

Chapter XVI

Representation of Coordination Mechanisms in IMS LD

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ABSTRACT

Group interaction has to be meticulously designed to foster effective and efficient collaborative learning. The IMS Learning Design specification (IMS LD) can be used to create a formal representation of group interaction, and the model can then be used to scaffold group interaction by means of coordination support at runtime. In this chapter, we investigate the expressiveness of IMS LD in representing coordination mechanisms by using coordination theory as an analytical framework. We have found that IMS LD can represent almost all the basic coordination mechanisms. We have also identified some hurdles to be overcome in representing certain coordination mechanisms. According to coordination theory, common coordination mechanisms can be reused in different settings. We briefly explore the feasibility of representing coordination mechanisms at a high-level of abstraction, which will be easier for instruction designers and teachers to understand and use.

INTRODUCTION

Group-based learning is an instructional strategy that provides a group of learners with intensive group interaction that can deepen individual learners' understanding. Well-organized group-based learning may result in collaboratively produced knowledge objects or conceptual artifacts which could not be created by any individual learner in the group acting alone. However, the benefits of this instructional strategy have a cost because additional coordination activities have to be carried out while learners perform learning activities. Examples of such coordination activities are allocating tasks, distributing and exchanging information, and managing work sequences. Although coordination activities do not directly contribute to the production of knowledge objects or conceptual artifacts, they have an influence on the effectiveness and efficiency of group-based learning, and sometimes on its success or failure.

In face-to-face learning, rich communication channels are available to support group interaction. These are lost in computer-based learning, and so in this environment, there is a need to provide computational coordination mechanisms. One promising technical solution is to provide a formal model of a well-designed group interaction by using a process modeling language, and then to coordinate learners' interactions according to this model in a language-compatible execution environment. This enables learners to focus on learning activities without having to pay too much attention to coordination problems, and so supports enhanced effectiveness and efficiency of group-based learning in computer-based environments.

IMS Learning Design (IMSLD, 2003) is an educational process modeling language which can be used to model a wider range of pedagogical strategies, including collaborative learning (Koper & Olivier, 2004). A basic introduction to IMS LD is available in the chapter ("Using the

IMS LD Standard to Describe Learning Designs" by Koper and Miao in this book). The purpose of this present chapter is to systematically investigate the expressiveness of IMS LD in representing coordination mechanisms which support group interaction, and the approach taken is to use coordination theory as an analytical framework. We also provide XML (Extensible Markup Language) code to illustrate how group interaction can be represented in IMS LD.

It is important to note that characteristics of group-based learning processes vary from well-structured to highly fluid. Highly fluid collaborative processes, in which it is unpredictable who will take which action when and how other group members will respond, are not well suited to coordination using computational mechanisms. The attempt to specify a fluid collaborative process in detail often raises the so-called "over-scripting" problem (Dillenbourg, 2002), which may restrict group interaction to some extent. Some fluid collaborations are suited to coordination by human users. These may be defined in IMS LD, for example, as a collaborative activity with a conference service (e.g., an audio/video conferencing, text-based chat tool, or a discussion forum). The users (e.g., tutors and students) are expected to solve their coordination problems by using functions offered by the service. It may be seen that using this approach the coordination within an activity is not specified at the process level in the learning design, and that responsibility for process control is shifted to the user at execution time. This is, therefore, outside the scope of this chapter, which focuses on how computational mechanisms can be represented in IMS LD.

BACKGROUND

This section briefly introduces group-based learning and coordination theory.

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