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A framework to analyze argumentative knowledge construction in computer-supported collaborative learning

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Abstract

Computer-supported collaborative learning (CSCL) is often based on written argumentative discourse of learners, who discuss their perspectives on a problem with the goal to acquire knowledge. Lately, CSCL research focuses on the facilitation of specific processes of argumentative knowledge construction, e.g., with computer-supported collaboration scripts. In order to refine process-oriented instructional support, such as scripts, we need to measure the influence of scripts on specific processes of argumentative knowledge construction. In this article, we propose a multi-dimensional approach to analyze argumentative knowledge construction in CSCL from sampling and segmentation of the discourse corpora to the analysis of four process dimensions (participation, epistemic, argumentative, social mode).

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Computer-supported collaborative learning (CSCL) often implies that learners communicate with each other via text-based, asynchronous discussion boards. Learners are supposed to engage in an argumentative discourse with the goal to acquire knowledge. For instance, learners are assigned to jointly analyze a written problem case with the help of theoretical concepts in order to learn to apply

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and argue with these concepts. Individual learners may, for instance, compose elaborated problem analyses and post them to a discussion board where the learning partners may read the message and reply to the contribution with critique, questions, refinements, etc. During this type of discourse, learners collaboratively produce a text. The rationale for analyzing the discourse is that in this kind of data, cognitive processes of learning are being represented to a certain degree (Chi, 1997).

Approaches to analyze discourse have developed simultaneously in different fields, such as linguistics, analytical philosophy, anthropology, etc. and have also inspired educational research, e.g., the concept of “grounding” in different media (Clark & Brennan, 1991) has been transferred to CSCL (Baker & Lund, 1997; Dillenbourg, Baker, Blaye, & O’Malley, 1995). These approaches need to be well connected to questions and theories of educational research (see De Wever, Valcke, Schellens, & Van Keer, this issue). The fit between theoretical and methodological approach is vital with regard to decisions on how to sample, segment, and categorize the discourse corpora. Counting the frequency of specific speech acts, for instance, may be more valuable to linguistic than educational research, because speech acts may not well represent relevant cognitive processes of learning. Furthermore, there are a number of different theoretical approaches to collaborative learning, which stress different process dimensions as indicators of knowledge building. Coding the discourse corpora with regard to one process dimension of collaborative learning may have blind spots regarding effects and side effects of other process dimensions on knowledge building. By analyzing whole samples of discourse corpora on multiple process dimensions we aim to better understand how specific processes of (computer-supported) collaborative learning contribute to and improve individual acquisition of knowledge. So far, the analysis of multiple processes is cumbersome, but as a result of this analysis, we can instructionally support those process dimensions of collaborative learning that are known to facilitate knowledge acquisition. First, we have analyzed discourse on two dimensions based on speech acts (Fischer, Bruhn, Gräsel, & Mandl, 2002). We have then revised and added categories, and segmented the discourse corpora with different grain sizes (Stegmann, Weinberger, Fischer, & Mandl, 2004; Weinberger, 2003; Weinberger, Ertl, Fischer, & Mandl, 2005).

In this article, we present a framework to analyze multiple process dimensions of knowledge construction in CSCL, namely (1) the participation dimension, (2) the epistemic dimension, (3) the argument dimension, and (4) the dimension of social modes of co-construction. The analysis of discourse of collaborative learners is guided by an explicit or implicit theoretical framework on what processes and outcomes are seen as relevant for collaborative learning to be beneficial for the group and the individual. Therefore, we will first shortly summarize the theoretical background which guided our analysis toward specific process dimensions of CSCL. Second, we will introduce the CSCL environment that we have used in several studies. With this background, we present our approach on how to organize discourse data and how to categorize contributions on multiple process dimensions.

1. Argumentative knowledge construction in computer-supported collaborative learning – theoretical background

Argumentative knowledge construction is based on the assumption that learners engage in specific discourse activities and that the frequency of these discourse activities is related to knowledge

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