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Extending Content-Focused Professional Development through Online Communities of Practice

Cynthia B. Vavasseur
Nicholls State University

S. Kim MacGregor
Louisiana State University

Abstract

This mixed method case study provides insights about how the professional development of middle school teachers is facilitated through their participation in content-focused online communities of practice. A key finding from this research reveals that the online community provided teachers with enhanced opportunities to share ideas, to discuss issues, and to make new connections with colleagues as well as with their principal. In addition, teachers gained curriculum-based knowledge, developed enhanced self-efficacy with respect to implementing technology, and collaborated on the development of interdisciplinary curriculum units. (Keywords: professional development, online communities of practice, principal support, middle schools.)

PURPOSE OF THE STUDY

Teachers are faced with pressures to implement instructional reform and accountability measures, both of which require new knowledge and skills. Reports from national commissions on the status of education highlight the need for promoting ongoing teacher growth (National Commission on Teaching and America's Future [NCTAF], 2003). Professional development typically offered as a detached workshop activity that is not connected to a teacher's pedagogy or to student achievement has not produced desired outcomes (Glazer & Hannafin, 2006). A long-term commitment is required to support the development of teachers' content knowledge and the improvement of their technical skills (NCTAF, 2003).

With increasing attention on the middle school curriculum and teacher effectiveness, there is a pressing need for reforming professional development at this level (Killion, 1999). While many schools provide planning time during the day for teams of teachers, a shift toward creating communities of active teacher-learners is recommended. The professional development approach that was the target of this study incorporated aspects of just-in-time learning, content-focused inquiry groups, and participation in an online community of practice. The purposes of the present study were to gain insights about the following:

- In what ways did this experience influence teachers' sense of efficacy and their ability to plan for and implement technology in their curricular areas?

- What was the focus of the interactions among teachers while they participated in the online community of practice?
- How did teachers perceive the participation of their school leaders in the online community?

THEORETICAL PERSPECTIVES

This research is informed by literature related to professional development focused on technology integration, communities of practice, and teacher efficacy**.** According to the guidelines of No Child Left Behind, a minimum of 25% of all funds spent on educational technology must be allocated for high quality professional development. In addition, the International Society for Technology in Education (ISTE) has developed standards for technology integration that have now been adapted or referenced by 90% of state departments in the United States (2006, http://www.iste.org/nets/bystate/). NETS, or the National Educational Technology Standards, identify the fundamental concepts concerning technology that should be mastered by teachers, students, and administrators (ISTE, 2000, 2007, 2002). NETS-A, or the National Educational Technology Standards for Administrators, much like the standards for students and teachers, identifies technological competencies that should be mastered by school administrators (ISTE, 2002). NETS-A were built upon the previous Technology Standards for School Administrators, or TSSA, document (ISTE, 2002). In addition, TPCK, or the Technological Pedagogical Content Knowledge is a framework that also identifies essential knowledge required by teachers regarding technology integration (Mishra & Koehler, 2006). Going deeper than simply defining competencies, TPCK focuses on three forms of knowledge: content knowledge, pedagogical knowledge, and technological knowledge. All forms must work together for a teacher to successfully master the integration of technology (Mishra & Koehler, 2006).

Technology integration, and therefore effective professional development for technology integration, has now become an additional mandate. Many schools and school systems offer workshop type sessions focused on the use of a particular software package or system as opposed to ongoing professional development focused on technology integration. The National Implementation Research Network (2007) states the importance of recognizing new mandates placed upon schools and school systems, and discusses how professional development should go beyond simple paper implementation in a school. The professional development program in this research strove to put in place new workshops, with supervision from principals and researchers, providing process implementation of a professional development experience.

Past school reform efforts have created schools and teachers that want to improve practices, but are not supported in doing so (Darling-Hammond, 1998). The problem of school improvement, therefore, is not one of motivation, but a problem of expertise that can only be improved through serious, systemic, and sustained investment in increasing the knowledge base of educators (Darling-Hammond, 1998.) Current approaches aimed at increasing this knowledge base

include just-in-time learning, peer mentoring, content-focused inquiry groups, online professional development, and communities of practice (Hughes, Kerr, & Ooms, 2005; Liew & Hang, 2000; Parr, 1999). Just-in-time professional development involves teachers participating in professional development within their classrooms and within their schools. Often, when the focus of professional development is technology, the availability of a technology specialist is required to provide teachers with help when it is needed (Hofer, Chamberlin & Scot, 2004). Peer mentoring is a collaborative approach to professional development with teacher leaders who are assuming the role of mentor. In addition, peer mentoring requires teachers to have time to collaborate within a school day. Many believe that this type of collaboration, used in conjunction with interdisciplinary teaming, is the key to the professional development of middle-grades teachers (Flowers, Mertens, & Mulhall, 2003). Teaming allows teachers with common daily planning times to collaborate and grow professionally. In content-focused inquiry groups (Hughes, Kerr, & Ooms, 2005), the participants engage in collaborative inquiry whereby they exchange ideas about alternative practices and beliefs about their content area and grade level. The inquiry group is situated in the school context, and participants select a focus on which they develop ideas and share the results of implementation.

Online delivery of professional development offers many benefits, including convenience, immediate application, professional growth, and economic advantages (Tinker, 2003). While the benefits of online professional development are numerous, many teachers remain uncomfortable with technology-based training (Schlager, Fusco & Schank, 1999). Although online instruction poses challenges, online communities of practice allow teachers to communicate with each other across physical space and time (Dias, 1999). Communities of practice is a term that describes a group of people in a professional environment who come together to share experience and expertise (Wenger & Snyder, 2000). Within these communities, there is no clear boundary between developing skills and developing new identities as leaders in a field. Both can occur as the community interacts (Barab & Duffy, 2000). In short, participants in a community of practice learn together by focusing on problems that are directly related to their work (Wenger & Snyder, 2000).

The literature related to communities of practice suggests that adult learners work more effectively when placed in a social, collaborative environment (Wenger & Snyder, 2000). Furthermore, successful communities rely on participants learning about something meaningful (Brown, 1997). Through a community of practice teachers can become less isolated and more inclined to discuss new ideas, can solve problems that arise concerning technology integration, and can form a support system to foster new ideas.

Teachers are in many ways the most isolated of professionals—teaching is still by and large a solo pursuit. Renewed teaching relies on generating new ideas and on having opportunities to examine one's own teaching. A supportive community of practice can help to sustain the slow, stepwise process that eventually leads to a fundamental transformation in teaching philosophy and practice. (Spitzer, Wedding & DiMauro, 1994, p. 1)

Teacher collaboration added to a traditional technology training program not only allows teachers to acquire and construct knowledge (Dias, 1999), but also leads to improving student knowledge and skill (Hawkes, 1999).

One study (Lieberman & Grolnick, 1996) found that teacher collaboration in educational reform networks, or collaborative communities, produced five themes in relation to the organization and collaboration among teachers: purpose and direction, building collaboration, consensus and commitment, activities and relationships as important building blocks, leadership, and dealing with funding problems. A key element of building collaboration is the creation of a network where the tone is welcoming and relaxed. Furthermore, engaging teachers in activities that facilitate both individual and group learning and reflection encourages teachers to assume leadership roles and to value one another's expertise. In initial conversations, teachers often use their time to share their feelings about school life (Lieberman & Grolnick 1996; Routman, 2002). However, over time, collaborative communities, such as educational reform networks, result in teachers discussing complex educational issues that often do not have a simple solution (Lieberman & Grolnick 1996; Little, 1993).

Successful collaborative communities such as these may provide a useful tool for teachers in relation to increasing teacher self-efficacy. Teacher self-efficacy is a critical issue often not addressed in designing and developing effective professional development. Self-efficacy is defined as a person's beliefs about his or her capabilities to perform at a given level of achievement, or a person's influence over other people (Bandura, 1994). Self-efficacy can affect a person's life choices, motivation in an activity, success in an activity, and resilience to adversity (Bandura, 1994; Tschannen-Moran, Hoy & Hoy, 1998). A teacher's sense of efficacy can also affect his or her involvement in a professional development experience, as well as his or her later classroom implementation of the material. Teaching efficacy can be impacted in positive ways by participation in experiences that foster the development of a professional learning community (Tschannen-Moran et al., 1998). In such a community, a teacher can be exposed to others' successes with a given task, as well as gain the support needed to change self-efficacy beliefs. A teacher's sense of efficacy can be influenced through collective efficacy (Glazer & Hannafin, 2006; Tschannen-Moran, et al, 1998) and leadership (Tschannen-Moran, et al, 1998). Collective efficacy is the extent to which efficacy is shared across teachers in a school building and can be established through collaborative, supportive experience among teachers within a school: "Schools where teachers work together to find ways to address the learning motivation and behavior problems of their students are likely to enhance teachers' feelings of efficacy" (Tschannen-Moran et al., 1998, p. 217).

A positive leadership presence can also influence a teacher's sense of efficacy. Research has shown that when a principal displays strong leadership, teachers' collective sense of efficacy is greater (Fuller & Izu, 1986). A well-established body of research on the principal's role in school leadership suggests that to promote teacher learning and to prevent attrition, principals should build interpersonal relationships among teachers (Blase & Blase, 2000; Bolman & Deal, 2002; Fleming, 1999; Fullan, 2002; McLaughlin, 1991; Morrissey, 2000)

and emphasize the importance of continued teacher learning (Darling-Hammond, 2003; Elmore, 2002; Fullan, 2004). In short, successful principals strive to foster healthy school climates by promoting collaboration and by fostering teachers' professional learning (Drago-Severson, 2005). However, given the busy schedule and daily responsibilities of a K–12 principal, leading reform often proves challenging (Chan & Pool, 2002; Furman & Zibrida, 1990). This research is designed to provide insights about a model of professional development that is situated in a community of practice, which includes both teachers and their principals who interact in both face-to-face and online contexts.

METHODOLOGY

This study was designed as a mixed-method comparative case study, allowing the researchers to focus on contemporary events, while acknowledging the lack of control of behavioral events within the research setting (Yin, 2003). Quantitative and qualitative approaches to data collection and analysis were implemented alternatively over a period of four months to provide triangulation and a more complete picture of the process and outcomes.

Participants

Two middle schools located in the same school district in the mid-south were selected through homogeneous purposeful sampling. The schools were similar demographically (Table 1) and were chosen because of their ongoing commitment to professional development.

Table 1: School Demographics

	School A	School B
Student information		
Number of students	427	336
Percent of regular education students	88%	85%
Percent of students with disabilities	12%	16%
Percent of students on free or reduced lunch	22%	45%
Attendance rate	95.1%	95.1%
Dropout rate	0.0%	0.4%
Teacher information		
Number of teachers in Grades 6-8	24	16
Mean years of experience	15.2	12.1
Mean years at current school	7.8	5.4
Mean number of students per class in Grades 6-8	21	24
Number of white teachers/African American teachers	20/4	14/2
Number of male/female teachers	1/23	5/11
Number of teachers with a Bachelor's degree	16	10
Number of teachers with graduate degrees	8	6
School information		
School performance score	111.9	102.8

Participants from each school included principals, and sixth, seventh, and eighth grade teachers of core subjects such as English, language arts, math, science, and social studies, as well as resource teachers. All teachers and their respective principal participated in the online community, as well as all data collection methods. Teachers at the two schools lacked the competency to successfully integrate technology into their teaching practices. Only 9% of teachers at the participating schools had participated in the state's technology integration 52 hour professional development program.

A school's performance score is based on students' achievement on state-developed criterion referenced content mastery tests and the Iowa Test of Basic Skills, student attendance, and student dropout rates. Scores of 111.9 and 102.8 give both schools the distinction of three stars. Schools with a School Performance Score between 100 and 119.9 receive three stars. The state average is 87.6 and the highest distinction is five stars for a school receiving a School Performance Score of 140 and above.

Context of the Professional Development Program

While professional development in the participating schools was an ongoing component of teacher teaming time, this research focused on the implementation of a module designed to facilitate the integration of technology. The content of the training sessions emerged from a needs assessment conducted with the schools' teachers and principals. An initial meeting with principals revealed concerns about their teachers' ability to implement a newly mandated state curriculum which required appropriate integration of technology. Teachers responded to a brief survey to provide input about their immediate needs with regard to implementing technology within the context of the new curriculum. From their responses it was determined that the focus of the professional development would be on using technology as a tool for productivity, research, and communication. These topics were embedded into the larger issue of curricular and instructional reform. In conjunction with these topics, teachers were provided with opportunities to learn the extent to which their activities fulfilled the National Educational Technology Standards (NETS) for students and teachers (ISTE, 2007, 2000).

Face-to-face sessions were conducted twice per week during the teachers' team planning time throughout the course of the professional development experience. In conjunction with the face-to-face training, teachers and principals participated in online communities of practice designed to facilitate teacher collaboration and principal support. It was determined that math and science teachers would be paired for membership in an online community, and English teachers would be paired with social studies teachers for another online community. Using the Blackboard Courseware Management System, two online communities were developed at each school resulting in a total of four communities. The Communication section of Blackboard was utilized, and a Group Page was set up for each of the content-focused teams at each school. The Group Page contained a discussion board, e-mail capabilities, and external links associated with each of the professional development topics. In the online community, teachers

engaged in weekly discussions about topics pertaining to the face-to-face training. Specific prompts, drawn from the needs assessment with the principal and teachers, were provided on a periodic basis by one of the researchers to stimulate and focus the online discussion. Hawkes (2001) noted that non-directed discourse may not be conducive to reflective online dialog. The prompts included questions and scenarios designed to elicit teachers' beliefs about teaching and learning, the status of their knowledge about various topics, descriptions of their experiences in implementing new approaches to instruction, and how these approaches addressed the NETS (ISTE, 2007). For example, one prompt asked teachers to identify ideas for creating interdisciplinary activities using technology. In another prompt, a scenario was provided in which students were working on a project requiring Internet research, but were found to be checking sports scores. The teachers were asked to relate their concerns about what the students were doing in this scenario and how they would handle the situation.

Data Collection

Quantitative data were derived from two sources. The first source was a teacher efficacy survey administered to all teachers. The purpose of the efficacy survey was for teachers to provide a self-report at the beginning and end of the professional development program. The second source of quantitative data was derived from teacher performance on the culminating project, a technology-enhanced unit plan. The teacher efficacy survey was adapted from six instruments (Box, 1999; Christensen, 1998; Knezek & Christensen, 1997; Norris & Box, 2005; Schwarzer & Jerusalem, 1995). This 32-item, Likert-scale survey was designed to determine: the level of teacher expertise in using technology, the perceived value of technology in the instructional process, teacher efficacy in using technology, and general teaching efficacy. The quality of the technology-enhanced unit plan was assessed on six criteria: (1) connections to the curriculum and its standards, (2) clearly defined objectives, (3) alignment of learning activities with objectives, (4) appropriate integration of technology, (5) alignment with technology standards, and (6) assessment procedures. A rubric designed by the state technology center was used to establish levels of quality and consisted of a rating scale from zero to three for each of the six criteria.

Qualitative data were derived from two sources: focus group interviews with all teachers, and the online threaded discussions. Focus group interviews were conducted at the end of the professional development experience with each content-focused team of teachers. The interviews were audio taped and transcribed for subsequent analysis. The purpose of the focus groups was to gain an understanding of newly achieved teaching knowledge and competencies, teachers' perceptions about the participation of their principal, and of the benefits and challenges associated with the online community. An analysis of the threaded discussions was conducted to develop an understanding of the nature of the interactions among teachers and between teachers and their principal in the online community.

Quantitative data were analyzed using statistical procedures. The analyses of the focus group interviews and threaded discussions were conducted through

constant comparative analysis (Glaser & Strauss, 1967). Using this method, the content of the threaded discussions and the interview transcripts were segmented and coded according to significant themes and patterns. Two researchers coded the data from the interview transcripts and the threaded discussions and achieved consensus in the classification of themes to segments of text. Inter-rater reliability was established through consensus.

RESULTS

The following sections are organized to address the research questions using data from both quantitative and qualitative sources.

Impact on Teacher Competence and Efficacy

Four forms of data were analyzed to address the impact of the experience on teachers: teacher reflections, the teacher efficacy survey, teacher focus group interviews, and the unit plans created by each interdisciplinary content-focused team of teachers.

Teacher Competencies

Teachers at both schools identified several areas where their proficiency with technology was gained. Experiences revealed from interviews and the threaded discussions indicated that, while the teachers were developing new skills and knowledge, they were also implementing new instructional approaches in their classrooms. Examples are provided in Table 2.

Teachers worked in content-focused teams of two to four to develop technology-enhanced unit plans that were compatible with the goals and objectives of the newly mandated curriculum. The plans were submitted to the state's educational technology center where they were evaluated by an educational technology specialist. Table 3 (p. 526) displays the detailed results of the evaluation of the unit plans for each content-focused community team and school. Analyses of the unit plans revealed appropriate instructional applications of the basic productivity, research, and communication tools which were the focus of this professional development experience. However, a maximum score of 18 was possible, suggesting that there was room for teachers to develop further expertise in this task.

In order to compare the total scores earned on the unit plans developed by the teacher teams in the two schools, an independent means t-test was conducted and revealed a significant difference between means ($t(10) = -2.272$, $p=.046$). There was a significant difference between the overall quality of the unit plans in favor of School B. In addition, sub-scores were examined, and it was determined that while both schools achieved similar scores for the content and evaluation components, School B had significantly higher scores for the technology integration component ($t(22) = -3.39$, $p=.003$).

Teaching Efficacy

In a pilot study, the researcher designed teacher efficacy survey was administered to 74 teachers from non-participating schools. A factor analysis was conducted to reduce the number of variables measured to a few factors by combin-

Table 2: Technology Competencies Gained

Using technology as a productivity tool	Teachers using technology to make a useful product; students using technology to display knowledge	I did the timelines twice. Once with Rosa Parks and once with American history. They (the students) really did well…I just walked them through it. We used Excel in graphing survey results from class newspaper reports.
Using technology as a research tool	Teachers using technology to gain information; students safely using the Internet to conduct research	Like the WebQuest, you look at one and see all of the work that goes into it and then think, 'I can't do that.' I've done that when looking at them. I've used them before and thought, oh, I could never make one of those, and we did! And it was not that difficult! Granted, you made it a bit easier because you gave us a template, but I'll always have that template, and now I could stray if I needed to. The template just gave me the jump start to what I needed to do.
Using technology as a communication tool	Teachers using the online community to collaborate and share ideas with other teachers and their principal	Sharing new ideas on Blackboard (the online community). Using Trackstar and WebQuest got me interested in other ways I can use technology. Ms. Smith got into the conversation and told me of a grant I could write to get about thirty computers. I don't think I would have had that opportunity without Blackboard because I don't get to really interact with the teachers at other grade levels that much, and it was nice to, you know, she offered to help me out and give me more information, so it really got things going for me.

ing variables that correlated to one another (Gall, Borg & Gall, 1996). Principal component analysis was used to extract the factors from the data set, resulting in the emergence of nine factors. The eigenvalues from this analysis showed that the first four factors accounted for 53.9% of the total variance. Following the pilot study, the survey was revised and administered to participants at the beginning and end of the professional development experience (Table 4, p. 526).

A difference score was computed to represent the growth score from the pre to post assessment on each factor from the efficacy survey. A MANOVA was computed to test the difference between the two schools for the four dependent growth scores. The Wilks' lambda was significant ($F(4,23) = 3.3$, $p = .026$) revealing a significant difference between the two schools in teachers' growth

Table 3: Unit Plan Evaluation Scores

	Science/Math Unit Plans						English/Social Studies Unit Plans					
Sub-Area Assessed	School A			School B			School A			School B		
Content												
Curriculum Standards	2	2	2	2	2	2	1	1	2	1	2	2
Objectives	2	2	1	2	2	2	1	1	2	1	1	1
Learning Activities	2	2	2	2	2	2	2	2	2	2	2	2
Content Mean	1.89			2.00			1.55			1.55		
Technology Integration												
Integration into Plan	1	1	1	2	2	1	2	1	1	2	2	1
Technology Standards	1	1	1	2	2	2	2	1	1	2	2	1
Technology Integration Mean	1.00			1.83			1.33			1.67		
Evaluation												
Assessment	2	2	2	2	2	2	2	2	2	2	2	2
Total Group Mean	9.67			11.67			9.33			10.0		

in teaching efficacy. Teachers at School A demonstrated a more positive growth in teaching efficacy than teachers at School B on the collective factors. In looking at the change scores for each factor, it is interesting to note, however, that the teachers at both schools showed an increase from pre to post assessment on their perception of the value of computers in teaching.

Teacher Interactions in the Online Community

Four online communities, two at each school, were ongoing during the course of this study. Each teacher was a member of one content-focused community; however, the principals participated in both of the content-focused communities at their schools. Table 5 provides details about the number of participants and their levels of participation for the online communities in each school.

Individual teachers posted between two and sixteen times at School A and

Table 4: Mean Scores on Teaching Efficacy Survey

Factor	Pretest School A	Posttest School A	Pretest School B	Posttest School B
Expertise in using technology	4.11	4.38	4.69	4.02
Perception of technology value	4.74	4.83	3.95	4.59
Technology efficacy	3.91	3.87	4.06	3.86
General teaching efficacy	4.27	4.43	4.50	4.12

Note: 1=Strongly Disagree to 5=Strongly Agree

Table 5: Composition of and Participation in Online Community Groups

	School A	School B
Mean number of postings for teachers	7.6	6.3
Range of postings for teachers	2-16	2-12
Mean number of postings by principal	11.5	15.5
Number of online community groups	2	2
Number of teachers in each group (ELA/SS-M/S)	13-10	9-6
Number of females (ELA/SS-M/S)	13-9	8-5
Number of males (ELA/SS-M/S)	0-1	1-1

two and twelve times at School B. The mean number of postings in the two content-focused communities by Principal A was 11.5, and Principal B was 15.5.

The threaded discussions from each of the online communities were analyzed to uncover the nature of the interactions. A cross-case analysis was conducted to identify themes consistent across the four online communities. An a priori framework for assigning categories to the content of the messages in the online discussions was not utilized. However, the themes emerging from the analysis of the message content supported several categories identified by Hawkes (2001) including technology use, technology integration, curriculum implementation, student assessment, and resource sharing. These categories are embedded and interwoven throughout the three prevailing themes identified in our analysis: teachers' perceptions of their personal computing efficacy, content-focused dialogue, and concerns about students' use and misuse of technology. Collaborative reflection (Schon, 1987, 1991) is evident throughout the conversations in each of the online communities.

Teacher Technology Efficacy

Teachers openly discussed their limitations concerning the integration of technology.

> I am not very proficient with this technology stuff. However, I do recognize the importance of it in the classroom. I sometimes feel like I need a 504 plan. The students are more proficient, but it's all good. I am learning, and I am actually better this year than last. I'm loving it.

Other teachers felt comfortable enough to share similar thoughts: "I feel that sometimes the kids know more than I do about searching on the Internet, which scares me!" These words of insecurity often were met with other teachers' reassuring words and humor. In these ways teachers provided moral support and encouragement to one another in their use of new technologies. "That's so great that you've gotten your students involved in online journaling; it's addictive. I'll bet your students enjoy writing ten thousand times more when it's on laptops in your classroom." Another teacher provided encouragement for work-

ing through mistakes, "You can teach an old work horse new tricks. I knew you could do this. See, I was right. Hang in there. We profit from our mistakes. You and I make plenty, but we keep on trucking."

Similarly, teachers also used humor to support one another. Many teachers, upon seeing a serious conversation about fear of technology would add comments such as "Well, it probably won't blow up anything new," and "By the end of the year, we will be technologically dangerous, if we aren't already." Many times such comments stirred more humorous comments, such as "She's not a dork, she's my hero," creating an atmosphere of ease and comfort. Overall, encouraging messages among teachers provided a collegial atmosphere, emphasizing the benefits of teacher collaboration. "This is easily done if everyone works together. Which we are."

It is interesting to note that the results from the teaching efficacy survey revealed that the teachers at both schools showed growth in relation to valuing computers in their teaching practice. It is likely that the sharing of experiences and support gained through their participation in the online community contributed to this outcome. Bandura (1997) postulated sources of self-efficacy including vicarious experience and social persuasion. Through their participation in the online community of practice, the teachers had the opportunity to gather ideas about how others implemented and managed their instructional computing experiences. Personal persuasion from peers provided encouragement and specific examples of solutions to problems. It is believed that these types of vicarious experience and social persuasion positively impact teachers' beliefs about their teaching efficacy (Tschannen-Moran, et al, 1998).

Content-Focused Dialog

Within the online communities, teachers not only debated the utility of technology implementation, but provided alternative ideas concerning the instructional use of technology. For example, ways of using technology to enhance students' opportunities to engage in higher order thinking were discussed. One teacher noted: "I think it is important to allow students to evaluate the importance of information found using technology. This is one of those 'real life' skills that will allow students to think critically." Other teachers shared how technology use has changed the ways in which their students learn: "Technology involvement has become essential…We can do interviews online with people we'd never meet, research surveys and polls done by large numbers and turn surveys into graphs with the push of a button. Life is sweet."

Teachers also asked for and provided resources to help one another. For example one teacher posted the following: "I saw that you mentioned Alfred Hitchcock. I don't know if you are still working with that, but I am a huge fan and I have several DVD's if you want to use them in class." Other teachers posted open requests for assistance: "I have been thinking about my National Board lesson. May I have all your information about poetry?" Most requests for resources were simple, such as: "If you have any great ideas for vocabulary graphic organizers or lessons on grammar, please share!!" Other requests for resources sparked detailed discussions about new technology applications. One group of

teachers had recently begun incorporating blogging, or online journaling, into their English classes. Upon hearing about this, other teachers asked for more information on the subject:

> I remember you telling me about this the other day. Is there a tutorial on blogger.com that gives detailed instructions on how to tie your account to students? I played on blogger the other day…fun, fun! I need to play some more to become more familiar with the site…Thank you for all you've done for me-I appreciate you greatly!

Teachers who had been using this type of application were quick to respond to comments and questions:

> You will also need to exercise caution when the students blog. Before you begin blogging with your class, you need to set up your account. Also, you want the students' accounts tied to your e-mail address. Then if anyone tries to change their password or create a bogus profile you receive an e-mail about the requested changes.

Another group of teachers engaged in a conversation concerning materials and the writing of local grants to gain new technology materials.

> I was curious about writing a grant for some laptops for seventh grade (I had heard through the grapevine that the eighth grade team wrote a grant for them). Does the grant program still exist, and if so, do you know were I can find out more info?

Again, teachers who had received monies were quick to respond: "Our grant is an 8G grant…I will help you any way I can in the writing process."

In order for teachers to accomplish newly formulated tasks, it is necessary for the individuals to understand the structure of the task as well as to have the resources to accomplish it (Nespor, 1987). In this case, the teachers were required to implement a new curriculum in conjunction with the application of instructional technologies. Participation in the dialog focused on the task at hand and collegial offerings of ideas provided these teachers with the opportunity to internalize and engage in processing relevant strategies.

Use and Misuse of Technology

A major theme emerging from the online discussion was the concern teachers had about their students use and misuse of the Internet. A lively discussion ensued about the various safety issues that arose while students were researching given topics on the Internet. The teachers shared their fears and concerns. One teacher noted "I have many concerns about Internet safety. I find that the students have a little bit of knowledge, and they think they are computer gurus. They are not aware of the dangers of the Internet." Another voiced: "I am VERY [sic] concerned about what the kids can get into while they are working on the Internet. There is so much trash out there! Plus, I want to make sure that my students are engaged." Another commented: "Internet safety is a very seri-

ous concern for teachers, parents, and administrators. Students are very vulnerable on the Internet and have too much knowledge about accessing inappropriate sites." These comments reveal the range of teachers concerns from issues of student safety to the appropriate use of class time and resources.

As more concerns were posted, teachers moved toward explicit discussion of how students who misuse the Internet should be handled. While discussing what to do if a student was looking at a non-school related site, a number of teachers offered suggestions for preventing the misuse of the Internet by students: "Close monitoring is the only way to keep our students on task with the computers. If they know you are constantly monitoring them, they will be less likely to go onto sites they should not be on." Other teachers discussed their "zero-tolerance" policies on the misuse of the Internet: "I would take the computer and not allow those students to work on them for the rest of the assignment." Such comments fostered debates, with many teachers agreeing with such strict policies, "The students would lose computer privileges for the assigned task and be required to complete the task in the library (public or school). Zero tolerance in order to stress the seriousness of disregard for Internet safeguard precautions." Other teachers disagreed with such strict regulations, and stated that "I would share with the students how much I like that website as well, but that we have to save that for later. Students would then be redirected to the appropriate website." Despite the debate, one teacher summarized the concerns over prior experiences with students' use of the Internet.

> The main safety concern I have with the Internet is that students may give out personal information online or agree to meet someone they have met online. The only way to guard against this, especially since they use the Internet at home, is to discuss the dangers of either of those things.

It was clear that these teachers used the online community as a forum to identify problems and to share potential solutions.

Teachers' Perceptions of Principal Participation

During the focus group interviews, teachers described their reactions to their principal's participation in the online community. Most teachers believed that their principal's involvement was pivotal to their success in the experience: "She would have had to be involved; otherwise, you think she doesn't care." Beyond this, two key themes emerged: pressure and support. The perception of how these themes characterized each of the principals was somewhat different. There was evidence of how the climate of the two schools was influenced by the principals and how this climate was echoed in the online participation of the teachers. Pre-existing conditions, beliefs, and values which comprise a school culture (Matthews & Crow, 2003) are likely to influence the level of openness expressed through this medium.

Pressure applied by School A's principal during this experience was consistently seen as positive: "We know that she is interested in what is going on in our class. She is pushing us to continue our education, and pushing us to be

better teachers, holding us to a level of expectations." Teachers were less consistent with their reactions to the pressures applied by School B's principal. She often was viewed as aggressive, and some teachers perceived her participation as "watching" their online conversations. One teacher articulated this concern: "Her being on Blackboard made me feel like she was watching me. That is why I didn't like to participate because I felt like if I put a comment there, it might come back at me later." Other teachers, however, were indifferent to the pressure, stating that their principal was simply trying to encourage their participation in the experience.

Both principals were viewed as role models who genuinely were putting forth effort to support their teachers in the learning process. An analysis of the principals' participation revealed that their postings reflected an interest in their teachers' perspectives, ideas, and concerns. Principal A posted specific ideas relevant to the teachers' conversation and her personal reactions to specific issues, whereas Principal B posted more general "pat on the back" kind of messages with occasional opinion-oriented messages. While the nature of the pressure and support put forth by each principal was perceived differently, the teachers at both schools believed that the online conversation was productive. Interestingly, in School A, where teachers viewed the pressure as motivational, and received continued praise from their principals, teacher responses on the teaching efficacy survey indicated that they also developed a stronger sense of efficacy about their capacity to be successful. In contrast, the teachers at School B produced more highly rated unit plans, which might have been a result of their desire to receive continued praise from their principal.

Recommendations for Enhancing the Online Community

Professional development, focused on the integration of technology, can be a successful collaborative experience when delivered using face-to-face and online mediums. Key aspects that led to the success of this program were:

- The use of a needs assessment: Teachers and principals had a voice in the focus of each professional development module.
- Principal introduction to the experience: Principals in this experience gave attention to the opening of the experience through face-to-face and virtual announcements. These introductions welcomed teachers and conveyed the principals' enthusiasm about the online community and their participation as a collegial member of each content-focused team.
- Facilitation of the online community: Thought-provoking weekly discussion board prompts were provided, technical support was available, and relevant resources for each topic were given. An online facilitator prompted teachers when needed, and provided clarification on difficult topics when appropriate.
- Effective online communication: In the online community, principals and teachers engaged in reflective conversations concerning efficacy and the tasks to be completed.

Following the experience, teachers voiced the desire for a change in the schedule of the program. Many teachers wanted the experience to include less frequent face-to-face sessions spanning a longer period of time. Teachers also

suggested changes for the composition of the online community. Although the community was effective within a school, teachers and principals in this study voiced the need for an online community that encompassed more teachers within the school district. Teachers from both schools believed that their online interactions with their school colleagues were effective; however, it was suggested that interaction would be more productive if teachers teaching similar grades and subjects throughout the district were involved in the online community. Public Web-based professional development sites such as Tapped In (SRI International, 1995-2007, http://tappedin.org) could be utilized to extend the community beyond the walls of a local school or school system. Large scale professional development Web sites provide features such as chat rooms, event rooms, mentoring programs, and online help thus allowing teachers to gain benefits from an ever-increasing range of resources.

Limitations of the Study

Limitations of this study center on the limited period of time that the online community was observed. It would be interesting to explore how the online community would evolve over an extended period of time. In addition, it is uncertain as to whether the members of the community will be able to sustain their participation over time. Also, one of the researchers provided the prompts for stimulating the discussion in the online community. Different prompts may lead to further insight into the conversations among teachers in the online community.

DISCUSSION

This research demonstrated that an online community of practice, added to existing face-to-face technology professional development, can be used to increase communication and collaboration among teachers. Assessment of the interactions within these communities revealed that the teachers were engaged in collaborative reflection (Schon, 1987, 1991). The teachers identified problems that were contextualized in their daily practice and shared potential solutions to those problems. Higher levels (Hawkes & Romiszowski, 2001) of reflection were evident, including explanations of events within the context of their practice and references to ethical issues and personal beliefs with respect to those issues. It allowed principals to motivate and support teachers while establishing a presence in the professional development experience. Implementing online communities of practice facilitates the extension of communication beyond weekly team planning sessions thus enabling opportunities for ongoing dialog. This study supports previous findings that have demonstrated the importance of the principal's instructional leadership in the implementation of professional development (Liaw & Huang, 2000; Little, 1993; McLaughlin, 1991; Morrissey, 2000; Parr, 1999). These findings also agree with those of Farrell (2001) that suggest that successful professional development emphasizes the importance of principals grouping teachers by teams, focuses on content instead of software, emphasizes being flexible and listening to the needs of teachers, and models classroom examples.

Interestingly, over the course of the professional development module, the teachers at both schools developed more favorable views of the value of computers in teaching. However, this experience had a differential effect on teacher competence in planning for and using technology and on teaching efficacy. There was a significant difference between the two schools in the quality of the teacher-produced unit plans. Higher quality unit plans were produced in the school where the principal applied more pressure, while at the same time posted more messages of praise. The teachers at this school were clear about their understanding of the principal's expectations and their role in helping to achieve the goal of implementing the technology-infused curriculum. In contrast, the teachers in the other school demonstrated an increase in their teaching efficacy with using technology to enhance instruction. It has been suggested that two specific ways to influence teacher efficacy are through collective efficacy effects (Glazer & Hannafin, 2006) and leadership (Tschannen-Moran, et al, 1998). Moreover, improved teaching efficacy could relate to reduced stress among teachers, as well as improved relations among teachers and administrators (Tschannen-Moran et al, 1998). The current research mirrors such findings and found that teachers who demonstrated significant growth in overall efficacy also had a more favorable perception of their principal's participation.

The online community in this study provided an opportunity for teachers to increase communication with their fellow teachers and principals. Within this community, teachers who normally do not communicate with one another were able to engage in reflective practice and provide support for each other in adopting innovation. Insights gained from this and future research could be used to design collaborative, supportive online communities to make technology professional development more meaningful for teachers.

Contributors

Cynthia B. Vavasseur is assistant professor at Nicholls State University. She also serves as adjunct faculty at Louisiana State University. Her research interests focus on teacher education and professional development in regard to the successful integration of technology. (Address: Cynthia B. Vavasseur, 18125 Judy Drive, Prairieville, LA 70769, cynthia.vavasseur@gmail.com)

S. Kim MacGregor is currently an associate professor of educational research and coordinates the doctoral program in Applied Research, Measurement and Evaluation. Her research interests focus on the assessment and evaluation of educational programs implemented in higher education and of instructional innovation within a variety of educational settings. (Address: S. Kim MacGregor, ETPP, 223 Peabody Hall, Louisiana State University, Baton Rouge, LA 70803, smacgre@lsu.edu)

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