Coordination Dynamics in CSCL based Chat Logs

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Abstract: This paper describes coordination dynamics in computer supported collaborative learning (CSCL) based chat logs. We developed a coding scheme for coordination processes containing 25 different coding categories, and used it to analyze chat data gathered in a semester-long education course. In general, we found a high level of coordination throughout the chat logs. The level of goal-related coordination (goal-related vs. not goal-related) varied extensively, depending on the specific task type. Based on an initial process analysis, a time pattern with regard to coordination levels was identified. We surmised that the amount of goal-related coordination and the point in time in which it occurs might play a role in coordination behavior. However, strong intra- and interindividual differences prevented us from detecting a distinct coordination pattern by numerical means over time. We conclude by proposing an extension of our analysis across media type and task type to detect coordination patterns relevant for collaborative learning.

Introduction

For collaboration to occur, coordination has to take place (Barron, 2000). Although coordination processes have been primarily analyzed in work teams, they also play an important role in learning groups, particularly in situations where groups both work together over longer stretches of time without being micromanaged, and work on tasks that require a division of labor. Malone and Crowston (1990) describe coordination as "the act of managing interdependencies between activities performed to achieve a goal" (p. 361) and identify different components of coordination: Two or more actors have to be involved in goal-directed activities. These activities are characterized by interdependencies. Such interdependencies can be common objects such as plans and diagrams, which are part of two or more activities, time as a constraining factor or the outcome of one activity that is required for another activity. Espinosa, Lerch and Kraut (2004) conclude that some interdependencies might be more important for successful performance than others. Groups have to be good at coordinating and managing the interdependencies that are crucial for the success of their particular task.

Most of the coordination literature has focused on face-to-face groups (Espinosa et al., 2004). However, collaboration in computer-supported groups occurs in a different setting and thus the nature of coordination must change. Another important factor for coordination processes is the task itself. Each task type goes along with specific coordination patterns. Arrow, McGrath and Berdahl (2000) stress the fact that behaviour of groups change over time Therefore, in order to illuminate coordination patterns in typical learning settings and their temporal patterns, we adopted an exploratory approach.

Educational Setting

This study examines the experience of seven participants in a postgraduate course in education during the course of a semester. The course was taught in a blended mode with 8 online and 5 face-to-face sessions. Participants' age ranges between 23 and 45 years, with an average of 31 (4 female, 3 male). Students formed two different groups with 3-4 members each. During the online sessions, groups collaborated through the content management system Plone®. Interaction between participants mostly took place in a synchronous chat environment developed within the CoCo Research Centre, University of Sydney (Ullman, Peters & Reimann, 2005), to be demonstrated at the conference. Students also used an asynchronous discussion board to some, albeit minor, extent.

Tasks were composed of the collaborative creation of Wiki pages, concept maps and joint group papers as well as the discussion and feedback to other group members' contributions to the online space. The tasks allowed for some degree of freedom as they typically asked for the collaborative production of an artifact, e.g. a concept map, but left coordination and collaboration means to the group to determine.

Coding Scheme for Coordination

Malone and Crowston's (1990) coordination theory guided us in the development of the coding scheme's categories. They distinguish four coordination processes: identification of goals, mapping of goals to activities, selection of actors/assignment of activities to actors and management of interdependencies. The category ‘interdependencies’ consists of five subcategories, such as addressing communication means, establishing simultaneity, negotiating shared resources and dealing with prerequisites. First codings revealed that in order to match existing chat log data better we added the category ‘establishing shared meaning’ (see Table 1).

An important part of coordination behavior is the response from the communication partner. In order to indicate closure of an action, we introduced two additional codes per category and subcategory, respectively: A plus (‘+’) indicates acceptance, elaboration, clarification or reassurance as a reaction to an initiation behavior. A minus (‘-‘) indicates rejection or disagreement. Closure was only coded if an utterance was a direct response to a coordination action.

Table 1: Overview of the coordination coding scheme.

(Sub-) Category	Definition	Examples
Goals (+/-)	• Identifying goals.	“Overall, what do we need to do?”
Activities (+/-)	• Mapping goals to activities.	“This is the to do list.”
Actors (+/-)	• Assigning activities to group members.	“I would like to see Ralph put the doc together as a Wiki.”
Interdependencies:	Management of interdependencies	
Communication means (+/-)	• Media usage for coordination purpose.	“Should we meet face-to-face to discuss this?”
Simultaneity (+/-)	• Synchronizing activities.	“Have you all read my notes?”
Shared resource (+/-)	• Allocating/discussing resources.	“Who is in our group for this task?”
Prerequisite (+/-)	• Ordering/demanding activities.	“Suggest other options.”
Shared meaning(+/-)	• Trying to establish a shared mental model.	“I am not sure, if I understand correctly.”
Non Coordination	• Entries not related to coordination.	

Semantic units served as units of analysis. Two raters used the scheme for initial coding. A first interrater agreement was estimated and the coding scheme underwent various revision cycles. The second rater coded about 50% of the existing data. The Kappa measure (κ=.77) for interrater reliability resulted in a satisfactory agreement.

Initial Results

The coding phase resulted in approximately 5800 coded events for 12 chat logs. We established a timeline for each of the two groups. The timeline for group A consists of 3500 events and the timeline for group B of 2300 events. This difference is due to the fact that group A felt more comfortable with the medium and chose to conduct additional voluntary chat sessions. Meanwhile, group B members decided to meet face-to-face.

With a few exceptions, the coordination process frequency per chat sessions was between 40% and 56%. Differences between the two groups can be noted. Group A showed an average of 42% coordination behavior in their chat logs and group B an average of 37%. Analysis of coordination frequency with regard to meaningful task units (a task unit combines all the chat logs regarding a particular task) revealed similar coordination patterns with only minor deviations across different task units. Even though both groups showed about the same amount of non-coordination behavior (59.7% group A and 62.5% for group B), group A showed more goal-related coordination (goal identification and goal mapping). About 0.9% of all utterances for group A were related to goal identification versus 0.4% for group B and 1.4% of all utterances for group A were related to goal mapping versus 0.3% for group B. An event log analysis, which plotted coded events along a timeline, revealed that group A performed goal-related coordination actions such as goal identification and goal mapping throughout the entire chat session whereas group B predominantly performed them during the second half of the sessions if at all. Although the overall amount of goal-related coordination differed between the two groups, they showed roughly the same pattern of goal-related coordination usage across the different task types (Figure 1).

In general, more initiations than closures were uttered (513 initiations versus 287 closures). Group A showed a convergent initiation–closure behavior pattern, more initiated actions were responded to by closures the longer the course lasted. Group B showed a divergent pattern, where an increase in initiation was accompanied by a decrease in closure. The more group members initiated the less they responded to their actions.