

It's OK to be Stupid: Contributions Professional Community Makes to Exemplary

Technology Use

by

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Many American schools have invested in computer access and technology support (Anderson, 2000) and have written technology plans that state their vision for the use of technology. At many schools there are individual teachers who make creative use of technology in their instruction. Through the site selection process for this study we encountered numerous instances of such schools and teachers; what was much harder to find were the sites where all or most teachers were incorporating creative approaches to technology and where the school's staff shared the vision for technology as a support to teaching, learning, and school improvement. The schools in the Exemplary Technology Supported Schooling Case Studies Project were selected, in part, because together their staffs were thoughtfully integrating technology into classroom pedagogy and had identified how it could support student achievement. A quality technology support program is key for teachers' uses of technology (Ronkvist, Dexter & Anderson, 2000). So, it was not a surprise to us to learn that there were also considerable levels of technology access and strong technology support programs at these successful sites. The school's technology leaders had obviously taken efforts to make it easier for teachers to learn to use technology to enhance teaching and learning, and to make it a priority to do so. What emerged in the data was the contribution to the use of technology made through the professional community in the school.

We know that professional community contributes to learning at the individual teacher level as well as to the organization's ability to function as a learning organization (Marks & Louis, 1994). Through "social processing" or team learning members forge consensus about organizational performance and the actions they might take for improvement (Marks & Louis, 1994). 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. 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). Because strong professional community is a vehicle for schoolwide knowledge processing, creating professional community enhances school capacity for organizational learning. Teachers no longer work in isolation but collaborate within a professional culture. 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 and Louis, 1998; Louis, Marks, & Kruse, 1996).

Our tentative conclusion for these six cases is that it appears 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 school 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. This paper focuses on those enabling conditions and mutual contributions in a preliminary analysis of the six cases described in the first paper of this set.

Conditions that Support Technology Use

We begin by reviewing the important conditions at these sites that supported and provided a need for teachers' learning about technology use. The technology support environment at each school, especially the commitment each school site made to individuals' learning, as evidenced by the strong professional development programs the sites put into place, and technology integration support staff, was key for helping teachers to focus on how technology could support teaching and learning. We then review how the technology leadership by teachers and administrators was instrumental in not only putting the technology support into place, but also in creating a supportive climate where teachers needed to learn.

Technology support.

Technology support in schools can be categorized according to its content---technical or instructional---and the method by which it is delivered. Instructional support focuses on integrating technology use into curriculum and to enhance different teaching methods. Technical support is focused on the access to, and operation and troubleshooting of hardware, software, and network resources. Support for both content areas is important for teachers intending to use technology effectively in the classroom. Technology support can also be described in terms of the types of resources used to deliver technology support services. These include facilities, support staff, professional development, including one-on-one consulting, and incentives. These six schools all provided exceptional access to facilities, support staff and professional development programming.

Facilities. All of the schools had a *classroom-based* student-computer ratio that met or exceeded the national average (which also counts computers located in labs). Two sites had a 2:1 ratio and 2 sites had a 1:1 ratio in their classrooms. For the schools where the classroom-based computer-student ratio was higher, 5:1 and 4:1, the arrangement of the technology in the school was somewhat flexible so additional computers could be brought into the class or made available to the students. In addition, most if not all of the computers were networked, so file sharing and Internet access was available. The teachers all had some sort of large screen display capability available for them to show a computer screen's content; digital cameras, scanners, and printers were also available to the teachers. Together these features added functionality to the computer's use. This high level of access is significant because it meant that technology was always readily available as a tool to the teachers and students. It also meant that teachers' work to integrate technology could focus on curriculum and pedagogical concerns without worrying about scheduling conflicts or complicated logistics necessary to rotate all of the students through a limited number of computer stations.

Technical support. The technical support---troubleshooting, repair, and maintenance---was excellent at all six schools. Not once did any of the teachers to whom we spoke complain about the reliability of their equipment. Several districts explicitly stated that they made providing excellent technical support a very high priority, explaining that without this, teachers would likely be unwilling to plan for the use of technology:

And I tell you, to make it work in these rooms, it has to work all the time. To make teachers adopt it, and accept it, it's got to work, and they have to trust that it's going to

work. And their trust is going to take a long time to build. So you have to have that.
(Pine City: Technology Director)

In this district, Pine City, the technology director adopted thin client hardware for the express purpose of being able to provide excellent technical support. With a thin client a technician can instantly and remotely see and take over the desktop of the machine experiencing problems. On several occasions we witnessed a technical glitch in the classroom, a phone call by the teacher to the central technician, and an instant fix.

Other schools provided reliable technical support through a combination of on-site and district, or other outside, support staff. Future High had a class that interested students could take for credit to allow them to learn about technical support issues and systems; one classroom assignment involved assisting the network manager, their teacher, in creating a system to track routine technical problems and create written job-aids so they could be addressed more quickly. While excellent technical support is unusual in a school, even more so was that each site understood that they had to go beyond this and also dedicate staff to helping teachers learn to use technology in the classroom. They recognized that such support was key to the meaningful integration of the technology. As the Joshua Junior district technology director said,

There are two things that [must] go on. The teachers have to be ready for this, and the technology has to be ready. If either one of those pieces fail the thing falls apart. (Joshua Junior: Technology Coordinator)

Instructional support for integrating technology. These schools and districts had all either sought additional resources or re-allocated existing resources so they could dedicate experienced technology-using teachers to help other teachers on a full-time basis with technology integration. In the four schools where the drive to and focus for integrating technology came from the school this was in addition to the district-offered professional development opportunities to learn to operate various software programs. Three of these schools, Mountain, Harland, and Walnut Grove elementary schools, each had two full-time staff members at the school. One was certified and the other was not but both provided integration support to teachers. In addition, they, with assistance by district personnel, provided technical support to the teachers at their school.

At Future High, where the 12 staff were drawn to the school because of their interests in and capabilities with integrating technology, their network administrator did do a few formal classes for the staff. But, because the staff was so knowledgeable it appeared that their need to learn was lower and so professional development opportunities were less frequent than at the other five sites.

At two of the schools, Joshua Junior and Pine City Middle, the scope and direction of the technology integration was led at the district level and so the staffing for professional development was at the district level too. Joshua School District dedicated two former classroom teachers to instructional support of the teachers in their district's technology classrooms. The Pine City School District had one person teaching much of and coordinating the entire district's technology professional development program but she was aided by experienced teachers who also led classes.

The schools employed different approaches to provide time or incentives for their staff members to attend classes or otherwise work with the technology integration specialist roles described above. Walnut Grove's school district provided all teachers with a laptop in return for attending 15 hours of technology training. Walnut Grove's principal wanted to go beyond this

shorter amount of and how-to-operate-focused training so he contacted an outside vendor to set up a 45-hour integration focused class for the school's teachers to take. The school's teachers took the class together, meeting with the instructor once a week for three hours after school for 15 weeks. The teachers were paid for their time. The teachers very enthusiastic about the course and several were further encouraged by their students' interests in it as a vicarious learning experience.

I loved doing my Future Kids presentation. Oh, gosh, it was so much fun. It was fun from beginning to end...Every Monday I knew I was going to go into that classroom and I would learn and get to experience something that I would get to take back to my children. Every Tuesday, I got drilled: What did you do in class last night? What are you going to show us on the computer? They loved it and it wasn't frightening for me.

(Walnut Grove: 6th grade Teacher)

An important complement for the walnut Grove teachers was that their school's two technology staff members regularly met with their students to teach them computer skills. They and the teachers co-planned for these sessions so that the skill development fit the needs of the technology use in the classes' project that was underway. This allowed the teachers to count on their students' developing necessary skills and established an integration planning relationship upon which they could build.

At Harland Elementary and Mountain Middle the technology integration specialists on staff co-planned with their school's teachers and also supported them by finding relevant web sites or coming into their classes to co-teach. The specialists at these schools also conducted classes for the staff as needed; for example, when a new digital camera was purchased. At Future High, the professional development was either classes after school, on a one-to-one more casual basis, or on the limited number of professional development days that were built into the school's calendar.

At the two schools where the technology integration push was primarily led by the district, there were classes organized for participating teachers that were led by district specialists for technology integration. These met after school once a week throughout the entire school year. At Pine City Middle and Joshua Junior both the classes were comprised of mixed groups of teachers of different grade levels and subject areas. However, teachers paired by subject area or came in grade level teams so as to have a collaborator back at their building. At Pine City the grade level teams were a very important source of support for teachers; one sixth grade teacher commented that it made the critical difference for their success:

I would stop in someone's room [see some technology thing] and say, "Oh wow, how did you do that?" Then I would stop in during my prep period or after school and they would show me. And so we did a lot of informal sharing and I can't stress strongly enough how valuable that was for us to go through as a team, to work together, to learn together and to be sharing. To me that was everything. I think if I had been in a group, where I was at this school and someone else was [over] there and this one was a different grade level and this one taught a different topic...I don't think there would have been that kind of bonding and sharing that went on. I really think that's what has pushed us and made us grow. (Pine City: Sixth Grade Teacher)

At the other four schools some built a different sort of mechanism for sharing into their professional development. For example, at Walnut Grove the outside vendor's class encouraged

teachers to learn about what their peers were doing. This helped teachers to think about technology integration across the grades:

The FutureKids' [outside vendor] training has been phenomenal. I just want to mention that because it keeps us really at the cutting edge of what's happening. When I hear what Mary's doing with her fourth graders---because you can imagine with [my] kindergartners, it is exploration....Then I hear what Alison's doing and I just see how it builds from kindergarten on up. It's just very powerful. (Walnut Grove: Kindergarten-First grade Teacher)

The teachers then made a final presentation to their peers during the last night of the class, which allowed everyone to see one another's final projects.

At Harland Elementary a teacher described a similar effect from a class taught by their district but taken by the whole staff of the school. She described it as most important technology professional development experience she had ever had. This experience provided a common basis for their sharing and follow up with the in-building staff:

...this class was a continual nine, I think it was about nine, weeks and we had all come back, because it was all one staff [taking it together], we could come back, help each other and talk about it, and then [go] back with our questions the following week....I think the biggest factor, we could help each other; whereas in the other classes the people [were] from all of the county, who we never saw again (Mountain Middle; 2nd Grade Teacher).

At Mountain Middle they established a peer coaching for technology integration, which they considered the most advanced part of their technology professional development program. In it, participants were trained as coaches and were then a part of the Vanguard Team. The coaches were teamed with a coachee and the pairs discussed integration ideas, plan a unit together and then observe one another's classes. The technology integration specialist at the school meets with the pairs once a month. One participant described a typical meeting as "We usually have a technology topic, and someone has something to show usually, there's a little show and tell part, and there's usually time to work on projects that we're working on (Mountain Middle: Teacher Focus Group).

At Future High, nearly all the teachers were team teaching interdisciplinary courses (science and math, and English and social studies). Consequently, sharing was a regular activity. This allowed the teams to think through curriculum and integration ideas simultaneously. They relied on one another for informal professional development. As one teacher quipped, "my professional development was [the principal] hired somebody [who was his partner] that was good at technology (Future High: Teacher Focus Group).

Harland teachers also were able to learn regularly from their peers as a result of teaching in teams, which made interaction more continual and thus allowed for sharing in smaller and more frequent increments:

...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....the children are immersed in it, completely, so for me to step into here, I really relied on my team mates. Some of the teachers, and one that had retired last year, was very helpful in explaining how to utilize the technology, and how to create lessons.... The experts, our co-workers, are really phenomenal at being able...to give us the means to understand the technology and use it completely in the classroom. (Harland Elementary: Teacher Focus Group)

In addition to formal opportunities to learn to integrate technology and the instructional support of specialist staff, at several of the schools teachers had time to meet with one another on a routine basis. In some cases this was a part of their regular daily schedule or perhaps extra time provided by the district; in other cases it was their own after-school time that they dedicated towards this purpose. At Pine City grade level teams met regularly and the principal also had teachers present technology ideas at faculty meetings. A Mountain Middle school teacher praises her administration for providing the extra support of time, noting that it makes all the difference between having a good integration idea and bringing it to fruition:

The other neat thing...is that they are very willing as a district, or at least our administration, to give us some time outside the classroom to work with fellow teachers. So a fellow teacher and I who are working on the coaching project together took, I think it was a full day, or a half day, just to kind of hammer out a unit based on chemistry, certainly integrating a lot of technology. So they're very willing to help us incorporate all that they're expecting [us to use and do] (Mountain Middle: Teacher Focus Group).

At Harland and Joshua Junior the teachers regularly worked extra before or after school in order to put together integrated instruction:

I've never worked with people who stay until seven o'clock, on a regular basis, and you know, a lot of it is to work on the technology and prepare it for...like whatever template you're making or whatnot. But, I mean, just as a staff as a whole [works late]; I mean, there are people...I've been here till seven and I see a group...like a team, that's meeting, at six o'clock (Harland Elementary: Teacher Focus Group).

Shoot, we'd get there at six in the morning and continue making lessons, and then we'd have more focus, though. Maybe not leave until sometimes six at night. That went on [for weeks] easy until Christmas. Yeah, [it is] a whole lot of demand if you're going to do it right. If you're not going to be caught making up lessons on the spur [of the moment]...And then, of course, that left no time for reflection or changing things. I mean, we really were going lock, stock, and barrel.... There was no time to refine or do anything. (Joshua Junior: 7th grade Teacher)

Leadership for technology implementation.

At each of these sites there were excellent conditions in which teachers could learn to integrate technology: teachers had access to equipment, technical support for it, and collaborative, ongoing, and situated professional development opportunities. To establish any one of these resources requires an investment of money, time, and energy. So it is worth pointing out that in these schools and districts these resources were also coordinated together into a system that complemented their stated purposes for technology use. Together administrators and teachers at these sites worked as a team to provide technology leadership for this coordination; this appeared to also help lead to the development emotional support for teachers implementing technology. Resources coordinated to support the purpose of the technology. The sites either located new or directed current resources to establish technology support that was aligned with their stated goals for technology. Technology leaders at Walnut Grove, Pine City, Future High and Harland

received new monies to help them establish infrastructure, purchase hardware and software, or fund professional development. Of course the money helped them to provide the necessary resources to teachers but it appears that the teams of people they established for planning purposes at the school and the communication they produced to apply or ask for money went a long ways towards creating a system of equipment and support coordinated with the purpose of the technology.

Walnut Grove Elementary pulled together grade level representatives, the technology teachers, and the administrators into a leadership team to write their professional development grant. After the money was awarded this team crystallized the school's approach to project based learning and the professional development needed to make it happen. Simultaneously, their district provided them an opportunity to make decisions about technology infrastructure. The Principal then encouraged the school to offer professional development that went beyond the basic training offered by the district; the teachers then created projects for the class that complemented the project-based learning underway in their classrooms.

Harland Elementary school's history is similar. As a school they had committed to the Boyer Basic School movement when they received money for technology as compensation for an oil spill. Their whole staff's involvement in implementing the Basic School philosophy was extended to the technology plan they had to create to receive the compensatory funds. As a result, the two efforts work well together and all staff members had a say in the specifics of that complementary work.

Future High was established as an alternative school where students would be competitively prepared for their future in a high tech world. The school staff member's philosophy about that preparation extends beyond students' familiarity with technology tools, however. The project-based and problem-based learning in interdisciplinary courses, their required internships and enrollment in community college courses represent the essence of the students' experience there; the technology in the school is configured to be of service as tools to the teachers and students for their work. Businesses and civic organizations were then solicited for money, expertise, or other in-kind donations to help the school achieve its mission. At Future High the small staff all worked together to create the school and to configure the technology and technology support within it; to date they continue to decide things on a consensus model.

Mountain Middle school did not solicit additional funds for technology, instead their funding came from their district. However, their district did require them to explicitly plan for how technology would support student achievement. A building council, comprised of teachers, administrators, classified staff, and parents, meet weekly to plan how to work towards improving students' attainment of standards; technology is considered in that discussion as one of many tools to help differentiate instruction so all students can meet the curriculum standards.

Pine City Middle and Joshua Junior were the two schools in our sample whose technology integration and implementation efforts were led by the school district. They were similar in that the purpose for technology, the hardware and software, the technical support provided, and the integration training all were planned for and provided by the district office. While the Pine City School District received a substantial Technology Challenge Innovation grant from the federal government and the Joshua School District funded their efforts by redirecting their resources, both district emphasized the cost savings and increased level of support made possible by coordinating efforts at the district level. In both cases the teachers at the schools in these districts received hardware in their rooms after they completed a year-long training. The principals and teachers at these schools were appreciative of the support and direction from the district office.

Because Pine City District had a goal of 100% of its teachers participating they were intent on providing an appealing level of access to technology (2:1 student to computer access) and very high quality technology support. They also framed the purpose of technology broadly: to raise student achievement. This left a lot of room for how teachers might use technology, an apparent benefit since teachers had not engaged in the intensive discussions for technology planning described in the previous four schools. Within three years the Pine City Middle school staff had all attended the training; some mostly used the math and reading drill and practice software and others focused more so on the tool software for use in students' projects.

At Joshua Junior, the training was offered to anyone and was framed in terms of supporting inquiry-based instruction, which they emphasized would improve students' performance on state tests. The district's plan was to create technology classrooms in the upper elementary classrooms and in the core subject areas of their secondary schools. These teachers were encouraged and "volunteered" to sign up in teams to attend the unpaid training, which was a condition--but not a guarantee of--receiving a technology classroom (with 2:1 student to computer access). The Superintendent and Technology Coordinators described that a teacher had to have the right disposition, i.e. hard worker and be willing to experiment with technology and refine its use to be allocated the equipment after completing the training. This carrot and stick philosophy had resulted in a shared goal of using technology to support inquiry among the teachers in the technology classrooms, but these targeted teachers did not represent the entire school.

Trust and support for risk-taking.

As described above, all the schools created technology support systems for individuals. And in some cases they explicitly encouraged teachers to collaborate and support one another in learning. What stood out in the data was how often teachers at these schools described the whole school environment as one where they felt trusted, where risk-taking was supported, and where any experimentation that fell flat would not be held against them. Thus, in addition to the technology support environment at each school, there seemed to be an emotional support system that was emphasized by the technology leadership teams.

At Future High the principal self-assessed that one of his key characteristics as the leader of the school was "the ability to trust people and to let them take ownership, and grow it beyond what I ever could have defined for them...(Future High: Principal)." His staff whole-heartedly concurred with his ability to do this. Several mentioned that it was essential in creating the sort of environment in which to constantly take risks in configuring and delivering the curriculum and their instruction.

I mean it's a big deal for him [the Principal]. When he came, his thing was, "You're creating a culture of trust, where people feel safe, emotionally and physically, and every other way" and he harps on that all the time. (Future High: School Secretary)

And, you know, his judgment in terms of what, you know, what potential people have and his willingness to take risks on that is definitely something that earns one's loyalty. (Future High: Teacher Focus Group)

He is very supportive of the staff in terms of he is always willing--not just willing but he is always wanting us to make changes and then evaluate our changes. He is constantly willing to think things through a new way. (Future High: Science Teacher)

Likewise, the staff at Mountain Middle felt that their principal was supportive of trying out new things to see if they would work, and modeled taking new approaches in her own work for her staff:

I think that if any of us came up and said [to the principal], “you know, we’re really interested in looking at how this works” there would definitely be people [made available] to help you out. And I think that’s part of the culture of this school that supports that innovation....I think has been modeled for us really extensively by the Principal, in her presentations to the staff...So it’s being modeled for us from the administrative side down, which kind of is inspirational. I think, oh, maybe I better try that sometime....she seems to know a lot about it, and she likes to try new things, and she tries it out on us. (Mountain Middle: 8th Grade Teacher)

A teacher at Walnut Grove echoed this notion that they were free to experiment as their judgement led them to and that should their idea not work out, they would have help figuring out the next option:

The beauty of it is that we can use technology but it’s an option--we don’t have to. It’s a tool. We can move it when we need to and have the support for us when things crash. (Walnut Grove: Teacher Focus Group)

In Harland’s district, the Assistant Superintendent for Technology recognized Harland Elementary school’s culture of risk-taking and viewed this as a benefit to the district in that the staff there was always willing to try hardware and software out and give the district feedback on it:

this school [Harland] often becomes a pilot for us, because they do have an expertise and a willingness to try new things....we’ll utilize them if we have a new set of technology or a new software package, or something like that. We’ll say, hey...Will you guys test this out? and they always will. (Harland Elementary: Assistant Superintendent for Technology)

In the Pine City and Joshua School Districts, the two schools whose technology use was mostly led at the district level, district administrators described the trusting and risk-taking they encouraged and felt:

It’s more of an open-minded approach [now in the district] and a freedom to experiment without being penalized. And I think our teachers feel that you don’t get zinged when that technology lesson doesn’t work....our principals’ approach has changed, [in] their evaluations of teachers. There hasn’t been one [teacher] who has been zinged for not getting their technology to work. We are here to support them... (Pine City Middle: District Technology Director)

I guess the trust that the superintendent gives [is key]. He knows what he wants, but he’s not telling me exactly how to do it....He doesn’t micromanage it....I think from above we have that freedom to operate in the best interest of the school district. (Joshua Junior: District Technology Director)

In summary, 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 the 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. In the next section we describe the main dimensions of professional community evident at these case study sites.

The Relationship Between Technology and Professional Community

The relationship between the presence of well-supported instructional technology and professional community among teachers is a complex one. Our case studies suggest that, under encouraging conditions, there is a reciprocal and recursive interaction among 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? We will look at several dimensions of professional community, as defined by Louis, Bryk, and Kruse (199X), and others (refs). These include: collaborative activities, particularly those focusing on curriculum and instruction; deprivatized practice, and reflective dialogue. Other dimensions 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 criteria for drawing our initial sample.

Collaboration and technology.

As noted earlier, 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:

I'd say the collaboration is high...and I feel a more sharing environment here than the competitive work environment that I was in before, where knowledge was power and they guarded their knowledge. And here I feel like if I teach them they appreciate the sharing and they are open in sharing in return. (Future High: Network Administrator)

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 (Future High: Teacher)

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:

...having the e-mail system that we have, the fact that EVERYONE in the school uses it...all the time, for everything...communication is amazing...I also think, because technology is new every day, I mean something new comes along, that at some point there is no one who knows everything. So, everyone here is still learning...everybody has their skill area, but no one is so much above anyone...so that allows for that...teamwork. (Harland Elementary: Teacher focus group)

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 (Pine City: District Technology Coordinator)

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]. (Mountain Middle: Sixth grade teacher)

In these and other cases, it is impossible to tease out a 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]. (Mountain Middle: 8th grade teacher)

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:

...If you're really going to use the technology and make it effective and be able to justify why you're doing it, that focus [on student achievement] has to be there...Not that you can prove that the technology is what got you there... but is one of the contributing factors to getting you there.

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 (Future High: School Secretary).

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 New Tech everyone agreed that they need even more time to meet. The principal is 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 provides conditions and facilitators for reflection. First, it is a common expectation that all teachers will use it to help achieve a desired purpose. At four sites technology use is 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 is to support student achievement; thus the ways in which technology are to be used are more broadly framed. Nevertheless, teachers in all of the schools have begun to consider, at deep levels, how technology can influence their own work and student learning. Because they are provided with or make time to meet and talk, and because effective technology use is a common focus, each of the faculties was engaged, to some degree, in "problematizing" technology use. The broad sharing of information in the building also enabled reflection. Unlike most schools, teachers let others know when they were starting a new initiative, in order to get reactions and help from others. This shared knowledge creates opportunities—teachable moments for adults—where commitments are not set in stone, and ideas are 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 (refs). We

were, therefore, somewhat surprised at the levels of deprivatization that we observed in the six schools.

At Mountain 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: Sixth grade teacher)

West 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...(Mountain Middle: Instructional Coach).

Deprivatizing practice is a specific goal for the instructional coach, and one where she feels there is a good deal of progress. She indicated that they had gone beyond the easy route, in which new teachers are assigned to watch more experienced teachers, to a situation where older teachers are 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 has been more difficult for her to have most teachers agree to regularly examine student work together, but she believes that she is making inroads.

At Pine City, the teachers viewed regular weekly staff meetings as professional development sessions, and opening up reflective discussion is 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...

A Pine Grove teacher 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.

At New Tech, where all teachers were committed to developing a new educational approach, teacher’s noted that in their previous school (the comprehensive high school in the district), collaboration on practice was threatening in ways that it was not at New Tech:

...If an individual or even a couple of teachers want to innovate within the walls of their own classroom, they can do that to a certain extent...but you, it raises the bar for the other teachers [so they may not talk about it.]

Although formal efforts to deprivatize at New Tech and Harland were taking a back burner to smaller collaborative efforts schoolwork, the staff noted that the culture was still supportive:
...Hey, we are small, nimble organization. People need to come into that organization and understand that we're all in it together. (New Tech principal)

...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. (Harland teacher)

...A lot of tutoring is going on among teachers. Teachers helping teachers (Harland technical coordinator)

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 some ways, the profiles of these six schools are more mindful of an R&D environment than a typical school. Many teachers have incorporated the assumption that teaching is 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 even in schools with strong teams (Kruse and Louis, 199X). The technology leaders have created environments that communicate and support the notion that integrating technology is a learning process; widespread technology in schools is new and technology is always changing. 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. To exaggerate, it was OK to be stupid. Or, perhaps it is more accurate to say that there was no such thing as being stupid. Instead, it was expected that some colleagues knew more others, and perhaps students knew 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 and how technology supported that. 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 that needed merely a few touch-ups. 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, are poorly supported, and are unable to create mechanisms to share their individual experiments. And, 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.

Six cases of schools that were selected for both exemplary uses of instructional technology and because of preliminary evidence of cohesiveness around common purpose cannot, of course, provide an answer to the question. However, our tentative supposition is that effective use of technology and professional community are mutually supportive—that increases in one create conditions for increases in the other.

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