Chapter 10
Scripting Computer-Supported Collaborative Learning: A Review of SCORE Studies

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ABSTRACT
In this chapter, we will present a review of theoretical and empirical analyses of Web-based collaboration processes used during a scripted university course. The results refer to a design-based study that involved first-year teacher-education students (N = 30) studying pedagogy over a period of three months. The intervention involved structuring the subjects’ collaborative actions with three different pedagogical scripts. According to the findings, the scripts guided students’ activities by helping them find resources for knowledge construction and work together through a series of steps. However, there were variations among groups in terms of quality of collaboration, and the students mostly cumulatively shared or constructed knowledge from similar perspectives. On the basis of the challenges raised in the SCORE and related studies, future prospects are outlined for the design of flexible pedagogical scripts.

INTRODUCTION
Computer-supported collaborative learning (CSCL) is a complex phenomenon and is often difficult to realize in authentic educational settings (e.g., Häkkinen, Arvaja, & Mäkitalo, 2004). It is evident that successful collaboration is not a spontaneous phenomenon. Earlier studies on collaborative interaction in CSCL environments have reported several problems and challenges (Häkkinen & Järvelä, 2006; Schellens & Valcke, 2005; Vonderwell, 2003). According to Häkkinen and Järvelä (2006), a common
feature of CSCL environments is the production of descriptive and surface-level knowledge, instead of deeper explanations for the phenomena under examination. Thus, a crucial problem for such collaboration is the difficulty of developing inquiries that evoke more elaborate explanations (Lipponen, Hakkarainen, & Paavola, 2004). Other particular challenges are related to the achievement of reciprocal understanding and shared values and goals in networked learning environments (Järvelä & Häkkinen, 2002).

Particularly in minimally structured learning environments, students may struggle to become engaged in productive interactions, such as questioning, explaining and justifying opinions, reasoning, elaborating, and reflecting upon their knowledge (Kobbe et al., 2007). Therefore, recent research has focused on how to make collaboration more frequent and more effective by introducing collaboration scripts as a particular kind of instructional support, both to trigger productive collaborative activities and to provide structure and support to otherwise open learning environments (e.g., Dillenbourg, 2002; Weinberger, Ertl, Fischer, & Mandl, 2005).

Collaboration scripts are rooted in the scripted cooperation approach (e.g., O’Donnell, 1999). In this approach, learners engage in specific activities that are assumed to lead to higher level cognitive processing and therefore to better learning outcomes (Kobbe et al., 2007). Collaboration scripts thus serve as scaffolds to improve collaboration by structuring the interactions of two or more learning partners (Kollar, Fischer, & Hesse, 2006). The core design principle through which scripts are expected to trigger specific interactions can vary. For instance, a script could lean on the jigsaw method (Aronson, Blaney, Stephan, Sikes, & Snapp, 1978) and form pairs of participants with complementary knowledge, providing each with complementary information or roles. Alternatively, a script might aim to create sociocognitive conflict (e.g., Doise 1985) or might assign and alternate roles to foster reciprocal activities, such as questioning or tutoring (Palincsar & Brown, 1984).

The goal of a script may vary from structuring small-group interactions to orchestrating collaborative and individual activities—some of which may be computerized and others not—into a consistent whole over a longer period of time (Dillenbourg & Jermann, 2006). There are also various possible solutions with regard to the type of technology used to support scripting; thus, scripts can be differentiated according to whether collaboration is supported by specific instructional means or by technology (Hämäläinen, 2008). In line with this notion, Lipponen (2001) has drawn a distinction between the collaborative use of technology (in which software alone does not scaffold collaboration) and use of collaborative technology (in which software is designed specifically to support collaborative knowledge construction). Our SCORE studies (Pedagogical Structuring of Collaboration and Self-Regulated Learning: Individual and Group-Level Perspectives) have focused on collaborative use of existing technology via sequences of instructions.

Although several research groups have designed learning environments for single studies using specific experimental scripts (Dillenbourg & Jermann, 2006; Hämäläinen, Manninen, Järvelä, & Häkkinen, 2006; Schellens & Valcke, 2005; Stegmann, Weinberger, Fischer, & Mandl, 2005), very little long-term empirical research has considered the effects of these scripts in authentic educational settings. Most recent studies have focused on micro-scripts that structure the interaction process per se by providing prompts, sentence starters, and so on (Dillenbourg & Jermann, 2006). In this line of research, scripting learners’ social interactions (e.g., with the aid of an argumentative script) is seen as an effective way to provide instructional support for group activities (Stegmann et al., 2005). However, some contradictory results suggest that scripting content-related (epistemic) activities might lead to better individual learning outcomes under relatively unscripted rather than minutely scripted conditions (Mäkitalo, Weinberger, Häkkinen, Fischer, & Järvelä, 2005). It seems evident that scripted collaboration is not...