Teachers' Informal Collaboration Regarding Technology

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Abstract

Elementary school teachers in the present study reported informal collaboration regarding technology use as a more effective method of professional development than organizationally planned or sponsored activities. Despite the fact that teachers see their colleagues as valuable resources for learning how to utilize technology, the disciplined inquiry into informal collaboration is sparse. To answer the research question, "What is the nature of informal collaboration among teachers regarding technology use?," a combination of questionnaire and interview techniques was utilized to generate five assertions concerning the constructs that govern teachers' informal collaboration regarding technology use. These assertions include information pertaining to teachers' perceptions of informal collaboration, factors that influence conversations, and with whom and for what purpose participants informally collaborate.

U.S. school districts spent $7.87 billion on technology equipment for the 2003–2004 school year, and $7.06 billion in expenditures are projected for the 2004–2005 school year (QED, 2004). Surveys (e.g., FRSS, 2003) suggest that in Fall 2002, 99% of American schools have some kind of access to the Internet. The question then becomes, how do teachers best learn how to effectively utilize this investment with their students?

There is a growing amount of research that points to colleagues and informal collaboration as being tremendous assets for teacher development in technology use. Wesley and Franks (1996) found colleagues helped each other in using technology by providing emotional support and sharing new ideas. Becker (1999) was intrigued by his finding that "frequent informal contact" among teachers may "help teachers to learn enough about the Internet to apply it in their teaching in a variety of ways" (p. 33). The importance of teachers assisting each other in learning technology was echoed in the QED Report (2000), which stated, "the most frequently cited sources of preparation (to use computers and the Internet) were independent learning (93%), professional development activities (88%), and colleagues (87%)" (p. 78).

Despite the fact that teachers have their colleagues as readily available resources to learn about technology, the role informal collaboration plays in developing teachers' ability to utilize technology has been poorly understood. The purpose of this study is to explore the nature of collaboration as a form of informal professional development concerning the use of technology for teaching and learning.

For clarification purposes, two major constructs—informal collaboration and technology use—must be defined. A modified version of Cook and Friend's (1991) definition of informal collaboration describes it as direct interactions between at least two parties who voluntarily engage in, and have full discretion

over, the process of working towards the goal of their choice. In the present study, "the goal of their choice" is improvement of technology use in their classrooms. Technology use is described as the utilization of computers, including the use of both software and the Internet. Understanding the constructs of informal collaboration and technology use as they emerged in the context of this study provides insights into the theoretical challenges the researcher faced in working with the conceptual frame of communities of practice.

Conceptual frame. At the onset of the present study the researcher believed that the construct of communities of practice would serve as a valuable lens through which to view informal collaboration. Communities of practice, like informal collaboration, consist of people working towards a common goal with sustained pursuit over time (Wenger, 1998). Communities of practice can be formal or informal, but in all cases, members are brought together by joining in common activities and by what they have learned through their mutual engagement in these activities.

Initially, the construct of communities of practice appeared to be an appropriate conceptual frame for the present study. Through analysis of the data, however, it became apparent that how informal groups were formed, or what values teachers held collectively, were not as imperative as each individual teacher's perception of his/her informal collaboration. The analysis of data revealed the most meaningful information as being teachers' reasons for choosing with whom they informally collaborate and for what purpose. The phenomenological viewpoint of the individual, as opposed to the communities of practice lens, seemed more fitting for these data.

METHODOLOGY

Due to the personal characteristics of informal collaboration, and the exploratory nature of this study, a variety of data collection techniques were used to gather information from participants. To develop an understanding of teacher collaboration in this exploratory study, it was deemed appropriate to focus on teachers who could be identified as already engaging in consistent collaboration with colleagues. It was left to later studies to contrast the behavior of these teachers with others who do not typically engage in substantive collegial interaction.

Data Sources

The emphasis of this study was on teachers' perceptions of their informal collaboration regarding technology. Because this is an exploratory study, three different methods of data collection (questionnaire, individual interview, and focus group interview) were employed in three distinct stages to help gain a better understanding of this relatively unexplored phenomenon.

An informal meeting was arranged with third through sixth grade teachers at Jones School and another meeting took place with a few representatives at Smith School (school names are pseudonyms) to explain the research project, seek interested participants, and distribute questionnaires. The chosen sites were two low-income elementary schools in Southern California that were comparably equipped with technological resources and whose teachers had a reputation among university researchers for having an academic emphasis on utilizing technology.

A modified version of a questionnaire by Lima (1998) was administered to the 14 third through sixth grade teachers at Jones School and Smith School who, through the informal meeting, expressed interest in participating in the present study. The questionnaire consisted of twenty graded response items and was designed to elicit information regarding access to technology, conversations with other teachers, their own teaching practices, exchanges of technology resources that they have engaged in with others, and their willingness and ability to participate in the study. The questionnaire also determined if participants met the selection criteria that (1) they engaged students in the use of technology for educational purposes at least once a month, and (2) they informally collaborated with one or more people at their school at least once a month.

Questionnaire data from 14 respondents were counted and tabulated to analyze the breadth and frequency of different topics of teacher conversation, teaching practices, and exchange of technology resources. (See Table 1, page 132.) Analysis of these data confirmed the fit of twelve participants with the selection criteria and resulted in the selection of six teachers each from Jones Elementary School and Smith Elementary School. The one male and 11 female participants ranged in teaching experience from 1–20 years, with four years being the mean and five years the median.

Interview. The questionnaire data assisted with the development of the 17 guiding interview questions, which were designed to provide clarity on participants' perceptions of their informal collaboration regarding technology use, their beliefs regarding informal collaborative relationships, and the particular people with whom they collaborated. The majority of interviews took place after school, for approximately 40–60 minutes in participants' classrooms. The interviews elicited descriptions of actual informal collaborative episodes in order to develop an understanding of the particulars regarding location, period of time, content, perceived value, and how participants chose with whom to informally collaborate.

Constant comparative analysis was utilized for the analysis of interview data and entailed identifying common themes and patterns by repeated reviews of the data corpus, and developing appropriate categories by comparing these patterns across the data (Glaser & Strauss, 1967). In an effort to control for researcher bias during data analysis, the present researcher conferred with an experienced colleague regarding the formulation of categories and the coding of statements. There were frequent discussions with this colleague regarding the categorization of both randomly chosen statements from the data and those statements in which the researcher had a question regarding appropriate categorization. Statements were placed in the consensual categories negotiated by these two researchers.

Categories that emerged through constant comparative analysis were counted and tabulated to enhance understandings of the phenomena. The analysis also assisted in identifying participants who collaborated frequently and with a large variety of colleagues. These participants were considered to be information-rich sources of data (Patton, 1990) and were asked to participate in a focus group interview.

Focus Group Interview. Four teachers from Jones School were seen as information-rich informants in the interviews and were chosen to participate in a fo-

Table 1: Questionnaire Data Results

Participants	Trouble-shooting Talk per Month	No. of Teachers with Whom they Talk about Trouble-shooting per Month	Talk to Improve Tech Lessons per Month	No. of Teachers with Whom they Talk about Tech Lessons per Month	Exchange Teaching Materials per Month	No. of Teachers with Whom they Exchange Teaching Materials per Month	Exchange Web site Addresses per Month	No. of Teachers with Whom they Exchange Web site Addresses per Month	Plan Tech Lessons with Others per Month	No. of Teachers with Whom they Plan Tech Lessons per Month
Bob	10	<6	2	2-3	2	2-3	1	2-3	0	1
Cali	1	2-3	2	0	2	2-3	1	2-3	0	0
Carol	1	2-3	0	4-6	1	2-3	1	2-3	0	0
Fran	2	2-3	2	2-3	1	2-3	1	2-3	1	4-6
Hallie	4	2-3	1	2-3	3	4-6	3	2-3	1	2-3
Holly	2	2-3	4	2-3	4	2-3	2	2-3	1	2-3
Joanne	1	2-3	1	2-3	1	2-3	2	2-3	1	2-3
Kristine	2	4-6	1	4-6	1	2-3	1	4-6	1	2-3
Kara	1	1	2	2-3	2	2-3	1	2-3	1	1
Lana	4	<6	2	<6	2	2-3	2	4-6	1	2-3
Laura	4	2-3	2	2-3	1	2-3	2	2-3	2	2-3
Sam	2	4-6	1	2-3	0	0	1	2-3	0	0
Average	2.83	3.38	1.66	2.79	1.66	2.5	1.5	2.91	0.75	1.83

cus group interview. This 45-minute interview consisted of 11 questions requesting information regarding with whom informants interacted, elaboration on the content of these interactions, and the value participants received from participating in these interactions. This interview also served to obtain participants' feedback regarding the researcher's tentative conclusions drawn through her initial reviews of the interview data corpus. To facilitate the conversation, information was placed on large charts and used as a base from which to elaborate on information presented in the interviews. The resulting discussion was videotaped (solely for the purpose of transcription), transcribed, and submitted to constant comparative analysis (Glaser & Strauss, 1967).

Assertions

Five major assertions emerged from the data analysis and will be discussed in relationship to teachers' informal collaboration regarding technology use. These assertions outline the value teachers receive from informal collaboration, factors that influence interactions, the type of information that is sought by teachers regarding technology, and the "ideal" type of person to provide this needs-specific information.

1. When seeking information regarding technology use, teachers value informal collaboration as a more effective method of professional development than organizationally planned or sponsored activities.

Clark (2001) found that ordinary talk among teachers is a potent medium for teacher learning and professional development. All twelve participants in this study expressed that their conversations with other teachers were not only essential to their use of technology, but also provided the best means of assistance.

Informal collaboration appeared to provide immediate assistance, addressing specific problems or projects, through the eyes of another educator. Typically, classes that are taught by teacher educators (or other forms of organizationally planned or sponsored activities) have their own agenda of what teachers need to know. In informal collaboration teachers have the opportunity to explore their own thoughts and interactions with students, curriculum, and instruction which significantly contribute to teachers' success (Osterman, 1990). In regards to informal collaboration, Joanne (all names are pseudonyms) remarked,

> It [informal collaboration] really is the best resource. We are each other's best resource because we know what we need to know. If someone comes to me with questions about an application I have used or a project I have done, I know exactly how to speak to what they probably need. It was hard when I took the class at [the University], although it was for educators I didn't have the sense that he understood the needs of an elementary school educator. (Joanne Interview, p. 4)

In addition to solving problems through informal collaboration, seven of the twelve participants mentioned they were able to obtain ideas that kept their teaching fresh and up to date. This is consistent with the findings of Loham and Woolf (2001), who reported that 86% of teachers in their study found collaboration a valuable medium for pooling ideas. Participants in the present

study also seemed to rely on each other to brainstorm ideas; as shown in Table 2, there were 81 incidences of ideas in general regarding technology in the curriculum that were included in the interview data. Laura touched on the concept of keeping "professionally fresh" as she remarked,

> I think that the number and amount of ideas you get is amazing. I have learned so much from talking to my fellow teachers, things that I would have never considered, just because they tried something I hadn't thought of yet. So the value of collaboration is invaluable. I think that it adds tremendously to my teaching of technology (Laura Interview, p. 5).

The informal conversations that teachers have with each other regarding the curriculum appear to be quite influential toward their thinking and action regarding their work with students (Little, 1982). As Hallie pointed out in the present study's focus group interview, "The only things available to students are what the teachers choose to teach or share...the talking provides a wider range of input" (Focus Group Interview, p. 3). The other members of the group unanimously agreed and felt that hearing about other teachers' successes with certain projects or the effectiveness of particular software made them feel more willing to try new ideas with their students. Joanne expressed this point of view to the group by saying,

Table 2: Curriculum Ideas: Topics of Conversation

Category of Code	Incidences Mentioned
Ideas in General Regarding Technology in the Curriculum	
Mention of "Sharing Ideas" for Using Technology in the Curriculum	56
Mention of Obtaining "New Ideas" about Using Technology in the Curriculum	17
Mention of Lesson Ideas for Use in the Computer Laboratory (not included in above totals)	8
Ideas in General Regarding Technology in the Curriculum Total	81
Specific Ideas Regarding Technology in the Curriculum	
Technology Projects for Students (e.g. research reports using the internet)	34
Discussing Web Sites for Teachers and/or Students	22
Feedback on Effectiveness of Technology Lessons or Resources in Meeting Educational Objectives	14
Efficiency of Technological Resources in Reaching Objectives (either educational or logistical) in a Timely Manner	9
Participants Setting Goals to Acquire Additional Technological Aptitude in order to Increase the Frequency and/or Effectiveness of Technology Use in the Curriculum	7
Computers for Families Program (provides free computers and nominal-fee Internet connection to low income students)	6
Specific Ideas Regarding Technology in the Curriculum Total	92
Overall Curriculum Ideas	
Curriculum Ideas Total	173

General mention of sharing ideas of use of technology in the curriculum.

> I start thinking more and more teachers are doing this, it's probably going to be something safe for me to try. I think in that way, the kids benefit, otherwise I might be stuck staying in the same safety zone (Joanne, Focus Group Interview, pp. 3–4).

Joanne's comment, and the affirmation of her opinion by the other members of the focus group, supported the notion proposed by researchers (e.g. Wesley & Franks, 1996) that much of teacher collaboration is focused on improving teachers' work environments and the performance of their students through collaborating on topics regarding students, instruction, and curriculum.

2. Informal collaboration regarding technology is a pervasive part of teachers' professional lives. It often takes place spontaneously and teachers do not consciously separate it from the remaining content of their daily conversations.

Conversations about technology are seen as an integral part of successful teaching and are reported to happen on an on-going basis. Participants in the present study said that they often get together in spontaneously convened meetings to trade information or seek solutions to problems that have recently emerged in their classrooms. Holly reported that, "We just, we kind of catch each other when we can and chat about what we need to get done" (Holly Interview, p. 3). These conversations happen with such frequency that half of the participants (six of 12) felt they were not aware of the fact they were informally collaborating, and did not see it as being different from their other work or conversations with teachers.

All of the participants in the present study reported that the majority of informal collaboration is embedded in spontaneous conversations that constitute the normal day-to-day discourse of any adults in these schools. Karen noted that,

> It is hard to give a specific...for me personally, I guess it is just a part of my language so much that I don't really think of it as a separate conversation from any other conversation I would have with a teacher. (Karen Interview, p. 1)

Lana even said, "It is kind of a common thing at our school. It is just like asking, 'What did you do after you brush your teeth?' It's like that kind of thing, you don't know exactly but you got ready..." (Lana Interview, p. 9).

3. Informal collaboration among teachers regarding technology is influenced by two major factors, time and the perceived potential for receiving information specific to their needs.

During the past 20 years the intensity and scope of American teachers' jobs have rapidly increased (Hargreaves, 1992). Teachers seem not only to have more students to teach, but also to have more ancillary responsibilities. Therefore, it is not surprising that 10 of 12 participants from the current study said time was a factor that inhibited additional informal collaboration regarding technology. When asked, "What prevents you from engaging in more conversations about technology?," Lana expressed her frustration by stating, "All the extra [garbage] we have to do, the paperwork and meetings and all. It is more beneficial I think if we have more freedom and more free time" (Lana Interview, p. 4).

Corcoran (1990) pointed out that the intensification of teachers' work may prevent them from engaging in the pursuit of their professional development. Sam reiterated the intense demands on teachers' time by saying, "It is very difficult to find time for technology. All the pressures that are on teachers, standardized tests, math tests, standards, you have to let go of things..." (Sam Interview, p. 3). Hargreaves (1992) reported that despite the constraints on teachers' time, they still find a way to collaborate. The time constraints may just contribute to the importance of making informal collaboration time efficient. Sam taught technology lessons to her students and engaged in conversations more than once a month, despite her frustrations. In fact, in the questionnaire (see Table 1), Sam reported talking with other teachers about troubleshooting at least two to three times a month (Sam Questionnaire).

All twelve of the participants in the present study also expressed that informal collaboration is an essential factor contributing to their use of technology. In fact, teachers not only said informal collaboration was the most time effective manner of receiving assistance, but also said if they could not find assistance through their informal collaboration the matter would be "...dead in the water" (Bob, Focus Group Interview, p. 3). Cali echoed this sentiment by saying,

> I feel very lucky that we have people here on staff that I can go to because if you didn't, with time being of the essence for all of us, if you had to make a phone call or if you had to physically get to somewhere else, I probably wouldn't. (Cali Interview, p. 9)

In the interest of time, teachers tend to gravitate towards colleagues with whom they perceive a potential for receiving information regarding their technology needs. They believe it is imperative to "...go to someone who can answer the question" (Hallie Interview, p. 2). As Joanne illustrates below, participants found informally collaborating with each other to be the most time effective and efficient method of obtaining assistance with technology, because their colleagues come from the perspective of using technology with students.

> I feel it takes me less time, I guess, selfishly, going to a colleague and asking a question. I'd much rather do that, than flip through a book. I know that if I go to someone else who has that information, another teacher, that person also knows why I want that information. (Joanne Interview, p. 4)

Five of twelve participants in the present study expressed resistance to engaging in conversations in which they felt there was no potential for receiving or providing assistance. An example of this resistance in the present study includes a comment by Holly in which she remarked, "I wouldn't talk to someone who doesn't like technology and doesn't use it" (Holly Interview, p. 3). This statement is understandable if one considers that a typical characteristic of informal collaboration is that colleagues work towards the goals of their choice. Teachers who do not like or use technology obviously have different goals from those who highly value integrating technology into the curriculum.

Technology is unique because it is not generally seen as an individual content area or assessed through standardized tests. Therefore, learning about and using technology to teach is viewed as somewhat "optional" in many schools and not all teachers are technologically proficient or interested in integrating technology into their curriculum. The stance that using technology is "optional" seems frustrating for teachers who believe in the importance of integrating technology use into the curriculum, and may contribute to the unwillingness of participants in the current study to share information with teachers whom they perceive are, as Bob said, "...not going to listen to information regarding technology" (Bob Interview, p. 4).

4. Teachers' specific needs generally focus around two broad areas, curriculum ideas and how-to information.

Researchers often report that teachers obtain general value and wisdom when provided with the opportunity to collaborate (McLaughlin & Talbert, 2001; Rosenholtz, 1989). There is still some question, however, as to the nature of these exchanges. In the present study, participants highly value using technology with their students; therefore they informally collaborated with other teachers to gather curriculum ideas. They also sought how-to information to address any technological difficulties they were experiencing.

Throughout the data, it was possible to note teachers talking about other teachers' teaching, and their delivery of curriculum that was labeled "curriculum ideas." Curriculum ideas provided teachers with various methods and resources to meet directly the needs of their students while integrating technology into the demands of their grade level curriculum. The present study found the acquisition of curriculum ideas to be a major contributing factor in teachers' engagement in informal collaboration. The questionnaire data shown in Table 1 revealed that at least once a month, 11 participants discussed improvements they could make to a technology lesson. These data also revealed seven participants talked about improvements to technology lessons two to three times per month. Eleven participants exchanged teaching material regarding integrating technology into the curriculum once a month, and five of these 11 participants shared such information two to three times per month. Eight participants mentioned that they conversed with other teachers regarding planning technology lessons and all twelve participants mentioned sharing Web sites at least once a month.

Table 2 illustrates that 173 incidences of curriculum ideas were mentioned within the interview data corpus, with the main topics being ideas in general regarding technology in the curriculum (81 incidences), details regarding technology projects for students (34), discussing Web sites for teachers and/or students (22), and feedback on effectiveness of technology lessons or resources in meeting educational objectives (14). Laura illustrated how curriculum ideas were exchanged among teachers by saying, "My fifth grade team will ask each other what we are doing in computer lab and we'll get ideas from each other that way" (Laura Interview, p. 8).

How-to information is sought to support teachers' work with the curriculum, and encapsulates troubleshooting hardware issues, problem solving, and learning to use software. All twelve participants reported through the questionnaire talking about troubleshooting at least once a month, and seven participants mentioned

that they conversed about troubleshooting at least twice a month. There are 89 incidences, shown in Table 3, in which how-to information is discussed in the interview data. Thirty-six of the incidences regarding how-to information were pertaining to assistance or instruction with software, and 35 instances were in regards to troubleshooting. Digital cameras have been newly introduced to the school sites and were mentioned on ten different occasions throughout the interviews. In response to the California Governor's Reading Initiative, a teacher at Smith School created a database to track students' scores and everyone in that school was going to enter their students' scores into the database. There were eight incidences in which this database was mentioned as a topic of discussion in the interview data.

How-to information provides teachers with the resources they need to make their curriculum ideas and instruction possible. How-to information afforded Sam the opportunity to integrate additional technological resources (Hyperstudio and Inspiration) into her curriculum through her informal collaboration with Joanne (Sam Interview, p. 4). Troubleshooting is a component of how-to information with which teachers frequently need assistance. This is illustrated by Lana's comment regarding her practice of "re-choosing" the printer in the computer's control panel to help many teachers with their work. Lana remarked, "I still do that for a lot of people" (Lana Interview, p. 5).

Table 3: How-to Information: Topics of Conversation

Category of Code	Incidences Mentioned
Software	
Reference to Needing Assistance with Software in General without Specifying a Particular Program	19
Talk of Problems Related to Various Software Programs*	10
Assistance with Spreadsheet Software (not included above)	4
Assistance with Grade book Software (not included above)	3
Software Total	36
Troubleshooting	
Obtaining "New Ideas" or Solutions regarding Troubleshooting Issues	13
Talk about Troubleshooting in General	12
Troubleshooting in the Computer Laboratory	10
Troubleshooting Total	35
Digital Camera	
Digital Video and Still Camera Use	8
Editing Digital Videos	2
Digital Camera Total	10
Use of California Governor's Reading Initiative Electronic Database	
California Governor's Reading Initiative Electronic Database Total	8
Overall How-to Information	
How-to Information Total	89

**Various software programs (e.g. Powerpoint, Kidspiration, Microsoft Word) were mentioned. The totals for Spreadsheet and Grade book software were presented as separate categories, due to the fact that they were the most frequently mentioned software programs with which participants needed assistance.*

5. Teachers seek out different types of individuals depending upon the broad area with which they need assistance.

Teachers informally collaborate to address a need, which is generally based on obtaining curriculum ideas or how-to information. Two categories of people have emerged that can best meet these needs. The first—teaching colleagues—are usually grade-level colleagues who are immersed in the curriculum and can provide direction in terms of curriculum ideas. The second category of individuals is technology specialists, which most frequently consists of technology laboratory teachers.

Prior research (e.g., Zahorik, 1987) has indicated the importance of interactions among teachers at the same grade level. The current study confirms that teachers believe these interactions are imperative and found that teaching colleagues are generally teachers at the same grade level who are immersed in similar curricula. When asked to identify three people with whom they collaborate most about technology, ten out of twelve participants identified grade level members. For five participants, choosing to talk to a grade level member simply because he or she was their grade level colleague was a determining factor. This supports the work of Lohman and Woolf (2001), which stated that teachers found their most productive collaborative experiences occurred when they worked with other experienced teachers at the same grade level and with whom they had long-term relationships.

Similar curricula appeared to influence teachers' decisions to talk with grade level colleagues and dictated the major topics of conversations. Teachers spoke to teaching colleagues about curriculum ideas almost twice as often as how-to information (See Tables 2 and 3). Holly's remarks reflected this trend towards conversations on curriculum ideas with teaching colleagues when she said,

> So we talk about it [technology] based on what standards we need to get done and how we're going to integrate technology into those standards and how we're going to get what we're going to be doing in the next few weeks and make it faster. That is basically why I talk to them. (Holly Interview, p. 5)

One participant, Carol, was the only teacher in her school teaching a class consisting entirely of fourth grade students. She felt like she missed out on opportunities to informally collaborate about curriculum ideas because she did not share a completely common curriculum with another teacher at her school site. Carol still reported collaborating with others at least once a month regarding troubleshooting and exchanging some materials, but she felt like she was not reaping the full benefits of informal collaboration regarding curriculum ideas (Carol Questionnaire). She expressed her frustration by stating, "...if I felt that there was somebody who really had something I wanted to use right now in my curriculum I would definitely seek that out..." (Carol Interview, p. 3).

When asked to identify three people with whom they most frequently engaged in conversation about technology, ten out of the twelve participants identified a technology specialist. Because technology specialists are the most frequently cited source for "how-to information," participants reported seeking out the technology specialist whenever how-to information was needed. In ad-

dition to finding time to talk with the technology specialist outside of class, participants also had access to the technology specialist an average of four times per month for at least an hour during their students' computer lab time. While students were working on activities in the computer lab, participants frequently engaged in conversations regarding how-to information with the technology specialist. It is evident that the support and assistance obtained from conversations with the technology specialist not only kept teachers' computers running properly, it also provided them with the ability and confidence level to complete projects. Fran mentioned, "If I took away Zoe [technology specialist] I might not be as risky" (Fran Interview, pp. 6–7).

When asked to compare the differences in the topics of conversation with teaching colleagues and technology specialists, the overwhelming response was that teaching colleagues provided curriculum ideas and technology specialists provided tech support. Sam illustrated this difference while referring to the computer specialist at her school,

> She's not a teacher so she doesn't have that [curriculum] connection. So I have to come to her with a specific problem and then she can help me fix it. The ideas are from Joanne and Beth, because they are the teachers. (Sam Interview, p. 6)

Regardless of the fact that computer specialists are generally paid to assist teachers, the conversations and interactions took place in the same informal manner as they would with a teaching colleague.

6. Teachers recognize a few individuals who we can label informally recognized experts, who they believe offer expertise in the areas of both curriculum ideas and how-to information.

Along with grade level members and computer laboratory specialists, there also emerged a third, less definable category of people to whom participants reported going for both curriculum ideas and how-to information. The interview data consisted of twelve incidences in which participants mentioned reasons for choosing to informally collaborate with informally recognized experts. Six of these twelve incidences referred to gathering information regarding curriculum ideas, while the remaining six incidences pertained to how-to information.

Informally recognized experts were rarely at the same grade level as participants, so they seldom shared a similar curriculum. Nevertheless, participants at all grade levels appeared to view the curriculum ideas from informally recognized experts as being innovative. In addition, the degree to which informally recognized experts integrated technology into their curriculum was inspirational to other teachers. Cali, a participant teaching sixth grade, said of an informally recognized expert who taught second grade, "If I want to stick my neck out then I would go talk to Frances and say, you know, what are you doing with your kids. Um, I am ready to try something new now." She continued by saying,

> Since he is doing stuff in class I ask him the nuts and bolts...You know, they had a news program he taped and put on all about astronomy...[I asked] How did you do this? What was the rest of the class doing while

> you were outside taping? How did you go about editing this? How much time did it take you? So, just to see how it's working for him to see if it's something that I'm ready to tackle....(Cali Interview, p. 6)

In regards to how-to information, informally recognized experts were generally viewed as being capable of handling any troubleshooting issues. Participants mentioned that if they were unable to locate the computer lab specialist they would refer to an informally recognized expert for how-to information. In fact, four participants who were identified as informally recognized experts by their peers throughout the interviews reported talking about troubleshooting twice as often as the other participants in the questionnaire (See Table 1).

Some informally recognized experts were also seen as having expertise with particular software (i.e., they were viewed as the "PowerPoint" or "Grade Book" person). Lana explained how these titles might have been formed by saying,

> I think that we all have specialty areas that we have shared with enough people now that it is just out there that they know that this is the person to seek if you're having this kind of trouble. I think it is just through staff information among the teams. (Lana Interview, p. 3)

Participants seek out informally recognized experts not only because they are knowledgeable about both the curriculum and how-to information, but also because they appeared happy to assist other teachers. Informally recognized experts are frequently found talking with other teachers about technology and genuinely seem to enjoy it. Their passion for technology, enthusiasm to share information with others, availability to meet with people who need help, and ability to provide assistance in a non-threatening manner made informally recognized experts excellent sources of information. Fran said of an informally recognized expert at her school, "He is easily accessible and very encouraging and supportive—his time is your time. He never says like, 'Oh no!'" (Fran Interview, p. 5)

DISCUSSION

The present study was exploratory in nature, investigating informal collaboration at two schools that were chosen for their high technology use and reputation for being collaborative in nature. Self-report data in this information-rich environment presented interesting patterns in terms of what purpose and with whom participants chose to informally collaborate regarding technology. Though the results of the present study provide interesting insights into informal collaboration, they also seem to raise some intriguing questions.

One such question may be, "Why do some teachers or schools engage in informal collaboration regarding technology while others do not?" Informal collaboration, by its very nature, is a spontaneously occurring phenomenon that is as unique as the people who are engaging in it. The purpose for engaging in collaboration even seems to vary by incident. Notwithstanding, informal collaboration does seem to have a relationship to the culture at a particular school.

Comparing the cultures of schools in which teachers' informal collaboration is prolific with schools in which teachers are generally isolated and non-collabo-

rative may shed light on why schools vary in their use of informal collaboration to support professional development of technology use. It may begin to uncover why some schools cannot imagine teaching technology without informal collaboration, while staff at other schools may never talk about technology.

There is still much to understand regarding the roles people play (e.g., teaching colleagues, technology specialists, informally recognized experts), and if these roles are consistent across schools in which informal collaboration occurs. Of particular interest are the informally recognized experts. Questions relating to informally recognized experts include, "Does the process of recognizing expertise in technology work the same at all schools? How do informally recognized experts view themselves and what benefits do they receive from fulfilling their role as an informally recognized expert?" To understand better the various roles involved in informal collaboration, one must also explore how schools adapt when a staff member leaves a site or when a new teacher arrives.

In the present study, informal collaboration appeared to contribute to teachers' professional development in technology and their work with students. How informal collaboration can contribute to students' use of technology and the subjects with which teachers choose to integrate technology would be an interesting area to explore. More important, however, may be the relationship between informal collaboration and the goals and educational purposes teachers have for their students while engaging in technology.

To explore adequately any issue related to informal collaboration, researchers must first ask, "What is the best method to collect data and preserve the 'informal' aspect of informal collaboration regarding technology?" Discourse analysis on actual exchanges among teachers would be ideal, but the authenticity of the "informal" nature of the exchange would still be in question. Even if teachers were outfitted with microphones or shadowed over a long period of time, the data may still lack their informal essence. Nevertheless, the collection of actual informal collaborative discourse is an avenue worth pursuing.

If the above conceptual and methodological issues were addressed, researchers may then begin to gain some insights as to how to foster informal collaboration among teachers regarding technology or other subject matters. This information could assist principals in creating a school environment that encourages informal collaboration, or it may just confirm the fact that it is ultimately teachers who decide with whom, and about what, they will informally collaborate. It is the researcher's hope that insights can be gained as to the best methods to assist teachers in supporting one another's professional development in regards to technology to help ensure that students are able to reap the full benefits intended by the billions of dollars invested in technology equipment each year.

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