# Contributions of Professional Community to Exemplary Use of Technology

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**Abstract**

From a preliminary analysis of six case study sites, the professional community of teachers, that is, shared activities and a group culture oriented toward improving their roles as teachers, was found to play an important role. Professional community appears to be an essential complement to technology leadership, support staff, and professional development programming in ensuring effective implementation of instructional reforms. Beliefs about the need to learn how to apply technology to instruction and professional community appear to be mutually supportive, that is increases in one create conditions for increases in the other.

Key words (from list provided):
Computer; teachers; professional community; case study.

## Contributions of Professional Community Exemplary Use of Technology[1]

United States participation in the IEA SITES study was coordinated by the project, "Exemplary Technology Supported Schooling Case Studies."[2] The project selected eleven school sites for case study and this report analyzes the first six cases with an emphasis upon the professional communities of their teachers. Our broad research question is the nature of the relationship between technology and professional community.

Prior research has found that professional community contributes to learning among individual teachers as well as to the organization's ability to function as a learning organization (Marks & Louis, 1999; McLaughlin and Talbert, 2001). Through team learning, and other "social processing," members forge consensus about organizational performance and the actions they might take for improvement (Marks & Louis, 1999). Learning by a social system extends beyond the sum of the learning processes undergone by individuals (Probst & Buchel, 1997), but brings new insights to individuals as well (Wenger, 1998; Wenger. & Snyder, 2000). Learning in the workplace is best understood in terms of the communities being formed: it is in community that personal identities are changed, employees become practitioners, and innovation occurs (Brown & Duguid, 1996; Brown & Duguid, 2000).

Because strong professional community is a vehicle for schoolwide knowledge processing, creating professional community enhances school capacity for organizational learning (Weigel, 2002). Teachers no longer work in isolation but collaborate to some degree within a professional culture. In a study of 16 high schools McLaughlin and Talbert (2001) found instances within a single school in which the degree of collaboration and community varied dramatically from one department to another. Reflective dialogue, open sharing of classroom practices, developing a common knowledge base for improvement, collaborating on the design of new materials and curricula, and establishing norms related to pedagogical practice and student performance are hallmarks of the professional culture and are demonstrably related to student achievement (Marks & Louis, 1999; Seashore Louis, Marks, & Kruse, 1996).

Most research on professional community has not investigated its relationship with technology. However, there are isolated instances of the role of professional collaboration and communities described in various reports such as that of Means, Penuel, and Padilla (2001). By far the most extensive analysis of this relationship was given in Becker and Riel (2001) in their survey analysis of over 4,000 teachers. They found that there is a substantial relationship between the amount of constructivist-oriented computer use and the degree of a teacher's involvement in professional community activities. Little is known about the complexities of such relationships, particularly in exemplary school contexts. Such questions are uniquely addressed here.

### Methods and Data

The specification of criteria for site selection was a long process that involved extensive discourse with our Advisory Committee and consultants. The six criteria that were developed for selecting sites were as follows: (1) a majority of teachers at the public school had to be engaged in a school-wide reform or school improvement; (2) a majority of teachers had to be engaged in an innovative, technology-supported pedagogical practice; (3) the school had to be committed to

1 In this report we use the term "technology" to mean the equivalent of "information and communication technology" (ICT), in order to be consistent with the common terminology of the educational community in the United States.

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meeting high content standards in core subjects; (4) the students should be drawn from diverse backgrounds including a number of low income students; (5) the reform effort and the innovative technology-supported teaching practices had to have potential for sustainability and transferability; and (6) there needed to be compelling evidence that the reform effort and the innovative technology-supported teaching practices had resulted in educationally significant outcomes or gains for the students involved.

The search for sites began by sending a solicitation letter to all 50 State technology directors. Another source of nominations came from directly contacting representatives of school reform programs and projects known to have a major technology component. We included the projects designated by the Secretary of Education's Expert Panel on Educational Technology. By the spring of 2001, we had received nominations for 86 different school districts and approximately 110 schools. The site selection process was arduous, and included input from a variety of sources. Many weeks were spent interviewing key personnel from candidate study sites, discussing each proposed study site with our advisors, and examining countless documents from the schools. The eleven sites which best met the six criteria were selected for site visits and case study reports.

Each site visit included a team of two researchers working at the school site for 5 days. These 5 days were used for conducting interviews with the principal, one or more technology coordinators, other administrators relevant to the technology reform program, 4 to 6 teachers, several students in these teachers' classrooms, and several parents of these students. In addition, at each site 2 to 4 classrooms were systematically observed by the researchers. All interviews were recorded and most are videotaped. The classroom observation periods were videotaped with one or two cameras.

As soon as the site visit was completed, site documents were logged and filed for analysis and reference. The interviews were transcribed into document files. The text segments in these files were then coded according to a coding scheme. This scheme contained seven main coding areas. The first was about the innovation or reform itself and is designed to capture information about the technology-supported school-wide innovation or improvement, the history and scope of the innovation, including its goals and origin, the curricular/subject areas involved and its instructional organization. This allowed us to compare reforms on the basis of their purpose and intent to improve the quality of instruction. A second code area is about the school itself and allowed us to organize information about the site, including background information on and the demographics of the school and its community. With this code we also tagged pertinent information about the school culture, its leadership, and any external relationships the school established to aid their technology implementation. This group of codes allowed us to capture relevant meso-level information about the school's setting and how together they helped to create a favorable context for the classroom uses of technology.

Another set of codes focused on the technology and the technology support present at the site. These codes supported our analysis of the vision for technology and the specifics of what the site has put into place and how it keeps it working and teachers prepared for its use. The next two sets of codes focused on students and teachers and their roles, practices, and outcomes. Together, these codes support the description and analysis of the classroom-based teaching and learning with technology. The final two sets of codes allow us to capture the elements of the site that contribute to the sustainability and transferability of its innovation. We differentiated between elements of the innovation itself, the classroom, school, and district components. These two codes were often used as a second additional code to some other pertinent information.

Each team of two researchers divided up the interviews to code; codes were assigned to sections of transcripts with the qualitative analysis program NUD*IST NVIVO. This program allows any length of the segment of text to be coded with as many codes as the analyst sees fit to apply. After all coding was complete, the NVIVO program was used to gather all text segments from that site's transcripts into a report for each code. These reports were then analyzed to determine the main points and themes within each code area. These points provided the basis for the conclusions that are reported here.

Sites Selected

The initial six sites are presented here and include two elementary schools, three middle schools, and one senior high school. One middle school is quite large with over 1,300 students and the senior high is small with only 240 students. Otherwise, the schools tend to be somewhat average or typical in size. Walnut Grove and Future High are magnet schools and only about 5 years old. The remaining schools are older, more established schools. Two schools are in sizable urban areas, three are in suburban communities, and the high school is in a small town. (See Table 2.)

There is considerable variation in the racial diversity and family poverty of the schools. Two schools have relatively little diversity and poverty: Harland and Mountain. Three schools have 60% racial minority or greater and very high poverty levels. The remaining school's student body, Future High, is nearly 50% minority. Because the school does not have a lunch program we were unable to obtain the percentage of students receiving free and reduced lunch. However, the staff told us that students are from diverse income backgrounds.

Table 2

Demographic Information for School Sites

| School Name[3] | Grades Served | Enroll-ment | Size of Place | Percent Minority | Percent Poverty* |
|---|---|---|---|---|---|
| **Walnut Grove** | K-5 | 768 | Urban | 60% | 60% |
| **Harland** | K-6 | 618 | Suburban | 25 | 7 |
| **Mountain** | 6-8 | 1,338 | Suburban | 12 | 7 |
| **Pine City** | 6-8 | 800 | Suburban | 65 | 75 |
| **Future High** | 11-12 | 240 | Small town | 46 | - |
| **Joshua Junior** | 7-8 | 500 | Urban | 95 | 80 |

Table 3 summarizes in a phrase for each school the investigated school reform and gives the share of teachers participating in the reform as well as the students per computer.

Table 3

Summary of Innovative Technology-Supported Reforms

| School | Reform/Innovation | Teachers Participating | Students per Computer |
|---|---|---|---|
| **Walnut Grove** | Project based learning using wireless laptops | 100% | 5 |

[3] All school names are fictitious for confidentiality purposes.

| | | | |
|---|---|---|---|
| **Harland** | Basic school powered by technology | 100% | 1 |
| **Mountain** | Technology to support standards-based high student achievement | 80+% | 4 |
| **Pine City** | Thin clients supporting academic performance | 100% | 2 |
| **Future High** | High-tech preparation for a high-tech world | 100% | 1 |
| **Joshua Junior** | Inquiry teaching supported by technology | 75% | 2 |

## Findings

Several things stood out as remarkable about the implementation of educational technology at these six sites. The first was the level of students' and teachers' access to networked, supported technology and their widespread, purposeful, and student-learning-focused uses of technology. The commitment to teachers' individual learning was strong, as evidenced by the support staff and professional development programming dedicated towards this end. The technology leadership contributed further to the supportive conditions and need for teacher learning that was required to implement technology-enhanced pedagogy in such exemplary ways. The presence of this need to learn and the supportive conditions to do so appeared to be reciprocal, or mutually supportive, of the development of professional community around technology use.

### The Relationship Between Technology and Professional Community

The relationship between the presence of well-supported instructional technology program and a strong professional community among teachers is a complex one. Our case studies suggest that, under encouraging conditions, there is a reciprocal and recursive interaction between the two that can reinforce and stimulate schools to become focused on continuous improvement and experimentation—in other words, to move toward becoming learning organizations.

How does this work in the schools in our sample? To answer this question we next examine several elements of professional community, as defined by Seashore Louis, Kruse, and Associates (1995), and others (Furman & Starrett, 2002; Scribner, Cockrell, Cockrell & Valentine, 1999). These include: collaborative activities, particularly those focusing on curriculum and instruction; deprivatized practice; and reflective dialogue. Other elements that are central to the concept of professional community—shared purpose, collective focus on student learning, and collective responsibility for student achievement—will receive less attention, primarily because they were part of the criteria for drawing our initial sample.

#### Collaboration and technology.

Two of the schools were either new, or reconfigured in order to become technology intensive, while four were "ordinary" schools that used external and internal resources to add technology to an existing staff and program. Many studies of new schools, whether charter schools or magnets, have noted that when a new staff is drawn together there is often a high level of collaborative activity that is engendered by both teacher choice to work with like-minded people, and the typical urgent needs to get a school up-and-running. This phenomenon is also

apparent in our sample. In Future High, which was both new and small, the level of collaborative activity was intense, according to all staff members:

> But here, and because we're such a small, well-organized building, we talk all the time. We have lunches, so generally just about everybody on the staff at one time or another during lunch comes in and we sit and talk.

But teachers in the well-established buildings also pointed to the impact that technology has on collaboration. Several, for example, pointed to the norm that people share and ask for help using the e-mail system—something that they had not previously experienced, such as at Pine City Middle School and Mountain Middle School, respectively.

> It is quite, quite common, in all grade levels…you create something, you e-mail a copy of it to everyone teaching at your grade level. And you share it with this open invitation: modify this and use it however you can use it. And consequently, I think the curriculum…is getting richer. Now it didn't necessarily start that way, but people saw the advantages and the opportunities and it's created a culture of sharing collaborations throughout the staff, and it has really opened up a lot of opportunities for thinking .

> I'm working with three other social studies teachers …we thought what part of the curriculum do we, as teachers, want to learn more about, and what do we want the kids to learn more about. We chose something that is fairly new…the new territory up in Canada, and…none of the textbooks have anything on it because its (only) a year old, so we decided we would go in and find our own stuff…[Note that in this case the Worldwide Web made this collaborative activity possible.]

In these and other cases, it is impossible to tease out a simple causal relationship between technology and collaboration. Technology makes collaboration easier, but the norms of collaborating using remote communication mechanisms also help to spread the interest in technology use.

Technology and reflective dialogue.

In both the new and established schools, virtually all respondents noted the presence of reflective dialogue. Teachers in these schools had or made time to meet, and they used this time seriously to discuss curriculum and instruction, technology, and student achievement. At Mountain Middle School, for example, "pretty much all" teachers belonged to a study group that they attended in addition to grade level team meetings. Both team and study group meetings were focused on critical issues that brought technology, curriculum, and student achievement together. The 8th grade team reported that:

> Most of our coaching stuff as a team is Inquiry [a required interdisciplinary unit for all students]. We are all teaching the same stuff, we get to teach sometimes outside our [discipline], sometimes within the [discipline]…we love to get to talk about something else [besides what we usually teach].

> Another 8th teacher commented that the math study group was very active:
> …Math is always developing new curriculum and doing new curriculum…they revise what they're doing all the time based on what the kids they have [already know] and what they learn, and so…they don't do the same thing twice.

While these reflective sessions did not necessarily focus on technology use per se, another respondent commented that technology augmented the level of discussion.

At Future High School, technology was clearly identified as a facilitator of deeper discussion, because it was used to get issues on the table before meetings, which meant that the meetings themselves (held for an hour and a half each week) were highly focused on issues of common concern:

> We have an agenda discussion data base [in Lotus] and people send concerns, and nobody can send a concern without a proposed solution.…Any staff member can go into that data base and comment, discuss---whatever they want to do before we get to the meeting…and the person who posted it is responsible for facilitating the discussion online

Whereas in most high schools, staff meetings are viewed as a waste of time devoted to one-way communication and rarely focusing on major issues, at Future High everyone agreed that they needed even more time to meet. The principal was currently looking for external funding to pay staff to come in for an extra hour per day to work together.

Again we argue that in these six schools having well-supported technology did not create by itself reflective discussions about practice and its consequences for students. Instead, it provided conditions and facilitators for reflection. First, it was a common expectation that all teachers would use it to help achieve a desired purpose. At four sites technology use was to serve the implementation of a particular instructional approach, i.e. project based learning, inquiry, or the Basic Schools movement. At Pine City and Mountain Middle technology use was to support student achievement; thus the ways in which technology were to be used were more broadly framed. Nevertheless, teachers in all of the schools began to consider, at deep levels, how technology could influence their own work and student learning. Because they were provided with or made time to meet and talk, and because effective technology use was a common focus, each of the faculties were engaged, to some degree, in "problematizing" technology use. The broad sharing of information in the building also enabled reflection. Unlike most schools, teachers let other know when they were starting a new initiative, in order to get reactions and help from one another. This shared knowledge created opportunities—teachable moments for adults—where commitments were not set in stone, and ideas were still fluid.

Technology and deprivatized practice.

Many schools that demonstrate collaborative curriculum development and reflective dialogue still hold to the common norm of privacy around the teaching act. Even in schools where doors are open, and people are free to "drop in," real efforts to learn from other teachers by revealing one's weaknesses and asking for help, or systematic observations to provide coaching are relatively rare. Previous surveys of professional community indicate that deep sharing and learning around particular problems of practice is the least frequently occurring component of professional community, except in instances where teachers are teamed and co-teach (Becker and Riel, 2001). We were, therefore, somewhat surprised at the levels of deprivatization that we observed in the six schools.

At Mountain Middle School, for example, teachers commented about the structured mentoring program that created a public forum for discussion of practice:

> So we have mentors that…observe us once a month, and then do a debriefing after watching a [technology infused] lesson. We meet with this mentor during the study group times and talk about the curriculum—what's going well, what's not going well, just deeper things to think about in terms of student achievement.

Mountain Middle also had internal resources for deprivatization—an instructional coach and a technology coordinator. Both participated in modeling and co-teaching at teacher's requests. These requests go well beyond the basics of finding resources to enrich the use of technology:

> People just come to me and say, "help me with an activity to enrich. For one day, and let's teach it together." So then, with this particular person my focus [would be] on the question, and not on using the technology. So I used technology as a resource…

Deprivatizing practice is a specific goal for the instructional coach, and one where she felt there was a good deal of progress. She indicated that they had gone beyond the easy route, in which new teachers were assigned to watch more experienced teachers, to a situation where older teachers were asking to watch each other, and even younger teachers. She noted that the prevailing assumption was that "you can pick up ideas from anybody;" a statement that was corroborated by both newer and older teachers. It was more difficult for her to have most teachers agree to regularly examine student work together, but she believed that she was making inroads.

At Pine City, the teachers viewed regular weekly staff meetings as professional development sessions, and opening up reflective discussion was leading to some deprivatization, according to the principal:

> …We have a couple of people that really have taken on leadership roles, just by the nature of their own exploration…what that has done is really enable people to see different ways in which [technology] can be used. …That's a big part of it…being able to see it modeled by other teaching staff, and being able to see the people who are experimenting…

At Walnut Grove teachers commented that technology was a particularly helpful vehicle for opening up practice, because initially no one was expected to be competent, so it was easy to share frustrations and missteps:

> Again, that's one of the advantages…it threw everyone out of their comfort zone…it was new to everyone….So you had groups of people that bonded together because they were thrown into this unfamiliar environment. And that's what I think really helped establish the culture that, yes, the support [from colleagues] will be there, we'll come out on the other side of this.

Likewise, at Harland Elementary the need to learn technology and the ready help available by colleagues led to teachers' sharing how they taught, and the role technology played in the instruction:

> …Coming into this school, I thought I was highly competent in technology, until I saw how it was being utilized in a completely different [way]…some of the teachers, and one that had retired last year were very helpful…using the technology as a means to the lesson, to the creating and the implementation of learning. That's mainly occurred

> through my teammates and other experts within the school…our co-workers are really phenomenal.
> …A lot of tutoring is going on among teachers. Teachers helping teachers

What we see throughout these comments is that, while technology cannot cause deprivatization, it creates a climate in which it may be easier to overcome the norms of privacy.

Teachers, for the most part, view technology differently than their subject matter competence or instructional skills. Instead, they see it as an area of constant change, where no one is "better" in all areas, and where "we're all in it together." This reduces the anxiety that many teachers feel about revealing their weaknesses or lack of skill. Expertise is spread widely within the buildings, and the open communication systems spread knowledge about who is experimenting on different instructional strategies that incorporate technology. Because technology use is easier to *see* than to disseminate in written form, teacher sharing through observation and intensive discussion is becoming more normative.

**Summary**

In the cases reported here we found that, in combination with certain enabling conditions, the teachers' shared need to learn technology contributed to the development of professional community. Likewise, the professional community at the schools contributed to more integrated and focused uses of technology as well as to the refinement of the schools' vision and necessary support system for technology use.

In some ways, the profiles of these six schools are more mindful of an R&D community than a typical school. Many teachers have incorporated the assumption that teaching is in flux, that knowledge is changing more rapidly than they can assimilate by themselves, and that project-based work around issues of common interest is as critical as the more typically managerial kinds of curriculum coordination and mapping that occur in schools more often (Seashore Louis, 1998; Seashore Louis, Marks, and Kruse 1996). Working from this assumption it was then logical for the schools to set up learning environments and "make it OK" for a teacher to not know how to operate or instruct with technology. It is expected that some colleagues know more than others, and perhaps students know more about technology than many of the staff. At these six sites this was turned into a positive, and staff served as ad hoc technology support for one another and teachers had ongoing and frequent opportunities to learn from specialists and one another.

Was technology the cause, or could technology take root because of school cultures that valued professional community? The answer might appear to be somewhat straightforward in Walnut Grove and Future High, which were established within the last five years as new technology-intensive schools: teachers were selected because of their commitment to working together on problem-based learning with technology. Their common focus created unusual circumstances in which teachers were willing to look at their work as an evolving palette rather than a finished portrait. Yet, we know that "newness" does not always create cohesiveness. In some instances, new schools flounder when teachers feel under pressure to produce immediate results but are poorly supported. Our established schools demonstrated many of the same norms and values as the new schools, although they were perhaps moving a bit more slowly toward widespread professional community, and in some cases were dealing with lingering "resisters" among the staff.

Because our cases were selected in part because of their exemplary use of technology and a common reform vision, we cannot definitively answer the question of the role of technology in professional communities of educators. The findings, however, give strong support to the notion that the effective use of technology and professional community are mutually supportive. Furthermore, there can be a powerful reciprocal interaction between the two that can reinforce and stimulate schools to become focused on continuous improvement and experimentation—in other words, to move toward becoming learning organizations.

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