Toward a Qualitative Approach to Examining Idea Improvement in Knowledge-building Discourse

Ella L.F. Fu, Jan van Aalst, Carol K.K. Chan, The University of Hong Kong, Pokfulam, Hong Kong, China
Email: ellaflf@hku.hk, vanaalst@hku.hk, ckkchan@hku.hk

Abstract: We report an exploratory study of discourse analysis, focusing on explaining the analytic approach. It is argued that most knowledge-building studies have taken a cognitively-oriented approach to examine collaborative discourse; therefore their findings do not shed light on how idea improvement is accomplished socially. The study employs thematic narrative analysis to address how idea improvement comes about. The paper ends with a discussion of the value of this approach.

Introduction

Among the theories of collaborative learning, knowledge building (Scardamalia & Bereiter, 2006) has unique emphases on enabling student to be in control of their own learning, progressive inquiry aimed at idea improvement, a shared goal to advance the collective state of knowledge in a community, and the use of a web-based knowledge-building environment, Knowledge Forum®. Due to these unique emphases, knowledge-building discourse is progressive, which reflects the process of how community knowledge is improved over time. van Aalst (2009) has hightlighted the importance of developing a clear account to characterize the nature of knowledge-building discourse, which can faciliate the integration of CSCL into classroom practice. In the past five years, a large scale project "Developing a Teacher Community for Classroom Innovation Through Knowledge Building" (Chan, 2011), produced numerous Knowledge Forum databases; it has provided rich resources for us to explore and characterize the nature of knowledge-building discourse.

In this paper, we present an in-progress study of discourse analysis drawing from the aforementioned project. The central problem we address is: how is an idea improved in knowledge-building discourse over time? This problem involves the issues of socio-cognitive dynamics in a community and relates to some of the fundamental questions in CSCL, such as group cognition (Stahl, 2003), and intersubjective meaning making (Suthers, 2006b). To tackle this problem, we first characterize knowledge-building discourse along a number of dimensions and then make abductive inferences to interpret variations of general patterns of interaction. Such patterns reveal sequential organization of interactions that are regarded as productive or unproductive collaboration. They are particular valuable for improving pedagogical designs of CSCL, as there are scant instances of sustained productive interactions in computer-mediated discourse (van Aalst, 2009).

Even though many prior studies on knowledge building measured the quality of idea in knowledge-building discourse, this study argues that methods used in those studies do not allow researchers to fully take into account of the fundamental assumption of knowledge building theory: collective knowledge is progressively improved in a community over time. Therefore this study takes a different approach to analyze knowledge-building discourse. Most of the knowledge-building studies that closely examined computer-mediated discourse have taken a cognitive-oriented approach. They examined the quality of discourse by following the procedures of content analysis suggested by Chi (1997), in which discourse is segmented into standardized units and then each unit is assigned to theoretically derived, mutually exclusive categories. The coding scheme is the backbone of content analysis (Titscher, Meyer, Wodak, & Vetter, 2000), and the schemes developed in those studies have revealed many important insights into the dimensions of discourse. After a comprehensive review, coding schemes were developed around three major foci: subject matter (e.g. clothing design, Lahti, Seitamaa-Hakkarainen, & Hakkarainen, 2004), theoretical framework (e.g. knowledge-building principles, Zhang, Scardamalia, Lamon, Messina, & Reeve, 2007), and cognitive performance (e.g. depth of explanation, Lee, Chan, & van Aalst, 2006). However, these coding schemes do not shed light on processes of idea improvement because of the inherent limitations in content analysis. The limitations include discarding the semantics, sequential, structural, and situational information about the process of collaboration, which have been widely acknowledged (Stahl, 2002; Suthers, 2006a).

This study takes a social-cultural approach to study collaborative discourse. In this approach, social interaction constitutes the focus of the analysis, rather than retreats to the background of analysis (Arnseth & Ludvigsen, 2006). The majority of CSCL studies taking this approach have employed conversation analysis (ten Have, 2007). For instance, they tried to track the process of convergence (Roschelle, 1992), to reveal participants' methods to call something into doubt (Koschmann et al., 2005), to uncover how a small group make use of the technological affordances of a dual-interaction space (Perit Çakır, Zemel, & Stahl, 2009), and to study the verbal and nonverbal aspects of interactional patterns in group learning (Sawyer, 2006). Conversation analysis is mainly used in synchronous, small group conversations, with special transcription conventions indicating non-verbal aspect of the interactions. However, Knowledge Forum is a text-based, asynchronous

discussion platform used by a whole class of students. Conversation analysis is an inappropriate method for analyzing knowledge-building discourse. Instead, this study employs narrative analysis to configure a succession of interactions to produce explanatory stories of how idea improvement comes about.

Methodology

Research Context and Participants

The data in this study was taken from the aforementioned project. The data comprised asynchronous discourse from three Knowledge Forum views from three classrooms: Grade 5 Science (matters and power; 38 students; 346 notes), Grade 10 Visual Art (community arts; 19 students; 292 notes), and Grade 10 Liberal studies (mixed classes advanced discussion political engagement; 82 students; 126 notes). These views were created during academic year of 2010-2011. Thus we employed purposeful sampling; the selection criteria were high build-on levels and rich discussion content, as judged by the first author. The reason for such criteria was to select the views that were likely to show productive collaborative interactions.

Research Context and Participants

This study has employed narrative analysis to examine knowledge-building discourse. Narrative displays human projects as situated actions in which participants purposefully engage, and it configures a series of events and actions into goal-directed processes (Polkinghorne, 1995). The focus of narrative analysis is on agency and intention through close examination of each case (Riessman, 2008). Narrative typically involves an original state of affairs, a series of events, and the consequent state of affairs (Czarniawska, 1998). The series of events are connected chronologically and thematically by means of a plot. The plot provides the narrative structure that describes the relationships between the events and their contributions to the consequent state of affairs. There can be different types of plots to connect the events, for example how a group of students success or fail in sustaining productive interactions. The data in this study did not come in storied form. The analysis composed the data and produced them into storied form (Polkinghorne, 1995). This study strived to address the problem of how idea improvement comes about. This study has employed thematic narrative analysis (Riessman, 2008), focusing on what was said in the Knowledge Forum database. In other words, the analysis did not emphasize how the discourse was produced in the classroom conditions and the non-verbal aspect of communications.

The method comprised a two stages analysis with different levels of granularity in each stage. However, before the analysis, the computer notes needed to be pre-processed for coding, and were arranged in inquiry threads for the subsequent analysis. The first-stage analysis was a qualitative coding, in order to characterize knowledge-building discourse along a number of dimensions. The unit of coding was an *event* (an action). The second-stage analysis was narrative analysis, in order to identify meaningful patterns of interaction in relation to idea development. The unit of narrative was a collaborative episode, consisting of a series of temporal events identified in the first-stage analysis. Each of the analytic steps is explained following.

Pre-processing the Collaborative Discourse into Inquiry Threads

Knowledge Forum supports asynchronous conversation for a whole class of students and provides flexible build-on functions; therefore, the discourse flow has incoherencies. For example, a threaded discussion may contain multiple inquiry problems; a problem may be addressed across multiple threaded discussions. To circumvent this problem, notes in Knowledge Forum database were restructured into inquiry threads. Zhang et al. (2007) have defined an inquiry thread "as a series of notes that address a shared principal problem and constitute a conceptual stream in a community knowledge space" (p. 125). In other words, notes that addressed a same problem were grouped to an inquiry thread, regardless of their original thread structure. We read the note content several times to identify the major problems investigated in the views. We then grouped them together accordingly. As the inquiry threads became the context for the subsequent coding and analysis, the sequence of notes preserved the order in which the notes were created. The sequence of notes in an inquiry thread followed semantic chronological order, in which notes were placed in sequence, first according to their thread structure and second their time of creation (Wise & Chiu, 2011). Therefore, the meaning of an utterance could be interpreted within an on-going discourse, and the nuances and contextual resources used to sustain the inquiry could be traced in the inquiry threads. The notes were carefully paced in sequence with annotations, assisted by Atlas.ti (Computer Assisted Qualitative Data Analysis Software).

First-stage Analysis: Qualitative Coding

The coding process started with a theory-driven approach, and then followed by a data-driven approach. First, the 7 major discourse dimensions in van Aalst (2009) study were adapted and they were further developed theoretically. The 7 dimensions were agency, community, idea, meta-discourse, information, linking, and question. Second, the theoretical ideas and the original coding scheme in van Aalst (2009) study were used to guide the coding process assisted by Atlas.ti. The first author studied the inquiry threads one by one and focused

on coding one discourse dimensions each time. She started with the most well defined dimension (idea) and ended with the least defined dimension (metadiscourse). As the coding process followed the qualitative tradition, the collaborative discourse was not standardized to fix unit of analysis. Instead, the unit of analysis was an *event*: an action or interaction. An event did not have a fix length, and it might contain a word, sentence, note, or multiple notes, depending on the meaning of an event. The guiding idea was that an event itself needed to contain enough discourse to be meaningful and understandable (Coffey & Atkinson, 1996). While events included both collective actions and individual actions, the technique of simultaneous coding was employed, which meant that events could be overlapped, nested, or embedded to one another (Saldana, 2009). This coding technique reflects the complex and intertwined nature of social interactions. To accurately describe the empirical data, new events were added to the original coding schemes, while some sub-codes in the scheme were deleted. Once there were changes in the event list, all of the data were coded again. When there were no more changes to the event list, the similarities among coded segments in an event were identified and used to develop the event descriptions. To ensure the accuracy of descriptions (credibility), the descriptions and coded segments were given to another research student for "member check". In sum, the 7 discourse dimensions were derived theoretically and 38 events were derived from the data. The events were developed based on all data in this study, rather than only a small part of it.

Second-stage Analysis: Narrative Analysis

In narrative analysis, the aim is to explain why and how something has happened by means of configuring a series of sequential events that are consequential for what happened (Polkinghorne, 1988). In this study, narrative explanation was developed to account for the cause of idea development. The cause referred to combinations and accumulations of events constituting certain patterns of social mechanisms. The unit of narrative was a collaborative episode which involved multiple chronological events that were sustained enough to show how an idea was evolved over time. One inquiry thread might contain more than one collaborative episode, depending on the thread structure. Using a collaborative episode as a unit of analysis followed the idea of group cognition, according to which knowledge building emerges from group interactions with its own methods and properties (Stahl, 2002). The narrative plots to configure the intentional and unintentional events into a coherent whole were productive and unproductive collaboration. As human actions are not entirely replicable (Polkinghorne, 1995), there was a range of variations within each plot. The focus was on synthesizing the collaborative episodes and preserving the unique characteristics of them. We first read the inquiry threads one by one to identify collaborative episodes. We then assigned each collaborative episode to one of these four groups: chat-chat, idea sharing, idea co-construction, and idea development. The episodes assigned to idea development group needed to fulfill two criteria: (1) they at least contained one explanation event; (2) the explanation event did not directly build onto the seed question of the thread. The reasons were that the thread should contain rich content knowledge, and explanation event was the best type of idea in the code list, and that the rich content should come out of collaborative interactions, rather than of an individual for answering the seed question. This stage of analysis is work in progress.

Discussion

The study has taken the social-cultural approach to examine knowledge-building discourse, which has been mainly examined by the cognitive-oriented approach. The study has employed thematic narrative analysis, consisting of two-stages: qualitative coding and narrative explanation. Even though this study does not report its findings, the analytic method allows the authors to conduct future studies. The direction of the future study is to characterize the nature of knowledge-building discourse, in order to develop account of general patterns of productive collaboration. The account is particularly valuable in pedagogical designs. As computer-mediated collaborative inquiry is widely employed in schooling, the conditions and mechanisms for productive collaboration remind unclear. The patterns of productive knowledge-building discourse can inform researchers where pedagogical supports are needed, and then they can design pedagogical supports to scaffold students toward productive collaborative inquiry (Chan, 2011). And such patterns can also be taught to students as criteria of formative assessment to monitor their process of collaborative inquiry (van Aalst & Chan, 2007). Students are the agents in deciding how to react or respond as the inquiry unfolds; however, they may not be aware of the collective nature of inquiry process as a whole. Students often only are aware of the quality of the message they write, without being aware of where the line of inquiry is going. Thus, it is important to engage students in formative assessment, so that they can continuously step back, assess, and reflect on the messages they contributed to their community. The assessment criteria can help students to reflect on how their messages affect the subsequent interactions and to decide what they should do in order to engage in knowledge creation. This formative assessment is a promising tool to foster student metacognitive abilities.

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