Chapter 2

DESIGN, MODELING, AND ANALYSIS OF COLLABORATIVE LEARNING

Introduction to PART I

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Over the past 20 years, computer-based training software has become increasingly successful at addressing the learning needs of individuals. Yet, the problems we face in meeting the needs of learning groups continue to be a challenge, both on line and in the classroom. As Webb and Palincsar (1996) explain, studying group learning involves much more than studying a synthesis of individual behaviors:

“Consider the numerous intraindividual factors (e.g., prior knowledge, motivation, language) that influence the learning of one child in “individualistic” activity. Place this learner in a group context, and not only does one have to contend with all the issues that attend this interaction among the group members (from the very mundane resource issues to the more lofty issues of attaining intersubjectivity), but in addition, other intraindividual factors that may have receded into the background when considering individualistic activity now emerge as salient, indeed critical (e.g. the learner’s gender and social status).” (p. 867)

Just as supporting individual learning requires an understanding of individual thought processes, supporting group learning requires an understanding of the processes of collaborative learning. These processes are shaped by the group members’ individual behaviors, and the dynamics of
their interaction. The chapters in Part I of this book bring together cognitive, social, and computational perspectives to evolve advanced methods for designing, modeling, analyzing, and evaluating online collaborative learning activities. To be consistent with the contributions that follow, we limit our discussion to collaborative learning activities that occur at a distance, over a computer network, although many of these ideas may be derived from, or may also pertain to face-to-face collaborative learning.

Guidelines for studying the collaborative learning process are by no means straightforward, however the pay off tends to be quite attractive. The collaborative learning experience has the potential to motivate students to seek new insights and perspectives, ask questions openly, and practice explaining difficult concepts, thereby gaining a better understanding of the domain (Doise, Mugny, & Perret-Clermont, 1975). The extent to which these benefits are realized depend largely on the effectiveness of the group interaction. The overall goal of the approaches described in this section is to help students interact effectively, so that they may maximize their potential learning gain. Many different factors may influence group dynamics, which in turn influence student learning. Some of these factors include group composition and cohesion, group size, task structure, student and teacher roles, discourse styles, nature of facilitation, rewards or incentives, training in communication skills, group processing, and the learning environment (Levine & Moreland, 1998; Webb & Palincsar, 1996). In the interest of positively influencing the process of collaborative learning through computational means, Part I of this book views these factors in terms of those that must be decided before the students begin collaborating (e.g., group composition, rewards), and those that may be altered as the collaboration progresses (e.g., roles, facilitation methods).

The chapters that follow cover two fundamental approaches to promoting effective group interaction. The first approach varies the assortment and intensity of external environmental factors such as the group’s composition or the learning context. For example, a (human or computer) facilitator might construct a learning group for a specific task by selecting members with the most compatible knowledge, skills, and behaviors in anticipation that this will create the dynamics needed to produce effective learning. The second approach focuses on the modeling and diagnosis of internal group interaction factors by analyzing the group interaction after the students have begun an assigned task. In this case, the facilitator might study the progression of the group conversation or the development of the group’s shared solution. By applying a combination of these approaches, the system may glean enough information from the analysis to dynamically facilitate the interaction, propose new problem sets that target specific skills, or alter the environment to adapt appropriately to the students’ changing needs.