

Using Online Communication Tools to Mediate Curriculum Development As a Collaborative Process

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Abstract: Online professional learning communities provide opportunities for teachers to leverage the capacities of Web 2.0 tools to engage in professional learning, access a network of professionals with shared interests, and to practice media literacy skills that transfer into classroom pedagogy. However the research literature related to teacher collaboration in online learning environments is sparse. This paper addresses this gap and reports on a study that explores features of teacher collaboration in an online community during a curriculum professional development workshop. The findings of this study show that the online professional community provides opportunities for teachers to share situated and distributed cognition and implies that further scaffolding interventions are needed to promote joint work among teachers.

Over the past decade, teacher professional development has shifted from traditional instructor-centered workshop models towards models that involve various types of professional collaboration among teachers. Collaboration is increasingly central in emerging professional learning communities. With the advent of Web 2.0 technologies, a growing body of research has emerged with respect to developing online professional learning communities to provide collaboration opportunities for teachers' professional practices, such as curriculum development. It is reported that online professional learning communities provide opportunities for teachers to leverage the capacities of Web 2.0 tools to engage in professional learning, access a network of professionals with shared interests, and to practice media literacy skills that transfer into classroom pedagogy (Dede, 2006; Owston, 2009). However the research literature related to teacher collaboration in online learning environments is sparse, thus the nature of teacher collaboration within these environments is poorly understood. This paper addresses this gap in the literature and reports on a study that explores features of teacher collaboration in an online community during a curriculum professional development workshop. The purpose of this study was to characterize the nature of teacher online communication interactions toward building curriculum and to shed light on the elements that need to be redesigned to better support teacher collaboration. Several data sources were collected to address the following three research questions: 1) What are the patterns of teachers' online communication? 2) To what extent does teacher collaboration exist in the online community particularly with a goal of constructing science curricula? 3) How does the online communication contribute to their curriculum construction?

Conceptual Framework

Curriculum Development as A Collaborative Process

While more national organizations are calling for the teaching of 21st Century skills and the shift to a learning community framework, teachers need to understand and use collaborative learning processes themselves before expecting it of their students, and to practice those skills in their professional practices such as curriculum development. Studies have demonstrated that teacher collaboration in curriculum development benefits both teachers and students (Hill, 2007; Pounder, 1999). Pounder (1999) compared teachers who worked collaboratively on curriculum design with teachers working independently and found that teachers in collaborative teams reported higher levels of professional growth satisfaction, internal work motivation, and teacher efficacy. Hill (2007) found that students in the classrooms of teachers who collaborated in curriculum design significantly outperformed students in the classrooms of teachers working individually.

Online Professional Learning Community

According to Stoll et al. (2006), professional learning communities often involve a group of professionals sharing and interrogating their practice in an ongoing, reflective, collaborative, inclusive, learning oriented, growth-promoting way. The fundamentals of a learning community require interdependence and reciprocity to provide richer contexts for learning to occur, which Selznik (1996) calls *mutuality*. Many current professional development programs aim to close the gap between the current and potential uses of technology for science instruction (Singer et al., 2000). One of the identified characteristics of "high quality" professional development that may better promote teacher learning particularly relevant to the issue of technology integration in science (Garet et al., 2001), is providing support for collegial interactions among teachers. We believe our online professional learning community offers such affordances. Study findings have supported the idea that the cause

of success in an online environment is the establishment of an effective learning community (Palloff & Pratt, 2007). It is reported that online learning communities provide optimum learning conditions where learning is self-directed and balanced with the opportunity for participants to take control of their learning (Hiemstra, 1994). In addition, the asynchronous nature of online learning communities allow flexible times for teachers to share successful stories or useful resources implemented during their professional practices. Such sharing may foster the development of the concept of “Legitimate Peripheral Participation”, where learning is seen as an inseparable aspect of social practice (Lave & Wenger, 1991). In a review of the technologies used within online communities intended to foster teachers’ reflective discourse, Zhao and Rop (2007) identified several key requirements, including low threshold for teacher use of the technology, scaffolds supporting authentic participation and engagement, and less focus on a tangible product as an outcome and more focus on supporting teacher dialogue. In the next section, we will explain how our program attempted to address these requirements for the purpose of promoting collaboration among teachers through developing an online professional learning community.

Method

Context

This study is part of a large-scale curriculum professional development project designed to increase opportunities for students and teachers in underserved schools to learn and apply innovative technology concepts and skills in the science, technology, engineering, and mathematics (STEM) content areas. We held a three-week professional development workshop where in-service modules occurred in the first week, then teachers collaboratively constructed curriculum units based on the requirement of the program framework in the second week, and in the third week teachers pilot taught their units in small groups.

In our study, teachers participated on Google Groups as the tool for their professional learning communications. Google Groups was selected based on the first key requirement by Zhao and Rop (2007) as it affords practical web pages and discussion boards and more importantly it is extremely user friendly and does not require a high threshold of technology skills. To scaffold authentic participation and teacher engagement, we applied several pedagogical strategies to support teacher communications. First, throughout the three-week professional development, all in-service modules embedded the use of online communication. For example, discussion questions were designed for teachers to answer as homework. Second, we modeled how to share documents and resources in Google Groups. For example, all instructors uploaded their instructional materials. These materials were categorized into content, pedagogy, educational technology, information technology, and STEM careers. Third, we emphasized the importance of developing a professional development community and encouraged teachers’ authentic participation and engagement by asking them to share materials, tools, and websites they used in their practices. Finally, we asked all teachers to create a profile page of themselves to promote expertise transparency, which was intended to help teachers locate others in the group who had particular expertise they needed to access.

Participants

Participants of this study are 13 science teachers (6 female and 7 male) teaching 6th – 12th grades in an urban school district located in Northeastern USA who enrolled in the curriculum professional development. Of the 13 teachers, 46.2% were Caucasian, 46.2% were Black, and 7.6% were Asian. The average number of years of teaching experience is 7.38 ranging from 1 to 33 years. They taught courses in the content areas of physical science, biology, chemistry and physics.

Data Sources and Analyses

The major data source to investigate the characteristics of teacher collaboration was their online discussions during the three-week professional development. All discussion threads were collected and were sequenced by posting time. In addition, five teachers’ collaborative curriculum units were explored to look for evidence of information use that emerged from their online communications.

Online Discussion

The unit of analysis of the online discussion was a message. Adapted from Little’s hierarchical levels of collaboration in professional development (Little, 2003), four coding categories were developed for this study to identify the features of teacher online collaboration for curriculum design:

Table 1: Coding categories for online discussion.

Level of Collaboration	Definition
Level 1: Storytelling	Occasional and sporadic content- or pedagogy-related messages posted by teachers in which they exchange practice stories or fragments of ideas.
Level 2: Asking for Help	Messages posted by individual teachers seeking specific help in the online community.
Level 3: Sharing Resources	Messages posted to share materials, resources, and methods with other colleagues.
Level 4: Joint Work	Messages posted by teachers that intend to evaluate or build on a previously posted message.

Each online discussion message was coded in one of the four categories to identify the level of online collaboration during curriculum professional development, and was coded as either initiation (i.e., initiating a new topic) or response (i.e., responding to a discussion topic). The order of the levels represents increasingly more difficult collaborative actions to achieve. The numbers in each level of collaboration were counted and the frequencies of initiation and response codes were calculated. The time of response message was coded as either within 24 hours or after 24 hours. We believe that a timely response to a message is important to sustain a thread in online communication as studies have reported that learners tend to focus most of their attention on new messages (Hewitt, 2005). Finally, themes found in the online discussion were identified for the purpose of curricular unit analysis.

Curricular Units

In total there were five curricular units constructed by five groups of teachers. A content analysis was conducted to see if the information discussed in the online environment was used in teachers' curricular unit construction. For example, if a teacher shared a link to visualize "the powers of ten", we looked through all five units to see if this piece of information was apparent.

Results

Online Discussion

In total, 30 discussion topics and 89 messages were found in the online learning community. Among the 89 messages, there were 30 messages (9 initiated by instructors and 21 by participating teachers) coded as initiation and 59 as response by teachers. Table 2 shows the distribution of frequencies for each level of teacher collaboration. Although all 13 teachers participated in the online discussion, only 8 of them initiated new discussion topics (21 topics in total). Twelve (57.14%) messages were about sharing resources (to which only 2 received responses from other teachers). Six messages (28.57%) belonged in the category of story-telling (to which 3 received responses), and 3 (14.29%) asked for help (to which 2 received responses). All 7 joint work messages occurred when responding to other messages. Finally among the 59 response messages, 53 responses (89.83%) were posted within 24 hrs after the initiation message and only 6 responses were posted after 24 hours. In general, if nobody responded to a message within 24 hours, the thread usually dies.

Table 2: Distribution of levels of teacher collaboration.

Story-telling	Discussion Question	Asking for Help	Sharing Resources	Joint Work
51 (57.30%)	5 (5.62%)	5 (5.62%)	21 (23.60%)	7 (7.86%)

In addition, in-depth qualitative analysis was conducted to further examine the characteristics of teacher communication and two patterns emerged. First, teachers tended not to respond to story-telling and sharing resources messages unless they had specific questions related to the shared information or certain concerns about its classroom implementation. Here is an example:

- Teacher B: Here is a new Powers of 10 video sent via the PSTA. Wait until it loads and then use the slider to move in and out. Starts at the universe and gets VERRRRRRRY small. <http://www.newgrounds.com/portal/view/525347>
- Teacher A: Thank you for this link. I am going to give it to my students to view at home. Unfortunately, the school district blocks it.

Second, asking for help messages and joint work messages seemed to invite more responses. Teachers tended to respond by providing suggestions based on their professional experiences and sometimes built on each other's idea (although not very frequently). The following example shows how teachers responded to Teacher A's help request. Teacher F, C, and H all responded with where nano-scale science content could be aligned with the core curriculum.

- Teacher A: How will this (nano-scale science) fit in with the school district's pacing schedule? How is it coordinated with the PSSA?
- Teacher F: I think that this would fit into the eighth grade introduction to matter unit that has the parts of the atom. I think it would also fit into the cells unit for 7th grade when students discuss parts of a cell and DNA.
- Teacher C: I also think that a very natural place to talk about a lot of what we'll cover will be in the introductory Physical Science unit, where you discuss what technology is, how it is related to science, and how we utilize it.
- Teacher H: I agree about the matter stuff. Also it would work for waves, in particular light.

Evidence of Adopting Shared Information in Online Discussion

We explored all five teachers' collaborative curriculum unit products to look for evidence for assimilation of shared information from the online discussion. We found that many shared resources were used by groups of teachers during their curriculum design activity. As mentioned above, 21 messages were posted to share resources by individuals (including both instructors and teachers) in the online discussion board. We excluded the information provided by instructors and explored those 17 messages shared by teachers as this study focused on teacher collaboration. Within these 17 messages, 20 pieces of shared information were found because one message may have provided several pieces of information (e.g., several links of computer simulations). We excluded 4 pieces of information not directly related to curriculum construction (2 pieces of information about school supply sales; 2 about policies). The remaining 16 pieces of shared information were categorized into the following themes: Educational Technology (7), science lab activities (5), assessment (3), and pedagogy (1). Table 3 shows how many pieces of information were identified in each group unit. All groups adopted at least one piece of shared information and shared information on assessment was most frequently adopted by groups.

Table 3: Shared information adaptation presented in group curricular units.

	Group Unit 1	Group Unit 2	Group Unit 3	Group Unit 4	Group Unit 5
Assessment	1	2	1	2	1
Lab	0	0	1	0	0
ET	1	0	0	0	0
Pedagogy	0	0	1	0	0

Discussion and Conclusion

This study has explored a neglected aspect of CSCL in the literature: the characteristics of teachers' online collaboration in curriculum development. Although using online communication tools for curriculum professional development is generally acknowledged as holding great promise (Dede, 2006; Owston, 2009), the question remains: What works and what doesn't work and why? The result of this study sheds some light on this issue. First, the online learning community provided opportunities for teachers to share situated and distributed cognition (57.30% story-telling and 23.60% shared resources of all messages). The results found in the sharing resources category were surprising. Little (2003) found that among those four levels of teacher collaboration, sharing resources and joint work had more learning potential for teachers, however they were demonstrated much less frequently. We also found that certain amounts of shared information in the online discussion were apparent in all five curricular units, particularly the shared information about assessment. Consistent with Little's finding, we also found it was difficult for teachers to achieve the deep conversations that constitute joint work. Second, we found that interactions in the online discussion were related to the nature of an initiation message. Specifically, asking for help and joint work messages seemed to invite more responses from other teachers in this study while typically no responses followed story-telling and shared resources messages. This is not surprising because questions in asking for help messages might attract others' attention to brainstorm answers and joint work messages that often include evaluation and reference to other people's posts would create common ground for further interactions. Finally, we found that immediate attention was needed to sustain a thread of discussion (89.83% of responses were made within 24 hours after message initiations). This is consistent with what Hewitt (2005) posited that learners tend to focus most of their attention on new messages. The findings of this study indicate that the online professional community has the potential to promote teacher

collaboration for curriculum design purposes and shows that further scaffolding is needed to promote joint work among teachers. The modeling pedagogical component in our program such as modeling how to share resources with others in the online environment was mirrored in teachers' online discussion. This indicates that positive effects may be achieved if we model how to develop joint work conversations in the online environment. The redesign of our next curriculum professional development will incorporate these implications.

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