Bringing Coherence to Knowledge Building Discussions

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Abstract: Student discussions in online environments have often been criticized as lacking in coherence (Herring, 1999; Hewitt, 2001, 2003; Suthers, Vatrapu, Medina, Joseph, & Dwyer, 2008; Thomas, 2002). While the branching structure of threaded discourse is useful for sharing the many diverse ideas held by community members, there are few supports for consolidation or synthesis. Consequently, online discussions tend to expand in many directions at once, fragmenting the focus of the community. The overarching goal of our research was to explore potential solutions to this problem. To accomplish this, we have been examining the potential of new software designs for reducing the coherence problem. Specifically, we have been experimenting with designs that integrate conventional threaded discourse with new representational supports – supports that allow learners to maintain an ongoing meta-level summary of the group discussion. This paper presents the results of our initial trials.

Introduction

Broadly speaking, there are two types of online communication: asynchronous and synchronous (chat), each with its own unique discursive style (Herring, 1996). Knowledge building has typically focussed on asynchronous forms interaction because it affords greater opportunities for reflection and deep thinking. By reading messages posted to a Knowledge Forum database, and by submitting messages of their own, students can engage in a form of online conversation with their peers. They can participate in these exchanges at times and places of their own choosing (Kaye, 1989; Harasim, 1987, 1989), using the online environment as a virtual meeting place for discussions that may last weeks or even months (Feenburg, 1989). The asynchronous nature of such interaction is thought to be educationally advantageous since it provides students with more time to reflect on the topic-at-hand, allowing more thoughtful contributions (Christopher, Thomas, & Tallent-Runnels, 2004; Jeong & Frazier, 2008; Poole, 2000; Veerman & Veldhuis-Diermanse, 2001). Moreover, such forms of interaction are thought to offer a level playing field, a democratic space where participants have equal opportunity to contribute their thoughts to the communal forum (Wellman & Gulia, 1999). The shared, social nature of the environment is believed to increase personal motivation (Hammond, 1999) and foster critical reflection among participants (Hawkes & Romiszowski, 2001).

Despite the tremendous promise of knowledge building, and a compelling theory-based rationale, the extent of its educational benefits are still uncertain. One problem that knowledge building shares with conventional computer mediated communication is the

challenge of fostering focussed, coherent discourse. While students in online courses frequently interact with one another and exchange information, there is little empirical evidence that they are engaged in the sophisticated processes of joint meaning-making and social negotiation (Wallace, 2003). In fact, conventional threaded discussions have been characterized as lacking coherence (Herring, 1999; Hewitt, 2003; Thomas, 2002), and are thought to offer relatively weak support for online collaborative knowledge construction (Hewitt, 2001, 2005; Suthers et al., 2008). Hewitt (2001, 2003) argues that the source of the coherence problem is the intrinsically divergent nature of threaded discourse. Over time, online discussions tend to branch into dozens of sub-discussions. It is not uncommon for participants to be engaged in many parallel conversations, not all of which are necessarily germane to the original purpose of the thread. While branching is often useful for drawing out a broad range of ideas and perspectives, the resulting lack of coherence makes it difficult to ascertain whether or not the group is making progress (Suthers, 2001; Turoff, Hiltz, Bieber, Fjermestad, & Rana, 1999). Moreover, it is often unclear which direction the discourse is taking, what conclusions the group has reached, or whether particular issues warrant further inquiry.

The coherence problem is also thought to undermine collaboration. Roschelle and Teasley (1995) define collaboration as an "…activity that is the result of a continued attempt to construct and maintain a shared conception of a problem" (p. 70). From an educational point of view, the branching tendencies of threaded discourse are problematic because the social processes of meaning-making and negotiation are more likely to arise in circumstances where learners are working to draw together ideas. Negotiation is fundamentally a convergent process; it involves a joint effort to reconcile disparate perspectives. It is less likely to occur when discussions diverge and people's attentions are focused on different branches of a thread.

Hewitt (2001) attributes many of the problems with threaded discourse to the limitations of the medium itself. In most asynchronous environments, "replying" is the only way to contribute to an existing thread (i.e., to participate in a thread, you must select an existing message and compose a response to it). As a result, learners quickly become focused on responding to individual messages and rarely adopt the broader, multi-message perspective necessary for convergence. For example, to summarize what a group has already learned, or to synthesize differing perspectives, a learner must carefully examine many messages. Such alternatives are less likely to occur to students when "reply to this message" is the only participatory support offered by the software (Hewitt, 2001). This pedagogical bias is a limitation of most CMC environments (Scardamalia & Bereiter, 2008); by only providing tools for simplistic read-and-reply behaviours, the likelihood is reduced that students will engage in more sophisticated discursive processes (Hewitt, 2001).

One strategy for increasing the level of coherence in threaded discussions is to appoint a leader, or moderator. Typical moderator activities include weaving together ideas from different group members (Feenberg, 1989), reviewing collective progress, and attempting to guide participants toward promising avenues of investigation (Davie, 1989). However, this strategy has met with mixed success (Hewitt, 2001). The problem, from a pedagogical perspective, is that the appointment of a moderator can bifurcate online activity. Creating connections between ideas may come to be understood as the moderator's responsibility. The result is often an electronic tug-of-war in which students

pursue a branching mode of interaction, while the moderator struggles to draw ideas together and keep people on track. To make disciplined progress on a line of inquiry, all participants (not just the moderator) should ideally be aware of the issues and problems that the group is facing, and tailor their actions accordingly (Guzdial & Turns, 2000).

Scardamalia (2002) has explored a second possibility: the introduction of a "Rise Above" utility which allows individuals to consolidate groups of notes. "Rise above" ideas can be seen in instances where someone distils the nature of different perspectives and proposes a new notion that advances the discourse. However, while "Rise above" has met with limited success in some classrooms, it suffers from the same problem as the moderator strategy: one person (rather than a group of people) takes charge of the synthesis operation.

A more promising solution to the coherence problem involves augmenting conventional threaded discourse with a shared meta-level representation of the group's progress. For example, this might involve displaying an online discussion on one part of a computer screen, and a discussion summary on another part of the screen. As the discussion unfolds, participants are expected to update the summary. Shared, explicit representations are advantageous because they encourage participants to clarify their thinking, identify areas of disagreement, and help learner's monitor the group's growing understanding (Brna, Cox, & Good, 2001). Past efforts to provide representational guidance for threaded discourse have used various discussion visualization tools as an adjunct technology (e.g., Reyes & Tchounikine, 2003; Suthers, 2003; Suthers et al., 2008). For example, in one experiment (Suthers et al., 2008), students were asked to continually update a group concept map as they engaged in online discussion with a partner. This produced promising but mixed results. In line with expectations, it was discovered that the small groups (dyads) who maintained a shared concept map during their discussion were more likely to converge to similar conclusions, and score higher on post-tests than dyads in the control condition (i.e., discussion-only). However, the concept maps grew rapidly in size and complexity, and the authors questioned the practicality of this approach with larger groups, or over longer periods of time.

The current research continues this line of inquiry, but in a new direction. Rather than use concept maps, we have been exploring how wiki-style supports might provide representational guidance. Students in our class have been engaging in conventional threaded discussions while using a wiki page to maintain a meta-level summary of their collaborative progress. Wikis have several promising advantages in this regard. As the success of Wikipedia illustrates, wikis are useful technologies for creating complex, cohesive artifacts authored by many individuals (Wheeler, Yeomans, & Wheeler, 2008). The ability of wikis to support group coherence appears to be grounded in three different design elements: 1) The existence of a single group-owned document that necessitates negotiation among participants; 2) The preservation of all previous versions of the group-owned document, which prevents the loss of data and permits backtracking; and 3) The provision of meta-level communication supports in which participants can identify problems, resolve disagreements and negotiate consensus. Since a wiki page is a single, jointly owned construct, it can serve as an up-to-date summary of the discussion that can guide further discursive activity.

To summarize, the central thrust of our research involves the design of technological and pedagogical supports that promote more collaborative and productive

discourse. One of the problems with conventional computer conferencing is that students rarely move beyond simplistic forms of interaction (i.e., build on this message). To make progress, learners must move beyond a focus on individual messages and monitor more broadly the progressive development of ideas over time (Scardamalia & Bereiter, 1999). This entails engagement in synthesis and summarization operations, the negotiation of ideas with others, assessments of what the group does not yet understand, a willingness to acknowledge confusion, and efforts to make intellectual advances in areas where the group is struggling.

Method

While conventional threaded discourse environments are powerful for promoting a diversity of ideas, they tend to be weak at encouraging the collapsing of messages into one larger idea, or the creation of a collective summary. To address this shortcoming, we have mocked up the design of a web-based environment in which the screen is divided in two. On the left side of the screen, students engage in convention "Build-On" style discussions. The right side of the screen contains a wiki page that holds a permanent, group-authorable summary of the discourse.

To illustrate: Imagine that a grade 6 classroom is studying the idea that planets stay in orbit because of gravity. Students login and discuss this issue in the discussion environment on the left side of the screen. As their discussion progresses, they update the shared wiki page summary on the right side of the screen. After some discussion, one of the students adds a new sentence to the wiki page, "Most people in the class find this idea to be very difficult to understand." She goes on to note, "We still need to answer the big question, 'What is gravity?'" This inspires new discussion. This process continues to repeat, with an ongoing interplay between discussion messages on the left side of the screen, and summary statements and new ideas on the right side.

This feature was tested in two graduate level flex-mode education courses. One was held in the fall of 2009 and the other was held in the winter of 2010. Each course contained 15 students and was co-taught by two instructors, both of whom were experienced with distance education courses. The two courses followed a similar 12-week format. Each week, students were assigned a set of readings, which they discussed in an online View (i.e., conference) that was specifically created for that week's deliberations. The marking schemes in both courses were based upon a combination of written assignments, the moderation of a weekly View, and participation in online discussions. A "Summary Note" – i.e., a co-authored wiki page – was associated with each week's View.

Data were drawn from student feedback, analyses of student online productions, and tracking data.

Results

Preliminary results from our initial iterations suggest that the Summary Note page offers some promise as a tool for representational guidance. After participating in the discussions, students tended to update the summary page by adding new text to reflect their most recent contribution. They did this in an ongoing fashion, with the Summary Note generally serving as a reasonable up-to-date reflection of the content of the discussion.

Summary Notes were revised an average of 25.5 time each. During most weeks, all students in the class made at least one contribution to the group's Summary Note. Thus, there was an acceptable level of student participation. In the first few trials, students used the Summary Note simply to maintain a summary of the content of their discussion. The instructors viewed this as problematic because it was hoped that the Summary Note would be used for more than just summarization. They had intended that it would also serve as an organizational space for the group, where important ideas and key questions could be highlighted and not lost in the complex network of notes. In an effort to emphasize the organizational applications of Summary Notes, the instructors renamed the "Summary Note" to "Collective Understanding Note" and developed a number of scaffolds which they embedded in the note:

- *Summary* – this scaffold was used for the group summary
- *The Important Ideas Seem To Be* – this scaffold was used to engage students in the identification of key concepts;
- *More Research Is Needed On* – this scaffold was used to prompt students to record difficult questions.

These scaffolds proved effective, and subsequent weeks witnessed an increase in the numbers of questions and key concepts recorded in the Summary Note.

Student response to the Summary Note was generally positive. They found it to be a useful, easy-to-use facility:

- "I didn't have any problems"
- "I just write and then see if my ideas can fit into the Summary Note"
- "I think it's a good addition"

Others talked about their experiences in other online courses where they had taken on the role of "student moderator" for a week and had been expected to generate a summary at the week's conclusion. They found this to be a difficult and onerous task. The Summary Note, they felt, did a good job of distributing that task across the entire class.

The instructors were also generally pleased with the Summary Note. They felt it provided a reasonably concise summary of the week's discussion. Because each student was responsible for updating the Summary Note, they felt it helped keep the students better aware of the discussion as a whole.

A number of problems were found to be associated with the Summary Note that suggest possible future research directions.

Problem 1: The flow of activity appeared to be unidirectional (from discussion to Summary Note) rather than bidirectional. So while the Summary Note appeared to be successful in terms of tracking what the group as a whole is doing, it was less useful as a device for inspiring new directions in the group's inquiry. It was hoped, for example, that when students posted an important question on the Summary Note that the students would subsequently initiate a discussion about that question. Unfortunately, we found no evidence of such activity.

Problem 2: In relation to Problem 1, there was a sense that students finished the weekly discussions with many unanswered questions and partially understood ideas. The difficulty, it is suggested, is that students did not engage with the material in a true knowledge building fashion. As students, they felt their weekly responsibility was to read the assigned articles, then login to the online View and make comments. They didn't feel a responsibility to follow-up on their questions with additional research (e.g., by retrieving other relevant articles from Google Scholar or from the University's electronic library). This suggests that they possessed a task-based mentality rather than a true knowledge building one.

Problem 3: One persistent challenge concerned the size of the Summary Note page, which eventually became large (the final size of the average Summary Note exceeded 500 words). As the page becomes larger and more unwieldy, students may have been discouraged from reading it closely. However, the larger problem may have been the monolithic nature of the Summary Note itself. It took the form of a single large artifact containing many ideas and questions. It may have been advantageous to instead store the ideas and questions as individual objects that were displayed as a collection on the right-hand side of the screen. That way, the ideas and questions could more easily be shared across Views or made the target of ongoing inquiry.

Discussion and Conclusion

With online discourse becoming an increasingly popular tool in distance education courses, the problem of group coherence is taking on a new urgency. Some researchers have already experimented with various solutions (e.g., see Suthers et al., 2008), but with limited success. The challenge, we suggest, is to augment asynchronous discussion with new tools for fostering group convergence and the consolidation of ideas. We propose that "wikis" may serve as a promising technology in that regard. Threaded discourse is effective at drawing out a plurality of ideas and perspectives. However, it lacks supports for synthesizing multiple perspectives or engaging in meta-level analysis. This is where wikis offer promise. The goal of our research is not simply to provide learners with two different environments – threaded discussions and wikis -- but rather to explore how the two might be integrated in ways that yield new synergies. Our recent experiments demonstrate some success at fostering an interplay between the idea condensing nature of the wiki and the idea expanding nature of the asynchronous threaded discourse forum. Such research, we believe, is necessary for overcoming the divergence problem and fostering more effective collaboration in knowledge building environments.

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