Joint and Individual Knowledge Elaboration in CSCL

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Abstract: This case study aims to illustrate the sequential process of joint and individual knowledge elaboration in computer-supported collaborative learning (CSCL). Six Dutch secondary school students (three males, three females) participated in the three-week experiment. They were paired based on self-selection. Each dyad was asked to work on moderately-structured problems concerning Newtonian mechanics. With the help of elaboration values, students' online interactions were categorized and sequentially plotted. Three dyads showed three different patterns of individual knowledge elaboration.

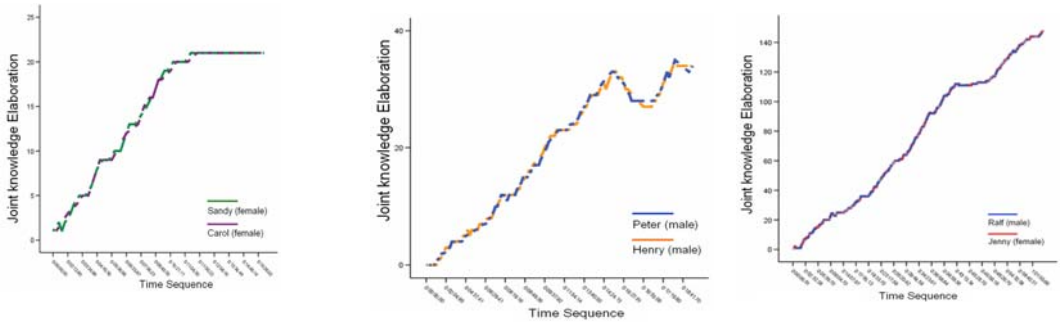
Knowledge Elaboration in CSCL

Group is the learning agent in collaborative learning (Suthers, 2006). Problem solving process can be regarded as a joint process of knowledge elaboration made up of numerous meaningful artifacts, such as utterances, visual representations, etc. In computer-supported collaborative learning (CSCL), verbal and visual interchanges in students' interaction are of ultimate importance for students' joint knowledge elaboration. To solve a problem collaboratively, highly elaborative messages are important for group success. As Van Boxtel (2000) posited that joint knowledge elaboration is a process within which all participants should contribute to the knowledge elaboration verbally and propositionally. Collaborative learning involves individual cognitive elaboration, and will not reduce it (Stahl, Koschmann & Suthers, 2006). But there exists a qualitative difference in individual involvement. Each person has unique situated prior knowledge, and their knowledge elaboration may vary in the degree of cognitive engagement.

Methodology

Six tenth graders (three females, three males) from a Dutch secondary school participated in the synchronous CSCL experiment. Students were paired based on self-selection. The scope was limited to average students. Students were spread into different rooms to avoid face-to-face contact. The content of students' interaction messages was analyzed, and each was endowed an integral, -1, 0 or +1. This was roughly in line with Kumpulainen and Mutanen's (1999) three cognitive processing modes that acknowledged that procedural processing referred to the routine execution of task without improving the ideas (value=0). Interpretative or exploratory processing referred to students' deep engagement in problem solving activity (value=+1), while off-task activity referred to those absent-minded activities or off-task social talk (value=-1). We aggregated numbers of messages one by one sequentially, and plotted the sum to illustrate the process of joint knowledge elaboration. Then we added up the numbers of each individual to trace the process of individual knowledge elaboration in CSCL.

Joint Knowledge Elaboration in CSCL



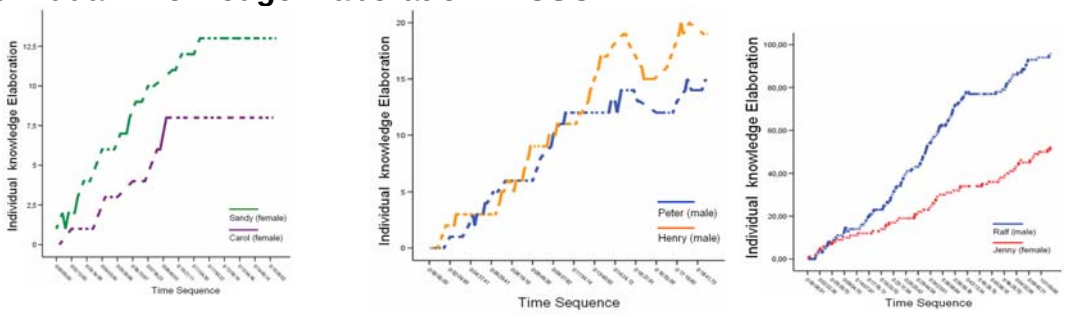
Sandy-Carol Dyad Peter-Henry Dyad Ralf-Jenny Dyad

Figure 1. Joint Knowledge Elaboration in CSCL.

Let's take one problem as an example. Sandy-Carol dyad spent 15"34' on it. Their joint knowledge elaboration (Figure 1) showed that the girls almost hadn't talked anything off task. But at the last stage of problem solving, they stopped at a plateau, without any advancement of knowledge elaboration. Henry-Peter dyad spent 19"07' on the problem. The joint knowledge elaboration process showed that only at the later stage of collaboration boys seemed to talk about something off the task, and the curve dropped. But they came back to the topic soon. In comparison with the other two dyads, Ralf-Jenny dyad was the most productive dyad. They

spent more than one hour (1'05") on the problem, exchanging 369 messages. The graph in Figure 1 showed that there was almost no off-task interaction.

Individual Knowledge Elaboration in CSCL



Sandy-Carol Dyad Peter-Henry Dyad Ralf-Jenny Dyad

Figure 2. Individual Knowledge Elaboration in CSCL.

When we added up the elaboration values for individuals and plotted them sequentially (Figure 2), we found three patterns of individual knowledge elaboration process in CSCL.

Pattern 1: Parallel Knowledge Elaboration

Sandy and Carol's curves showed a substantial gap. Sandy seemed to excel Carol in knowledge elaboration, and guided her from beginning till end. It looked like that Carol followed closely all the time. It is noticeable that the curves kept roughly parallel.

Pattern 2: Cross Knowledge Elaboration

Henry and Peter's curves were entangled most of the time. During the first thirteen minutes, there was no substantial gap between their elaboration curves. It indicated that both Henry and Peter contributed to the final success, pushing the problem solving process in turn.

Pattern 3: Divergent Knowledge Elaboration

There was a gap between Ralf and Jenny's curves, and the gap tended to get larger and larger. Their individual elaboration process seemed to be two divergent tracks.

Conclusion:

Method like *elaboration value* enables us to visualize the joint and individual knowledge elaboration process in CSCL. The difference found in Ralf and Jenny dyad helps to explain why group success and individual achievement may be not synchronous.

References:

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