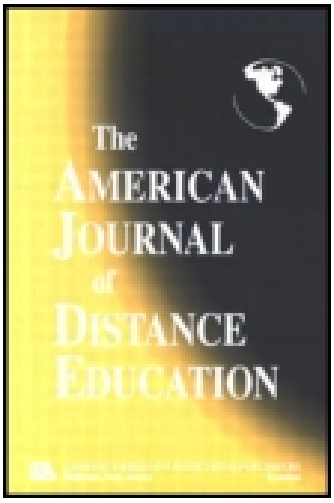

American Journal of Distance Education
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/hajd20

Exploring Factors Influencing Collaborative Knowledge Construction in Online Discussions: Student Facilitation and Quality of Initial Postings

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Published online: 26 Aug 2014.

To cite this article: Andri Ioannou, Skevi Demetriou & Maria Mama (2014) Exploring Factors Influencing Collaborative Knowledge Construction in Online Discussions: Student Facilitation and Quality of Initial Postings, American Journal of Distance Education, 28:3, 183-195, DOI: 10.1080/08923647.2014.926780

To link to this article: http://dx.doi.org/10.1080/08923647.2014.926780

The Amer. Jrnl. of Distance Education, 28:183–195, 2014

ISSN: 0892-3647 print/1538-9286 online
DOI: 10.1080/08923647.2014.926780

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Exploring Factors Influencing Collaborative Knowledge Construction in Online Discussions: Student Facilitation and Quality of Initial Postings

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Although lots of studies have investigated collaborative knowledge construction in online courses, the factors influencing this process are yet to be fully determined. This study provides quantitative and qualitative types of evidence on how (naturally emerged) student facilitation and quality of initial postings influence collaborative knowledge construction in online discussions. We analyzed the discourse of nine student groups ($N = 34$) working on a case problem in an online discussion forum. We found that student facilitation was an important contributor to the process. In contrast, the contribution of low-quality postings in early stages of the discussion can jeopardize the process. This work is an attempt to address quality in online learning by helping instructors decide on encouraging student facilitation in online discussions as well as structuring and carefully monitoring the content of initial discussion postings.

Collaborative learning is consistent with a sociocultural perspective on learning. From this perspective, knowledge is constructed socially in the interactions among people before it is internalized as individual knowing. Learning collaboratively does not just entail sharing a workload or individual knowledge with one another but rather comparing and understanding multiple perspectives on an issue (e.g., Scardamalia and Bereiter 2006; Stahl 2006). Gallini and Barron (2002) explained that successful collaborative learning is generally marked by the amount of communication, interaction, and reflection that takes place—that is, how often students engage in explaining and justifying their thinking to one another and negotiate their interpretations and solutions to establish meaning. Collaborative learning is particularly popular in online, asynchronous courses. Typically supported by asynchronous threaded discussion forums, learners engage in social exchange, interaction, discussion, and collaboration in an effort to construct knowledge together.

For more than fifteen years, researchers have been investigating collaborative knowledge construction in online learning settings and several approaches and models have been employed to study this process (e.g., Gunawardena, Lowe, and Anderson 1997; Weinberger and Fischer 2006; Zenios 2011). In general, productive collaboration in online learning groups

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addresses (a) contributions of content and ideas related to the group task; (b) reflections and cognitive/metacognitive exchanges (asking questions, exchanging conflicting opinions, providing explanations); and (c) evidence of knowledge construction—that is, having new insights as a result of the discussion, making deep connections, and synthesizing information (i.e., Hmelo-Silver 2003; Stahl 2006). Furthermore, researchers have examined factors influencing the success of collaborative knowledge construction. Group composition (in terms of gender, status, culture, and expertise), size of group, nature of the task and task structuring, participants' individual characteristics, and the role of the instructor and tools/interfaces supporting the learning task have all been identified as variables influencing collaborative knowledge construction in online settings (Hmelo-Silver, Chernobilsky, and Nagarajan 2009; Resta and Laferrière 2007; Roschelle 1992). In this study we attempt to advance the research in this area by focusing on two factors: student facilitation and quality of initial postings.

The study draws upon the literature suggesting that the presence of a student leader in an asynchronous online course promotes regular participation by the rest of the students (Tagg 1994), with the emphasis placed not only on the frequency of contributions but also, and most important, on the quality of the learning process and the meaningful construction of knowledge within the online community (Aviv et al. 2003; Garrison and Cleveland-Innes 2005). The influence of student facilitation is echoed in several e-learning studies that examine student-led facilitation techniques (Baran and Correia 2009) or the role of the moderator who, structuring a student-centered course, should be encouraged to assign responsibilities and leadership roles to the participants (Maor 2003). Researchers discuss how student facilitation takes the edge off the authoritative influence of a teacher (Akyol and Garrison 2011) and how students show preference toward student-led, rather than instructor-led, online discussions (Rourke and Anderson 2002). Still there are concerns that low critical thinking and irrelevant contributions take place when the discussion is guided by peers (Rourke and Anderson 2002).

Assessing the quality of students' postings in online discussions and their impact on the ongoing collaboration has not been thoroughly investigated to date. Ho and Swan (2007) found that quality—defined by them as "substantive contributions that expressed beliefs or values" (7)—was the most important criterion for predicting responses to a discussion posting compared with quantity, relevance, and manner. Other researchers have focused on structuring online discussions and creating evaluation rubrics to ensure meaningful discourse and knowledge construction will take place (e.g., Gilbert and Dabbagh 2005). Yet, there seems to be lack of work examining how high-quality postings, and especially low-quality postings, influence the progression of online discussions and the construction of knowledge. Also, researchers have yet to explore how postings help build the context for other future postings and how this influences the overall knowledge construction process (Wise and Chiu 2011).

This work is part of a broader investigation where collaborative learning in discussion forums and wikis has been studied (Ioannou and Stylianou-Georgiou 2012). Here, we provide quantitative and qualitative types of evidence on how (naturally emerged) student facilitation and quality of initial postings may influence collaborative knowledge construction in online discussions. The main criteria for identifying a student facilitator in this work included their core presence in guiding and structuring the discussion toward the final product, their frequent undertaking of summarization of the points and ideas articulated (by themselves and others), and the acknowledgment of their contribution by their colleagues (e.g., Aviv et al. 2003; Baran and Correia 2009; Garrison and Cleveland-Innes 2005). Also, a high-quality (initial) posting was identified as a new

contribution, reflective of the student's belief and/or opinions and supported by sufficient evidence where necessary (see Ho and Swan's 2007 definition). This work is an attempt to address quality in online learning, both by helping instructors decide on encouraging student facilitation in online discussions and by structuring and carefully monitoring the content of initial discussion postings.

METHOD

Participants

Our sample consisted of thirty-four graduate students in an online learning theories course taught over 16 weeks at a public university in the northeastern United States. Most of the participants were female (79%) in-service teachers (95%) between 22 and 54 years of age ($M = 37$, $SD = 10.8$).

Procedures

Students were randomly assigned into nine groups: seven groups of four students and two groups of three students. Student collaboration was carried out virtually using the threaded discussion forum of the school's learning management system (WebCT). The activity lasted roughly two weeks and took place three weeks before the end of the course.

Students were tasked to work in their groups on a case problem adapted from a book specialized on the case method for teacher education (Dottin and Weiner 2001). Students were to apply concepts learned in the course to produce a comprehensive solution to the problem of the case. In order to guide their activity, students were provided with guidelines on how to approach the analysis of a case problem (also adapted from Dottin and Weiner 2001). Briefly, the guidelines involved directions on (1) how to define the problem; (2) how to identify facts, stakeholders, and unanswered questions in the case; (3) how to offer interpretations using theoretical, pedagogical (application of theory), and professional knowledge; and (4) how to produce a consensus solution plan.

The discussion was led by the students themselves and there were no specific requirements about the number or quality of contributions to the discussion. The instructor monitored the group discussions, but her intervention was purposely restrained. In general, she did not provide content or content feedback, but instead she tried to encourage discussion by giving structural feedback (e.g., "You need to base your arguments on instances from the case and to support those with theory") and acknowledging students' contributions (e.g., "This is a good argument . . .").

Analysis

The corpus of collaborative discourse of all nine groups was automatically captured in the discussion forum—a total of 252 messages were collected for analysis. The analysis was conducted in two levels: (a) coding and counting the group's discourse in order to understand the general content structure of the discussion and (b) exploring the collaborators' contributions as they occurred

chronologically to constitute evidence for the role of the factors of interest (student facilitation and quality of initial postings) in the collaborative knowledge construction process.

Code-and-Count Content Analysis

Initially, two coders with professional backgrounds in educational technology (authors of this article) became acquainted with the data by reading all the discourse thoroughly. Then, a number of coding schemes from previous investigations were reviewed to decide whether one of them could describe our data corpus (e.g., Aviv et al. 2003; Gunawardena, Lowe, and Anderson 1997; Marra, Moore, and Klimczak 2004; Puntambekar 2006; Weinberger and Fischer 2006). This effort was in line with researchers such as Rourke and Anderson (2004) and De Wever et al. (2006), who strongly encourage the reuse of coding schemes developed in previous research to foster their replicability and validity.

We decided to use Gunawardena, Lowe, and Anderson's (1997) coding scheme, which conceptualizes the processes of collaborative knowledge construction in virtual environments as a series of successive (though not necessarily strictly sequential) phases. Besides being a good fit for our data corpus, this coding scheme is both theoretically and empirically validated and one of the few content analysis protocols with an existing research base (e.g., De Wever et al. 2006; Marra, Moore, and Klimczak 2004; Wise and Chiu 2011). Two coders worked closely together to refine the coding scheme in context and to decide what aspect of the content constituted evidence for each coding category: (1) Sharing/Adding, (2) Negotiating meaning, (3) Elaborating, (4) Evaluating/Testing of proposed synthesis, and (5) Consensus/Applying constructed knowledge. See Table 1 for the coding scheme with excerpts of students' discourse categorized in different phases.

The entire corpus of collaborative discourse of each group was analyzed using the coding scheme of Table 1. During coding, the post was taken as the unit of analysis—an acceptable practice in related works (e.g., Wise and Chiu 2011) and was considered in relation to the overall discussion. Each message was categorized under one, and only one, of the categories for the phases of collaborative knowledge construction. In cases of two or more applicable phases (usually in lengthier postings), the contribution was coded in the higher phase (e.g., if a posting included elements of Phase 2, Phase 3, and Phase 4, it was coded as Phase 4). Given the developmental nature of this coding scheme (i.e., higher levels of knowledge construction are implied by more advanced phases), this practice was deemed appropriate and allowed us to be systematic.

Approximately 50% of the discourse was coded by the two coders together. The remaining 50% was coded by each coder independently and percentage agreement was computed to be 89% (kappa statistics = 7.6); disagreements were fully resolved by discussion between the coders. Messages that only aimed the monitoring of the team progress, planning the task, using the technology, and socializing were not coded; this also included any statements contributed by the instructor. In the end, we calculated frequencies of codes across phases and groups as shown in Table 2 to understand the general content structure of the discussion across groups.

Chronological Visuals

For a chronological examination of within-group collaboration, we plotted all discourse and actions on a chronological visual—a method inspired by Hmelo-Silver et al.'s (2011) CORDTRA

TABLE 1
Collaborative Knowledge Construction Coding Scheme

Phase	*Category*	*Description*	*Excerpts from the data*
1	Sharing/Adding	A statement of observation or opinion; Definition, description, identification of a problem.	"Just thought of something else. Maybe Joe's[a] parents don't know what services are out there for them so maybe they need to be educated on what services they are entitled to have." (Participant from Group 1)
2	Negotiating meaning	Agreement (Statement of agreement with other participants, corroborating statements provided by other participants); Disagreement (Statement of disagreement with other participants, restatement of a participant's position, advancement of arguments in support of an opposing statement).	Agreement: "I agree with you that Joe's low self-efficacy and low motivation are important parts of the problem. I also think his perceived lack of relevance of the content of what he is learning in school is also a big problem." (Participant from Group 6) Disagreement: "I respectfully disagree, and think that Sherry should at least attempt to contact the parents. She can find out from them if he has any time to do his homework or if he really is obligated to help his mom care for the kids to such a great extent that he cannot complete his work." (Participant from Group 9)
3	Elaborating	Building of previous statements/meanings; Clarifications.	"Do you think giving him a leadership role is a bad idea? I have tried this before with students in my class. Sometimes, the leadership role gives them a boost of confidence. It appears that Joe has "been on the edge" for so long that he needs the boost, like yesterday!!! However I do see how your opinion is valid." (Participant from Group 4)
4	Evaluating/Testing of proposed synthesis	Review of the new synthesis with the prospect of finalizing it.	"Hi team. Here is my revised version with citations to the case: In order to truly help Joe become a better and higher achieving student, Sherry not only has to focus on Joe in the classroom but also as an individual outside of the academic day. . . . Joe needs to have a shift in his thinking or paradigm in order to become a better student. To help facilitate this transfer Sherry will need to call on resources that are outside her control, like social services and other institutions that can play a role in keeping Joe focused on academics while still being able to help his family. . . ." (Long posting of synthesis of contributions; Participant from Group 9)
5	Consensus/Applying co-constructed knowledge	Summary of agreements; Application of new knowledge; Metacognitive statements of changes in knowledge or ways of thinking.	"I feel our discussion shows that Motivation is one of the factors that need to be addressed. Once motivation is filled along with aiding in his home life I believe that Joe will do much better at school. Also we all seem to agree that Joe lacks in self-efficacy, which relates to motivation. I suggest we focus on motivation for our solution plan as one of the major key factors in helping Joe." (Participant from Group 2)

[a]Joe is the name of the boy mentioned in the case problem.

TABLE 2
Number of Codes Across Phases and Groups

	Phase 1	*Phase 2*	*Phase 3*	*Phase 4*	*Phase 5*	*Total*
Group 1	3	3	2	6	1	15
Group 2	10	2	5	2	1	20
Group 3	7	2	2	3	1	15
Group 4	4	4	3	2	1	14
Group 5	13	7	6	6	1	33
Group 6	20	5	19	4	2	50
Group 7	7	10	13	8	4	42
Group 8	9	4	7	11	2	33
Group 9	7	14	3	5	1	30
Total (%)	80 (32%)	51 (20%)	60 (24%)	47 (19%)	14 (6%)	252 (100)%

technique and used in a number of previous works (e.g., Ioannou 2011; Ioannou and Stylianou-Georgiou 2012). That is, for each group, we generated a spreadsheet scatterplot using the group's coded discourse. The time of the contribution runs at the top of the visual (e.g., two weeks duration of the activity in two days breakdown).[1] The learners and discourse categories are listed on the right of the visual, whereas each time point on the visual represents a leaner's coded contribution. In general, these visuals are inspected for patterns and serve as pointers to the discourse to help understand the collaboration process on a chronological spectrum, beyond coding and counting.

For the sake of space, we present the visuals of four groups—two groups with an emerging student facilitator (Figures 1 and 2) and two groups with low-quality initial postings (Figures 3 and 4). The researchers carefully inspected the visuals of all nine groups and here they discuss collective results and consistent patterns with reference to Figures 1–4 (all other visuals can be provided upon request).

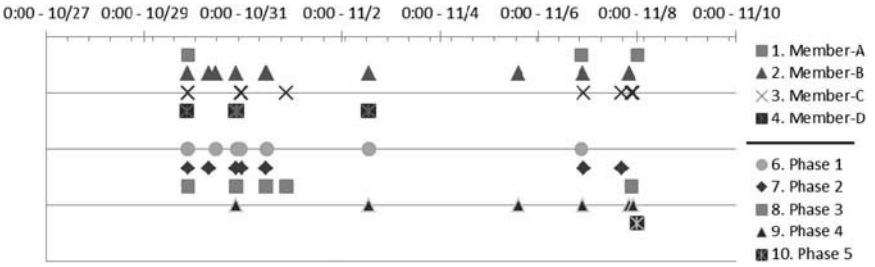

FIGURE 1 Chronological Visual of Group 5 (Facilitator).

[1]We note that the two days breakdown creates an overlap of the scatters on the visual when contributions are close to each other timewise (e.g., one hour apart). This breakdown is unavoidable for the presentation of the visuals in an A4-page, yet the researchers work from a fully populated visual in spreadsheets where a detailed study of students' interactions is possible.

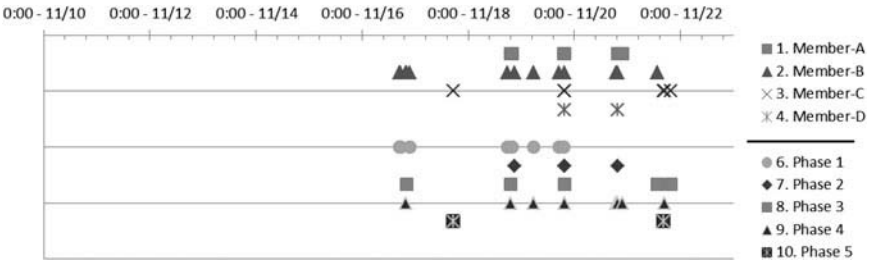

FIGURE 2 Chronological Visual of Group 8 (Facilitator).

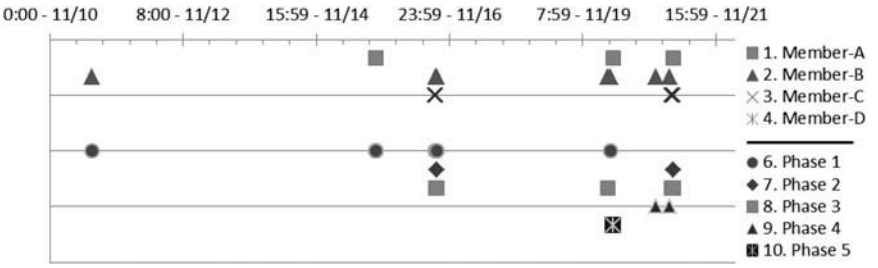

FIGURE 3 Chronological Visual of Group 2 (Low-Quality Initial Postings).

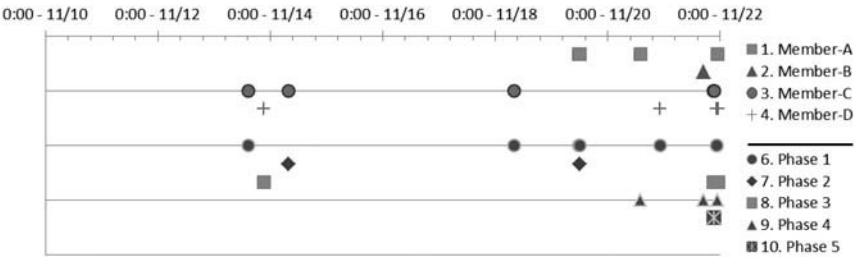

FIGURE 4 Chronological Visual of Group 3 (Low-Quality Initial Postings).

RESULTS

An initial consideration of Table 2 and the visuals of all groups showed that some collaborative knowledge construction occurred in all groups. Consistent with prior work (Gunawardena, Lowe, and Anderson 1997; Wise and Chiu 2011), Phase 1 statements (Sharing/Adding) accounted for the largest proportion of the overall discussion (32%)—representing between 20% and 50% of the talk depending on the group—and suggesting that students devoted a significant amount of their discussion in stating their positions and sharing information about the case problem before they produced more advanced statements toward a comprehensive problem solution (e.g., Phases 4–5). Yet, considering the total number of codes across phases (Table 2), we found that collaborative

knowledge construction was more apparent in some groups than others; this triggered a more in-depth examination of the groups' collaboration in relation to the factors of interest: student facilitation and quality of initial postings.

Student Facilitation

A detailed examination of the visuals and associated groups' discourse showed that two groups—Group 5 and Group 8 (Figures 1 and 2)—were supported by an emerging student facilitator. In both groups, the student facilitator emerged in the early stages of the discussion; she possessed core presence in guiding and structuring the discussion toward the final product; participated frequently, often undertaking the summarization of the points and ideas articulated; and her contribution was acknowledged by her colleagues. Overall, Groups 5 and 8 appeared successful in engaging in the collaborative knowledge construction process in that (1) their discourse involved contributions along all phases of knowledge construction; (2) all group members participated in this process; and (3) there were numerous constitutions suggesting engagement with the task (33 contributions in both groups) but not too many (e.g., >40 contributions), which could be suggesting difficulty in coming to a consensus, or too few (e.g., <20 contributions), which could be suggesting limited engagement with the task. Our analysis of results demonstrates how the emerging facilitator might have had a positive influence on the process.

Specifically, in Group 5 (Figure 1), the facilitator (Member B) took the initiative to describe the situation and define the problem making sure she set out common grounds of discussion with the rest of the participants. Upon interaction with the other group members, she next tried to identify secondary issues and revise the problem definition. She often (from the beginning until the end) summarized the other students' postings evaluating and extracting the central ideas that would construct the final argument. Managing time in view of the assignment deadline was another initiative on her behalf. Overall, her postings were lengthy but not authoritative as her tone and style were not discouraging to other group members. She clearly expressed her opinion, but at the same time she invited others to add to or modify her points. Also, she frequently encouraged and motivated her colleagues to contribute, such as the following:

> I was just about to post that some of the issues might be taken care of by a change in the learning environment. Varying routines and presentations might help. . . . I think Colleague 1 or Colleague 2 hit on this too! Great job. (Student facilitator, Group 5)

At the end, she indicated her satisfaction from their collaboration and appreciated the outcome as a successful one. Her role as a facilitator was reflected in one of the other participants' postings who, when finalizing the group's consensus, said to her, "Will you take a final look at this and then post it to the group consensus discussion? I can do this if you want, but I don't want to post without your final 'once over.'"

The student (Member B) who emerged as a facilitator in Group 8 (Figure 2) demonstrated similar facilitation patterns. She took the initiative to start and direct the discussion, and although this group had a rather late start in the activity (see Figure 2), its members worked intensively during Week 2 and managed to complete the task on time. Her postings, albeit not lengthy, inspired the contribution of the rest of the participants; for example:

> I think that's right [facilitator name]. Thanks for posting! (Member A, Group 8)
>
> My pleasure, you did a lot of work for all of us on Readers workshop and responsive classroom. Thank you. (Student facilitator, Group 8)

She frequently integrated the several contributions into one summary document while leading the discussion under a critical evaluation angle. Also, she often reviewed and monitored the group's progress. Her colleagues did recognize her significant contribution, as shown in comments such as "Your hard work really helped me out a lot." She contributed the most up until the end of the discussion, occasionally giving the impression that she did so trying to meet her colleagues' expectations, such as the following:

> Ladies, we are almost at the end!!! I am not sure who wrote the closing paragraph, but it pulled things together well. I added to it on the doc and have posted here again for final comments/edits/revisions. (Student facilitator, Group 8)

In both groups, the emerging student leader often drew from theories in the course textbooks and readings to initiate discussion in some direction; for example:

> Are Joe's nonacademic needs being met? According to Ormrod (p. 486), students are more likely to focus on their schoolwork when their nonacademic needs have been met. (Student facilitator, Group 5)

In other cases, student leaders drew from their experience and, with examples from their teaching practice, they indicated how they would respond to the problem described in their case study activity. In this way, they encouraged the rest of the participants to construct and elaborate on those examples, such as the following:

> Based on my experience, the teachers would benefit from finding out what Joe's interests are. While he seems to be ok in math, the teachers of other subjects would do well to find out what other areas of knowledge he is confident about. They could use his interests to help spur work in language arts, reading, science, social studies, etc. . . . (Student facilitator, Group 5)

Overall, our findings constitute evidence of the positive influence of the emerging facilitator in Groups 5 and 8.

Low-Quality Initial Postings

Group 2 and Group 3 appeared to be less successful in engaging in the collaborative knowledge construction process for a couple reasons. As evident in Table 2 and Figures 3 and 4, these groups (1) experienced large periods of inactivity within the two weeks of the collaborative activity (e.g., three- to four-days gaps), (2) their number of contributions was relatively low, and (3) some group members did not contribute equally. Our detailed examination of the groups' discourse suggested that the contribution of low-quality postings in early stages of the discussion may have jeopardized the collaborative knowledge construction process.

In particular, in both Groups 2 and 3 the initial postings involved undeveloped, single-sentence statements that were neither reflective of the students' belief and/or opinions nor were supported by sufficient evidence. In fact, these postings represented a (bulleted) list of ideas without elaboration or supporting information from the course content or the learners' professional experience

TABLE 3
Example of Low-Quality Initial Postings (a Bulleted List of Ideas)

Subject: Possible Intervention/Solution
Group 2—Member B (coded as Phase 1)
- Karen needs to make connections with her students (text to self, text to others, text to world).
- Karen needs to balance the needs of all her students.
- Karen should create a classroom environment where students feel safe participating.
- Karen needs to assess her students to find the specific area or skill where they are struggling.
- Karen should take more time in preparing for her lessons; this is a new reading adoption and skimming the story before class is not sufficient.
- Karen needs to create discussion during reading rather than using a few questions at the end.
- Karen has to reflect on her teaching practices more regularly.
- Discipline practices need to be more consistent.
- Consult with other teachers on differentiation.

Subject: RE: Possible Intervention/Solution
Group 2—Member A reply (coded as Phase 1)
- *Karen absolutely needs professional development on effective reading strategies (think-pair-share, guided reading groups, reader workshops, read alouds, think alouds, literature circles, making reader text connections, etc.).
- *Karen must address her classroom environment and stop alienating the more difficult kids by choosing kids who are academically superior; she's segregating her class.
- *She absolutely needs to review the new curriculum to see where certain student interests may be highlighted.
- *She needs to use minilessons to address questions that come up during a discussion or lesson.

Subject: RE: Possible Intervention/Solution
Group 2—Member B reply (coded as Phase 1)
- *Karen needs to address reading levels and adjust materials accordingly.
- *Investigate available resources to help make the class size more manageable (i.e., paraprofessional support, parent volunteers, etc.).
- *Attend professional development activities that promote current "best practices" in reading pedagogy.

(see Table 3 for an example). This practice not only did not invite other group members to build on a reflective discussion but also was adopted and continued for the majority of discussion. This constitutes evidence that low-quality postings contributed in the early stages of the discussion can jeopardize the progress of collaborative knowledge construction.

DISCUSSION

Although lots of studies have investigated collaborative knowledge construction in online discussions, the many factors influencing this process are yet to be determined. In this work, we examined how student facilitation and quality of initial postings may influence collaborative knowledge construction in online discussions.

We found that naturally emerged student facilitation was an important contributor to the collaborative knowledge construction process, consistent with findings of several previous studies (Baran and Correia 2009; Hew and Cheung 2011; Maor 2003; Ng, Cheung, and Hew 2012). Furthermore, our study overcomes concerns that student messages tend to be of low critical thinking and irrelevant to the topic when the discussion is guided by their peers (Rourke and Anderson 2002). In fact, our results constituted evidence of successful student-led online discussions passing through phases of knowledge construction until a group solution is agreed. These findings

might help instructors impose student facilitation in online discussions. In this case, future work may focus on the establishment of explicit guidelines for student facilitators that will encourage contributions from all group members along all phases of knowledge construction. However, as evident in this study, facilitators do naturally emerge and have a positive influence without any guidance. Perhaps all instructors need to do is encourage students to actively pursue this role within their online groups.

With regard to this finding, we acknowledge a limitation of the study to conduct a detailed analysis of Group 9 (30 contributions), which appears to be successful without the presence of a facilitator. Further, based on our observations, we argue that too many contributions (e.g., >40; see Groups 6 and 7) could be suggesting difficulty in coming to a consensus, whereas too few contributions (e.g., <20; see Groups 1–4) could be suggesting limited engagement with the task. However, in future studies this assertion should be documented systematically.

In contrast to the positive influence of a student facilitator, this study further uncovered the possibly negative effect of low-quality contributions in the early stages of the discussion. As evident in this study, low-quality initial postings were imitated by other group members throughout the discussion, possibly resulting in the limited engagement in the collaborative knowledge construction process. This finding suggests the importance of imposing guidelines for the structure of contributions in online discussion. Also, some extra monitoring in the early stages of the discussion, coupled with modeling of high-quality initial postings, might be a good practice on behalf of online instructors and tutors. Considering that researchers have yet to explore how postings help build the context for other future postings in online discussion (Wise and Chiu 2011), this study provides initial insights in this direction.

Future work can focus on atomizing the identification of low-quality postings in online discussions. Such atomization would allow the prompt notification of the instructor or facilitator. Also, future work could further examine how high- and low-quality postings influence the progression of online discussions and collaborative construction of knowledge. This study provides initial evidence for the negative influence of low-quality initial postings. The opposite might also be true and merits investigation; for example, can high-quality early contributions set the basis for successful engagement in the collaborative knowledge construction process? The time of contribution of such postings is also a factor that merits investigation; for example, do low-quality postings cause more harm when contributed earlier, than later, in the discussion? Do high-quality postings create more benefits when contributed earlier, than later, in the discussion? Such questions are vital to explore in order to better understand what influences collaboration and knowledge construction in online learning settings and how we can better structure online discussions. Overall, this work suggests that assessing the quality of students' postings in online discussions and their impact on the ongoing collaboration is an important direction for future research. In closing, with regard to this finding, we acknowledge a limitation of this study to conduct a detailed analysis of Groups 1 and 4, which appeared less successful although they did not hold low-quality initial postings similar to Groups 2 and 3.

CONCLUSION

Although our findings are tentative, demanding replication, this study provides some new insights that may inform the design and instruction in online courses. First, planning for student

facilitation in online discussion, or simply encouraging learners to pursue this role, may have a positive influence in the collaborative knowledge construction process. Second, structuring online postings in terms of content and monitoring/modeling high-quality postings in the early stages of online discussion may set the basis for learners' engagement in the collaborative knowledge construction process. At the same time, this study calls for more investigations of student facilitation and quality of postings in online discussions that will enrich our understanding of designing for online learning and provide practical implications for online instructors.

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