on the collaborative processes. Macro-scripts rather reflect an *educational science* perspective: they are applied for designing learning activities in real educational contexts. This contribution focuses on macro-scripts. We illustrate our approach with two examples of macro-scripts that are briefly described below. A longer description can be found in Dillenbourg & Jermann (2007) and Dillenbourg & Hong (2008). We then describe the underlying pedagogical model, which can be applied to design many new scripts.

The first example of a script, *ArgueGraph* (Jermann & Dillenbourg, 1999), aims at triggering argumentation between pair members. It includes 5 phases.

1. Each student takes a quiz on-line. The questions have no correct or incorrect answer; students' answers reflect their own theories about learning. For each choice, the students justify their choices by typing comments into a free-text entry zone.
2. The system produces a simple graph in which students are positioned according to their answers. The graph is displayed to the whole class and discussed by the teacher, The students react to this social map, which amplifies the social dynamics in the class. The system or the tutor forms pairs of students by selecting peers with the greatest distance between them on the graph (i.e., those with the most different opinions).
3. Pairs answer the same questionnaire as in phase 1 together, and again provide some justification for their choices.

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