

Discovering Technology Treasures:

Making Best Use of School Technology Resources

Master's Thesis

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Discovering Technology Treasures: Making Best Use of School Technology Resources

The Problem

“Innovative classrooms are abuzz with productive discussion and the excitement of learning. Students are working in teams on challenging projects, asking questions of each other, reviewing each other’s work, and referring each other to new sources of information. . . The teams have access to technology of various kinds, enabling them to access worlds of knowledge beyond the classroom, consult with other experts, assemble their work, and share it with their teachers and classmates. They also know that the audience for their work lies beyond their classrooms, in their families, the community, and visitors to their Web site.

The Digital Age redefines the boundaries of the classroom no longer are students confined to learning within the four walls of a room or the edges of a school campus. The classroom can now be a forest or stream, an office or lab, a museum or a zoo or anywhere real issues present themselves and professionals are working to understand them. Increasingly, the Digital Age is bringing these environments to students virtually, so that students in class or at home can travel via the Internet to a scientist’s laboratory or a collector’s collection.

Innovative classrooms are not defined by fixed places but by their spirit of curiosity and collaboration among students, teachers, and others in a true learning community” (Armstrong & Chen, 2002).

This description of an ideal classroom where real world learning and student engagement occurs demonstrates the importance of technology and 21st Century skills for students, but many schools around the world and, in fact, in our own nation do not benefit from the higher level of learning and student engagement that this type of technology infusion affords. Why? These schools are only inching toward adequate access to technology hardware and software. Students in struggling schools are underserved and do not have sufficient opportunities to use tools that can introduce them to the digital world where they can learn a skill set that they will need to thrive in college and in a global economy.

In some communities, however, there is no lack of access, yet the technical tools that can bring children skills that open doors to intellectual challenge are barely being accessed in meaningful ways. Walk with me for a minute through the halls of my elementary school in 2005 to see a snapshot of technology integration on a typical morning. Downstairs to our right are the first grade rooms, speech therapy, special education and functional life skills classes. Taking a peek into the first grade rooms, students just finished calendar time and moved to group activities. Some are cutting and pasting, one group is doing guided reading with the teacher, and two students are using Reader Rabbit software on computers. Speech teachers work individually with students at tables, and functional life skills students are in groups working with several teacher assistants, one of whom helps with Starfall (a free, Internet-based program) for phonics practice on two computers. To the far left, on this hall are a computer lab, kindergarten, and second grade rooms. Kindergarteners sit together on the floor for read aloud time

with their teachers. A look in the computer lab shows that it is empty, a few pages printing from the laser printer networked to teachers' desk PCs. Second grade students are writing at their desks. Some students write by hand in spiral writing journals, some conference with the teacher, and others have laptop computers at their desks where they work between the laptop and a handwritten copy.

Upstairs, the view is much the same. Most third grade classes read whole-class novels and practice reading strategies with sticky-note questions as they read together. SAIL teachers who assist with at-risk students are at their desks reading email. The upstairs computer lab computers, printers, and scanner remain idle. Fourth grade classes are into their rotations, some doing whole class math and some working on handwritten compositions. Most of the fifth grade students are at their desks with laptops creating food chain representations with Inspiration software. The teachers demonstrate techniques for modeling from a laptop/digital projector cart. Special education students work individually with teachers on activities related to their individual educational programs (IEPs).

Specials teachers lead whole group activities in art, PE, and music. The library is busy with students checking out books using the barcode scanner. A handful of students look for resources from the school/district database at kiosks. At this time, however, none of the digital cameras, video cameras, TurningPoint response devices, or Mimio interactive whiteboard devices have been checked out for classroom use.

From this view walking the halls, we see that technology resources are available for teachers in the school to use as they equip students with 21st century skills vital to their future success. Yet the technology proficiencies are hardly being addressed. These skills are what students will need to know to compete in a global economy, and they must become fluent with these tools and skills that "will be part of their long-term repertoire for ongoing learning" (Darling-Hammond & Bransford, 2005). The skills begin with technology but are not solely about the hardware and software taught in isolation, rather about technology as it is infused into the curriculum (Rivero, 2006, August). An instructional leader is needed then who can take teachers on this campus to the next level of technology implementation. The teachers will be better equipped to prepare their students with the technical abilities so critical to living in the world that is coming into being.

Access to technology is not missing in these classrooms. It is, rather, teacher learning and preparation for using and infusing technology that is absent, because "if teachers are to develop a curricular vision with respect to the use of technology for learning, [school districts] need to think of their responsibilities as including the production of technically literate teaching professionals who have a set of ideas about how their students should be able to use technology within particular disciplines" (Darling-Hammond & Bransford, 2005). In a school equipped with effective, up-to-date hardware and software, what should happen to prepare teachers to integrate available technologies seamlessly into student learning experiences? To find answers to this question, it may help to look at research to first examine, reasons why technology initiatives often fail in public schools; second, evidence for promoting technology use in schools; third, ways to empower teachers in technology use; fourth, reasons and methods for designing a community of practice for teachers using technology to sustain this use; and finally, viewing implications and conclusions reached for school technology integration.

Literature Review

Reasons Why Technology Initiatives Often Fall Short in Schools

From the time that computers came to popular public use, their acquisition in some public schools has come in a top-down fashion (Cuban, 2001). Such is the experience within the Round Rock Independent School District where from the beginning of mass technology acquisition, personnel in the instructional technology department and budget office determined what computer purchases would be made for schools through the bid process, and campus administrators would determine placement of hardware and software (Mary Jo Humphreys, Lead Instructional Technology Specialist, personal communication, 2006). According to some researchers, administrators deal with budgets, make purchasing contracts for districts, and oversee the purchasing power of individual schools. There is little direct classroom teacher input into such decisions, creating conflict between the actual needs of the stakeholders and the perceived needs as communicated to administrators by vendors who have a unique financial gain in promoting technology acquisition (Cuban, 2001 and McGrail, 2006).

There is a growing sense that while the physical availability of technology in schools is critical, these same administrators who make purchases do not recognize that the presence of the technology in schools is not enough to promote its use. What is most critical is the vision of the stakeholders for technology use (McGrail, 2006). What then, contributes to teachers' uncertainty in integrating technology? "Four larger clusters of conflict contributed to this ambivalence: 1) conflicts surrounding institutional control in implementing the laptop program and teacher agency; 2) conflicts surrounding standardized testing's uncertain relationship with technology mandates; 3) conflicts surrounding technology uses in the general curriculum and technology allocation in specific class types; and 4) conflicts surrounding professional identity and the challenges that both student and teacher technology use brought to this identity" (McGrail, 2006).

The No Child Left Behind Act of 2001 presents a distinctive problem for teachers integrating technology due to mandated standardized testing in public schools. "The assumption underpinning the establishment of standards and test based accountability systems is that they a) motivate teachers and schools to improve student learning; and b) encourage teachers to focus on specific types of learning. Some observers have raised concerns that the locus on specific types of learning too often translates into 'teaching to the test'" (Russell & Abrams, 2004). Teachers, in fact, report that they feel uncertain about integrating technology into a curriculum already packed in preparation for tests (McGrail, 2006). They perceive technology integration as being a secondary concern in a system with so much emphasis on the standardized testing (McGrail, 2006). It is evident, in addition, that pressure from this testing has had more adverse effects on use of technology in schools. Writing tests in particular offer a problem for technology integration due to the fact that standardized writing tests are paper based and not reflective of the abilities of students used to composition on computers, making teachers reluctant to practice digital composition in the classroom (Russell & Abrams, 2004).

Other inhibiting factors to technology use in schools are commonly noted in educational research. Teachers are often reluctant to use technology finding it unreliable and counterproductive in some instances reporting that the technology was inefficient, failed, or didn't function as planned (McGrail, 2004; Cuban, 2001). Traditional competencies for teachers in the past have not included computer skills, leaving teachers ill-prepared for implementing computer use (McGrail, 2004) and lack of time for

learning competencies and time for developing comfort levels for successful integration is seldom available (Chiero, Sherry, Bohlin, et al, 2003).

Evidence for Promoting Technology Use in Schools

Even with the reluctance of some teachers to incorporate technology into the learning experiences of their classrooms, a growing body of evidence exists for promoting the use of technology in schools. These benefits reach all students including those with disabilities, those from urban and low-performing settings, as well as general and gifted education classrooms. Added benefits have been found as well for teachers themselves.

There is much new digital literacy present in the workplace and outside of the school environment today which have not yet been fully embraced by schools. Unless students are prepared in the new literacy related to technology, a new form of illiteracy—digital illiteracy--will be born for the coming generation. Children have a right to be equipped in this literacy including the use of computers and the web (Rubenstein, 2006). Computers, in fact, offer access to reading texts in a variety of formats such as multimedia, video, and audio not previously available the print-only world, giving opportunities to reach struggling readers in a variety of delivery methods (Rubenstein, 2006). In addition, it is essential that these technologies and related skills are provided for students in urban and low-performing settings. Because these students are more likely to lack opportunities at home, it is increasingly important that they are provided in school (Russell & Abrams, 2004). Additionally, children with disabilities are now able to use assistive technologies which enrich their academic experiences, allowing them to do what was unimaginable in previous years. Using their own computers, these students can complete Internet research, take notes, and write their own papers without the assistance of a full-time aide (Curtis, 2005).

Technology also provides practical aspects in today's classroom. Students are noted to have increased time-on-task and attention spans because of their active involvement in what they do. This involvement, in turn, translates into fewer discipline management problems for teachers and administrators (Harpine, 2004). Technology itself can provide opportunities for teachers to organize information and complete daily tasks in a more efficient and timely manner. In addition it can "provide an answer to the chronic and debilitating effects of teacher isolation and time constraints" by providing opportunities to communicate and find new resources in a digital environment (Serim, 1999).

While increased academic skill mastery is a primary goal for schools, another is to prepare students to become dynamic citizens of the future. This requires the educational system to encourage life-long learners who can work cooperatively to solve real-world problems and think creatively (Harpine, 2004). Indeed, this goal promotes many of the skills found among those considered better prepared students for the future including "the ability to think quickly, adapt to changing conditions, build alliances to address large scale challenges, and work comfortably in a global information environment" (Riel & Fulton, 2001).

Technology-infused curriculum supplements the packed elementary curriculum rather than adding to it, offering activities which involve students in communicating, problem-solving, as well as increasing, implementing, and mastering academic skills in an engaging context which leads to increased retention (Harpine, 2004).

Empowering Teachers to Use Technology

“According to results from the 2005 National Speak Up Survey, 74 percent [of teachers] agree that technology has made their job easier, and 47 percent believe that technology has had the greatest impact in teaching and instructional support. In regards to student performance, teachers report that students are more active learners with richer multimedia learning experiences because of technology use in the classroom” (Rivero, September 2006,). Sinc technology, when integrated effectively, creates positive effects in schools, how can teachers be empowered to use it with the maximum outcome? We know that teachers must feel confident and capable to model its use in their classrooms to fully facilitate positive student experiences (Serim, 1999). Research tells us that prospective teachers should receive training through immersion in authentic situations which have a base in curriculum and technology grounded in situated learning (Dawson, 2006). It is essential; however, that these prospective teachers are given opportunities to reflect upon their experiences because their learning comes more from the reflection than from the experience itself (Dawson, 2006).

Professional development for all teachers, both novice and veteran, is mirrored in the same experiential form of training that is recommended for prospective teachers, with an emphasis on authentic practice and reflective activity. Their development may be enhanced through awareness of levels of technology integration outlined in the LoTi [Level of Technology Implementation framework] continuum (Dawson, 2006) or in other similar research-based continuums evidencing levels of incorporation in best practice models. This offers to educators the opportunity to assess where they are on the continuum, reflect, and set goals for appropriate technology applications in their classes.

Given the time and agency to plan and implement technology initiatives and to revise their curriculum as they feel is appropriate, teachers are more likely to embrace the technology itself and the professional development needed to put technology into service in their classrooms (McGrail, 2006). This emancipation will offer to teachers the feeling that they are empowered to choose whether or not to use technology and to what extent based on their own skills and goals. Given this freedom, “a one-size-fits-all approach to computer instruction for teachers will not succeed. Teachers will continue to require customized approaches to computer instruction in their professional development” (McGrail, 2006).

Designing a Community of Practice for Elementary Teachers Using Technology

Knowing that teachers’ professional development will be most effective grounded in authentic experiences in a situated learning environment, experience demonstrates that a community of practice may present the most authentic experience available without the one-size-fits-all, “sit and get” approach typical of many forms of professional development (Rivero, September 2006). Schools and larger educational institutions have many such communities, both formal and informal, but how might one be created for this specific purpose if not already present? Wenger, McDermott, and Snyder tell us that the design of such communities is more a matter of shepherding or facilitating them rather than creating communities from the ground up (2002). The idea is to build upon networks or personal connections that already exist in the institution and to assist in their development (Wenger, McDermott, & Snyder, 2002). These researchers offer seven principals for ushering this growth:

1. Design for evolution. Due to fluid boundaries and changing memberships, the community itself will change, building capacity within, and must be

- cognizant and prepared for this process of transformation.
2. Open a dialogue between inside and outside perspectives. Information from the outside offers opportunities for members of the community to see what they could accomplish upon its inward flow.
 3. Invite different levels of participation. Not everyone within the community is ready to participate in the same manner, therefore membership can offer comfort where they are, then build a center of interest that draws them in as their interests are piqued.
 4. Develop both public and private community spaces. The web of relationships within the community grows sometimes in private dialogue (face-to-face, blogs, or email), and at times in public communication situations (wikis, and other physical or virtual community spaces accessible to all).
 5. Focus on value. Communities continue to live and grow because they offer a recognized value to the larger environment.
 6. Combine familiarity and excitement. A comfortable community will have security and daily interactions as well as innovative events with new people who enter the community bringing fresh and exciting perspectives.
 7. Create a rhythm for the community. A combination of varying sizes and types of gatherings creates a balance between exposure to different ideas and the comfort of familiar associations. Without a balanced rhythm, members of the community are left feeling overwhelmed. (Wenger, McDermott, & Snyder, 2002)

The community model for professional development has a history of successes. They include groups marked by share sessions in which teachers share strategies and thoughts about technology integration (Chiero, Sherry, Bohlin, et al, 2003). Within these same groups is a variety of expertise, but the emphasis is on sharing, support, and construction of new knowledge (Chiero, Sherry, Bohlin, et al, 2003). This is the sole purpose of these communities because “the only ‘work’ that the community does is to create knowledge. Once created, that knowledge is captured, stored, and made readily available to other members in dynamic exchange supported by a knowledge architecture” (Wallace, 2006). Here members of the community can work together to build from strengths of those with particular expertise, thus giving others the power to bring forward the abilities of others who lack such expertise (Riel & Fulton, 2001). In this way the community works together to create common understandings.

Deb Wallace notes that the communities of practice model, originated as a business design, is expanding into the arena of learning communities and professional development with the focus remaining on sharing knowledge (Wallace, 2006). She offers thinking points for those considering nurturing a learning community of practice including an organization that has first, members prepared for collaboration and sharing; second, supportive culture; third availability of technology for communication, seeking, and sharing knowledge; and fourth, aligned organizational vision and mission. The last, point for consideration is realistic expectation for outcomes—work in, value out (Wallace, 2006).

Action Research

Action Research Defined

Action Research is defined by Center for Collaborative Action Research as “a process of deep inquiry into one's practices in service of moving towards an envisioned future aligned with values. Action Research is the systematic, reflective study of one's actions and the effects of these actions in a workplace context. As such, it involves deep inquiry into one's professional action. The researchers examine their work and look for opportunities to improve. As designers and stakeholders, they work with others to propose a new course of action to help their community improve its work practices. As researchers, they seek evidence from multiple sources to help them analyze reactions to the action taken. They recognize their own view as subjective and seek to develop their understanding of the events from multiple perspectives. The researcher uses data collected to characterize the forces in ways that can be shared with practitioners. This leads to a reflective phase in which the designer formulates new plans for action during the next cycle. Action Research is a way of learning from and through one's practice by working through a set of reflective stages that helps a person develop a form of ‘adaptive’ expertise. Over time, action researchers develop a deep understanding of how forces interact to create series of complex patterns. Since the forces are always changing, action research is a process of living one's theory into practice. The researchers both act and seek to learn from the actions taken. The subject of action research is the actions taken, the change, and the theory of change that is held by the persons enacting the change. While the design of action research can originate with an individual, social actions taken without the collaborative participation of others are often less effective. To be successful, the action researchers have to plan in such a way as to draw an ever widening group of stakeholders into the arena of action. The goal is to work towards a better understanding of their situation in order to affect a positive personal and social change.

This form of research then is an iterative, cyclical process of reflecting on practice, taking an action, reflecting, and taking further action. Therefore, the research takes shape as it is being performed. Better understanding from each cycle points the way to improved actions” (Center for Collaborative Action Research, 2007).

Action Research Process

The Center for Collaborative Action Research definition of action research describes the process I chose to investigate the lack of technology infusion for the purpose of improving student learning on my target elementary campus. Because the technology had been present and ready for teachers to integrate into the curriculum for the purpose of increasing student learning, I knew that I would have to examine my own practices so that I could first discover why teachers were not using the available technology with students. This field of action analysis looked at the driving forces and restraining forces affecting implementation of technology to advance student understanding in the classroom. I believed that the lack of teacher training in current technologies was the force that, given my position in the school context, could create the greatest positive outcome for teacher and therefore student learning. With the abundance of technologies available, teachers at my school could become more personally and professionally adapted to technology use. Within the elementary school, technology was used with fairly good efficiency for the business of running the school, but it was in integration into the classroom that we needed to become more proficient. Studies of positive uses of technology as evidenced in our own

Cadre 9 research in the OMET program with Pepperdine University showed that gains could be made by incorporating technology use into the classroom. My own personal research indicated also that technology serves as an important factor in bringing about student engagement in classroom activities. I wanted to know how I could improve my practices in my job to promote positive use of technology in the classroom, perhaps working further toward the transforming level of technology use where appropriate.

I needed to collect evidence so that I could view the environment from not only my own perspective as a technology integration specialist, but from the standpoint of teachers, sharing my discoveries with them and collaborate in finding possible solutions. Second, I planned to act by implementing a viable solution based on data and collaborative problem solving with teachers, my stakeholders, reflecting on the resulting technology use and collecting evidence for its effectiveness not only in implementation but with evidence of student learning. The overall goal of my action research would be to create a community of learners among the teachers, who would build and share expertise in using the available technology to strengthen their classroom practices, thus promoting student engagement and learning 21st century skills necessary for success beyond the classroom.

Could I become the instructional leader who would bring technology use on this campus to higher levels? I planned to use the action research process to work with campus staff to understand the local context of technology use and integration, to improve instructional technology practices, and to analyze changes for improved future action.

Summary of Three Cycles of Action

"The great aim of education is not knowledge but action." --Herbert Spencer

Cycle One: *Will identifying staff needs for technology training provide a viable baseline for promoting an increase in the use of technologies already present on campus?*

In order to identify the staff needs, I decided to use an online survey of classroom teachers in my focus school. Several different online survey services are currently available, but because of the advantages which ProfilerPro offered including a bank of prepared technology surveys, and their collection and data graphing, I decided to create my survey there. Using existing questions from ProfilerPro sample surveys and other web resources, I created a list limited to twenty questions, thus increasing the likelihood that teachers would thoughtfully read and complete the survey. I also wanted to ensure that all questions would bring data that would offer help in answering my action research question for this cycle.

Continuing to focus on completion of the online survey, I wanted to be sure that it was easy to follow, concise, and out ahead of the longer one already slated by campus administrators. I posted a Word document of the survey on BlackBoard which Dr. Riel helped to edit in Orlando and, with assistance from my learning circle, created a survey which I felt would meet my research needs. An email went out from both ProfilerPro and from me before the survey so that teachers would be prepared the following week.

Logging into my ProfilerPro account periodically through the following week, I could see that I had a problem getting faculty members to log onto the site to take my technology use survey. On the final day of the window for completion, only three had taken the survey. At this point I considered several

options including offering a hardcopy survey option, or re-introduction of the survey with a revised timeline. I conferenced with my principals about the poor survey response and together we decided to use the beginning of a faculty meeting to underscore the importance of my survey. I also took steps to assist teachers with the process including registering each online as a member of ProfilerPro, and sending a new, more detailed promotional email reminding them to complete the survey. Daily, I watched the results and sent a cheerful reminder message to those teachers who had not yet completed the survey, followed by a personal note on the last day.

With all of the survey results in, I compiled the data into an Excel spreadsheet and posted it to BlackBoard. The school data was sorted into separate tabs, breaking the results down into grade level and departmental data groups for closer viewing.

Cycle 2: *Will providing opportunities for professional development increase teachers' knowledge base for technology integration into the classroom?*

Survey data provides a unique window into the minds and systems of a community of practice. For this reason careful examination of the data is critical in achieving a realistic view for use in action research. Since, as a part of cycle one, I divided the survey result into its components, I had a fairly accurate view of each of the six areas surveyed. I focused most of the actions for my second cycle on categorizing the data by teacher groups according to their grade levels taught or by special assignment. This presented a communication opportunity between the teachers and me as we collaborated to increase technology integration and make its use more effective. Prior to this time, I could come to teachers with an idea of my own, demonstrate for them a new hardware or software, or answer questions which they asked directly, but never had a basis for saying to them, "Look, this is what you have told me that you need and want to improve your teaching practices, and I am here to offer help."

With funding for technology professional development provided by the school district, I calculated the number of teachers for whom it would be possible to provide out-of-class time for professional development related to the cost of paying substitutes. The budget given for this school would provide for half-day substitutes for each teacher in grade levels K-5 plus specials teachers including music, art, and physical education/wellness, but not special education which has a separate technology fund.

Groups were emailed to schedule a time to meet with me so that we could look at their specific data together, determine what it said about their technology needs, and draft a design for their upcoming professional development. My incentive to meet was a promise that I would bring snacks and make the meeting time short and productive.

Meeting with teacher groups to plan their half-days of technology professional development, I provided snacks to help create a comfortable working environment. As a team, we went through the survey results one question at a time, focusing specifically on the areas indicating need. One point of interest we noticed as we went through the data was the fact that a group not using a specific hardware did not necessarily indicate a weakness. Each group of teachers has its own specific tasks to accomplish, and not all technologies are necessary or even helpful in taking care of those tasks. By using the data from the survey and personal meeting times, I feel that we planned productive half-days that teachers would find applicable to their needs at work and would, in turn, benefit the school's mission.

Throughout the planning meetings, I discovered an exceptional opportunity to touch base with groups

of teachers in a way which, because of the small size of the group and the informality of its setting, allowed them to ask questions related to technology which were on their minds but had never been asked because they were not specific to daily routines. Because these meetings made me realize that teachers have a need to know beyond what I have been offering to them, this was a springboard opportunity to add to my cycle three actions and provided more opportunities to connect with teachers and for teachers to connect with each other in new and varied ways of keeping technology information fresh and engaging.

Prior to each training session, I completed several tasks including room reservations, sent email reminders to contact substitutes, created participant notebooks with an agenda plus instructions we would use during training and afterward, saved digital copies network's shared drive as well, and made a very important check of equipment and software.

On the dates of training, I set up a snack table in the training area, set out their notebooks, set up all needed equipment, and provided a sheet to sign offering credit for district professional development. I made a point to be seated casually and invite the teachers in, giving opportunity for conversation before heading directly into the agenda. As we began, I went through the agenda which we had created together, checking with them to see in which order they preferred to take the agenda so that if they wanted more time with one item, we could begin there, being certain that it was covered to the fullest. The time was relaxed, and instead of spending much time demonstrating, I guided the teachers through hands-on activities, giving ample time for each of them to explore and ask questions as needed. Sometimes I did not have answers to their questions during the sessions, so I made a point of researching the answer the same day and sending it to the group via email. If there was not enough time to work through each item selected for the agenda, we agreed to plan a follow-up time during a planning period or after school. The last activity for each professional development session was for the teachers to write a short email to me reflecting on their learning for the day.

Cycle 3: *Will professional development opportunities crafted to meet the needs of teachers translate into changed practices related to technology integration with the goal of increasing student learning?*

Immediately after the cycle two training sessions, I followed up our learning time with emails that explained answers to their questions I was unable to answer during the learning time. This served to keep the information fresh, to remind teachers that I was listening and active in their learning, and offered them an opportunity to report new questions and comments. At first there was a flurry of questions, comments, and reminders. They told me more about what they thought they could really use and their plans to integrate them into their classes (Appendix A).

At this point, I found myself checking in with teachers through email, but primarily by walking the halls and stepping into rooms when I saw technology in use. This is how I contacted second grade teacher Lisa D. who was especially interested in using the Mimio with her class. Lisa used the Mimio as a collaborative tool for students to demonstrate their thinking for math exemplars and continued using it to collect brainstormed ideas when her class began talking about creating animal PowerPoint presentations. Because the boards could be saved and printed, she was able to share the class thinking with students who had been absent.

Teachers Michelle S. and Amanda T. who had previously seemed skeptical about using technology with kindergarteners decided to collaborate and try using the Mimio with their combined classes. I helped to

set up the equipment the day before the activity, practiced basic operations, and reminded them that our “expert” Lisa was across the hall if they needed help. These kindergarten teachers used the Mimio as a tool for displaying an interactive website with choices the children could make. Though they reported a few difficulties in using the equipment at first, both teachers were pleased enough with the result of their lesson that they documented it with photos and determined that they would consider the display equipment as they planned future lessons.

The fifth grade teachers were especially interested in using the interactive TurningPoint voting devices in their classes. Melinda G. was the most interested to use the system with her class, and while part of the presentation worked for her, Melinda was disappointed that the grid indicating which devices had responded during the presentation was performing erratically. She came to me for help, and we worked together without much luck to resolve the problem. Because of her disappointment, Melinda turned the equipment back in to the library and did not attempt to use it again. I persisted in working through the problem, however, and finally discovered a solution and communicated it with her shortly before school was out for the summer.

First grade teachers who had never used the laptop computers with their classes soon began integrating them into their language arts curriculum. Because I had told them that the second grade teachers taught their students how to use the laptops effectively, the first grade teachers met with the second grade team to form a class-to-class partnership. Rachel G.’s first grade students began using laptops from Lisa D.’s second grade class with student guides to assist along the way.

It wasn’t until after the half day of training that third grade teachers decided to implement technology presentations in their student-led spring parent conferences. Using PowerPoint, the group of five teachers assisted students in demonstrating their learning in presentations for their parents. This became an integral part of the talking points for the conferences.

Fourth grade teacher Gigi S. decided to go beyond the professional development learning and came to me asking what she could do differently with her students who were about to research important events, places, and people of Texas history. She wanted to do something new that hadn’t been tried before, so together we created a plan for research and presentation of information in the form of podcasts as an online Texas Audio History Museum. Students completed online research, and then became directors of the project, recording their classmates’ voices, helping them to select and integrate background music, and save the files in MP3 format. This project was documented in a digital story scripted and recorded by students and was recognized by the district as an example of best practices in technology.

Through all of the technology integration attempts teachers made during cycle three, I made a point to show my enthusiasm for their actions without regard to how simple or complex they were. It was the effort and follow-through that I wanted to reward. I used email communication to offer congratulations for their efforts and to encourage them to continue in light of any problems they may have encountered. In addition, I publicized their successes among other faculty members and to the principal in an endeavor to promote an eager community response, not solely supported by me. It was also important to continue making a physical presence in classrooms and responding immediately in person as well as by email or phone for questions, troubleshooting, and to personally view successes.

Findings

Cycle 1

Those Taking the Survey

Data gathered from my survey in ProfilerPro indicated thirty-six of forty-one possible classroom teacher respondents. School personnel who were not asked to take the survey included administrators, a librarian, non-classroom support teachers, paraprofessionals, office staff, substitutes, therapists and diagnosticians, custodians, and cafeteria workers. Three classroom teachers did not respond to the survey, and two classroom teachers who were on maternity leave did not answer as well.

The Survey

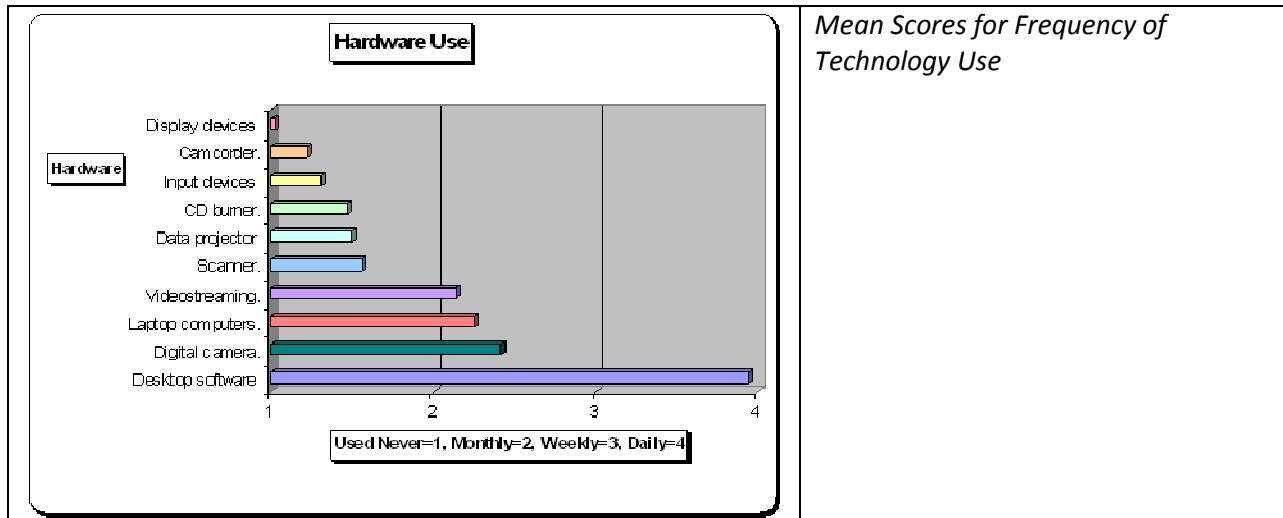
The survey itself could be broken down into six sections. The first section related to technology hardware already present on the campus and teachers' degree of use of the hardware with responses of use frequency ranging from *Not At All*, to *Monthly*, then *Weekly*, and finally *Daily*. The second section of the survey had to do with competence in technology integration with answer choices indicating *Not At All* [confident], *Minimally* [confident], *Confidently* [integrated], and *Able to Teach Others*. After that, teachers were able to select up to four obstacles which they face in educational technology integration. The fourth section of the survey had teachers select the area of professional responsibility in which technology has had the greatest impact. After this, teachers were asked to rank their responses to attitudinal statements regarding technology use and support on campus. In the final section of the survey, respondents were asked to briefly describe their best use of technology integration.

Survey Results (Appendix B)

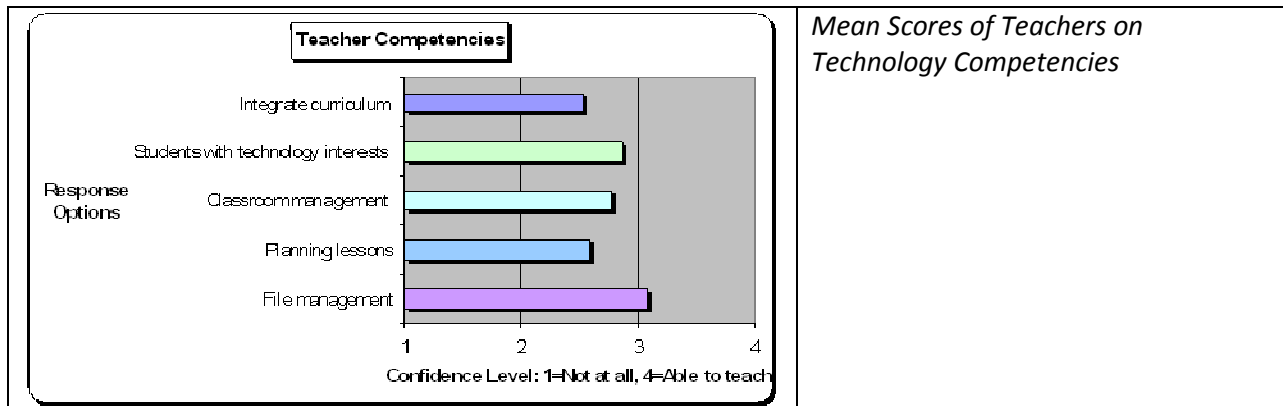
Taking each portion of the survey as a separate entity, the data may be viewed in a variety of ways, but the view taken for the purposes of this report was that which I believed would be most helpful in making positive changes in the use of technology for academic purposes on the campus. My goal was to use the data to help customize professional development along with teacher input in order that teachers would have a greater buy-in to technology use, and apply it in their classrooms.

The first ten questions asked teachers to select how often they used ten hardware-based technologies that were presently available. These hardware items included desktop computer software, laptop computers, data projectors, CD burners, digital display devices, television to computer video streaming, audience input devices, digital cameras, digital camcorders, and scanners. Overall, data for the campus showed a high use of desktop computers with their related software. The next most highly used technology was the digital camera, indicating that most teachers ranged between using them monthly (2) and weekly (3). The next two most highly used hardwares were the sets of laptop computers along with video streaming capabilities used monthly (2) and weekly (3). In the weekly to monthly use range of hardware included first data projectors, CD burners, audience input devices, camcorders, and

scanners. The least used hardware items were, the interactive display devices, which according to my own observation received no use at all.

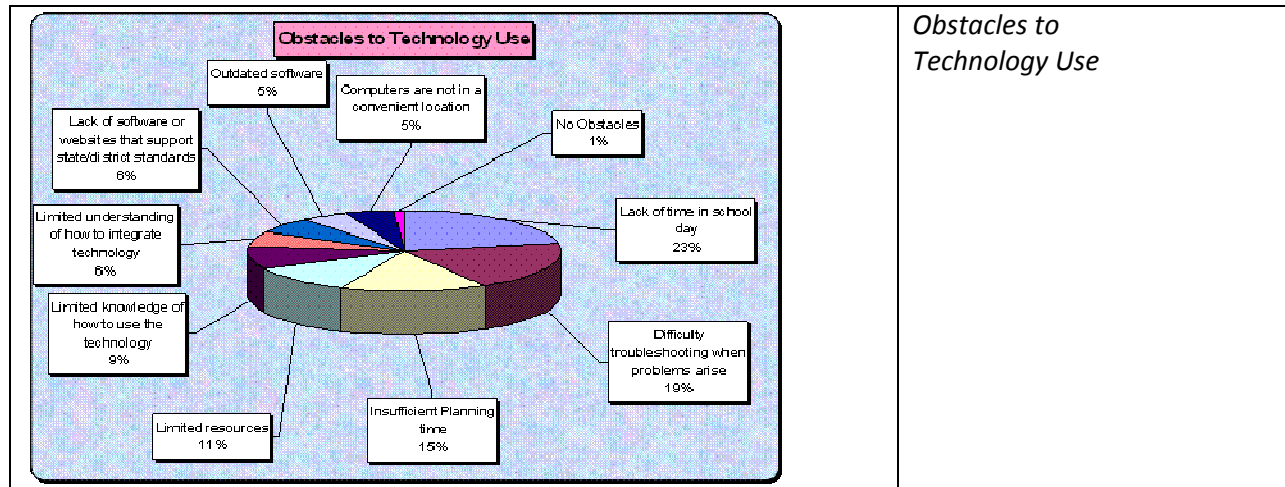


Questions eleven through fifteen in the survey related to teacher competencies in file management, lesson planning, classroom management with technology, employing student expertise, and technology integration into the curriculum. As a confidence measure ranging from not at all confident, to able to teach others, the average response of the campus to all five questions translated to a feeling of confidence.



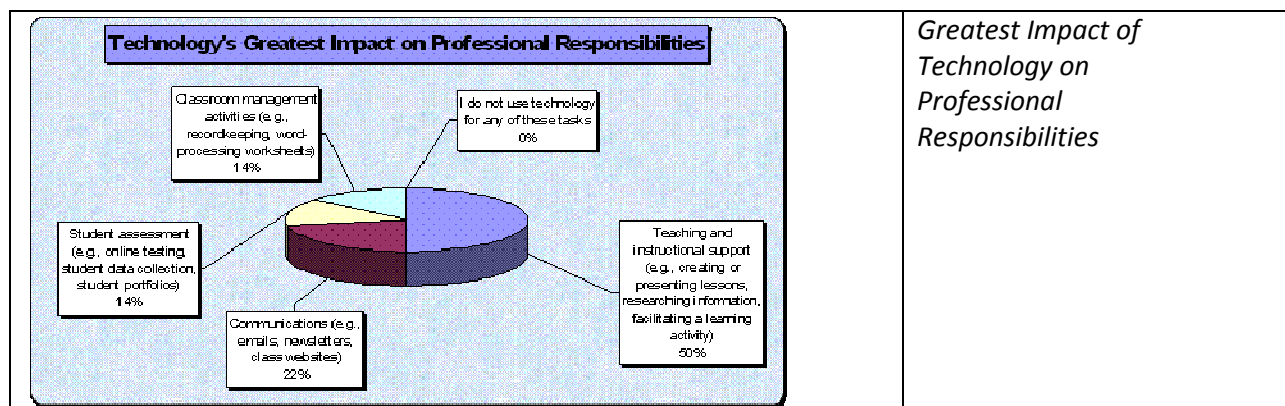
Question sixteen offered ten possible obstacles that get in the way of using technology. Survey takers were allowed to select up to four obstacle indicators with results showing that time was one of the major factors hindering technology use on this campus with lack of time in the school day to use the hardware and software with students (23%) and insufficient planning time for integration (15%) both

ranking high. The second-highest rated obstacle was personal difficulty troubleshooting technology (19%).



Obstacles to Technology Use

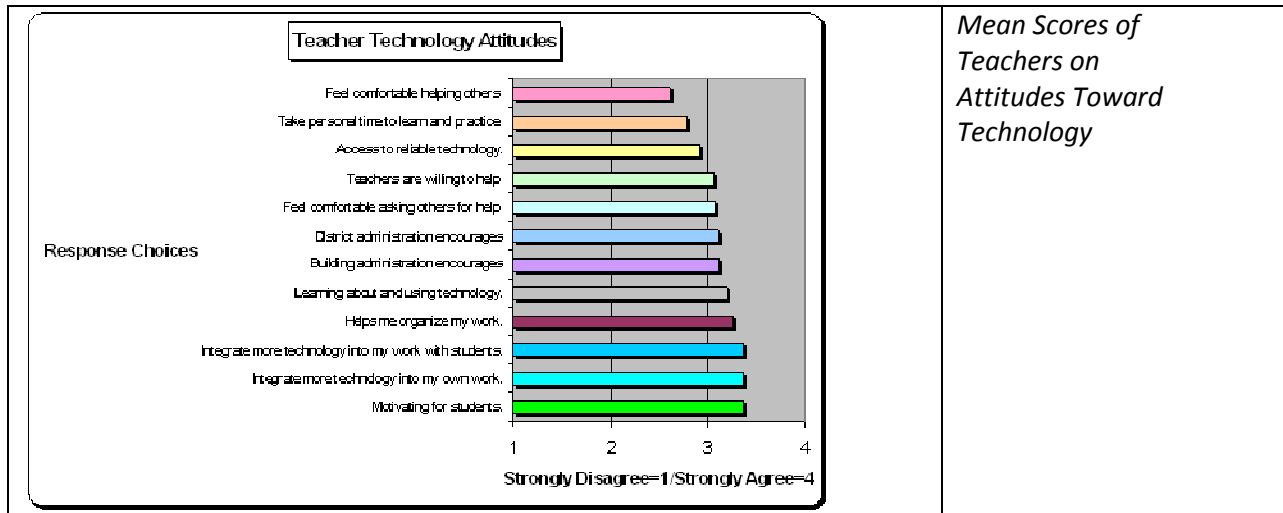
The greatest impact of technology on professional responsibilities was a short section of the survey allowing teachers to respond with the one area in which they felt technology provided the greatest influence. Fifty percent of the teachers taking the survey indicated that teaching and instructional support provided the single greatest impact on their professional activities, and another fourteen percent indicated classroom management activities had a significant influence on their actions as well. As closely related as these two categories are, if collapsed, they would show that teaching and instructional support including classroom management is viewed at sixty-four percent as having by far the greatest bearing on their work as teachers. The second single highest rated impact was communications (23%).



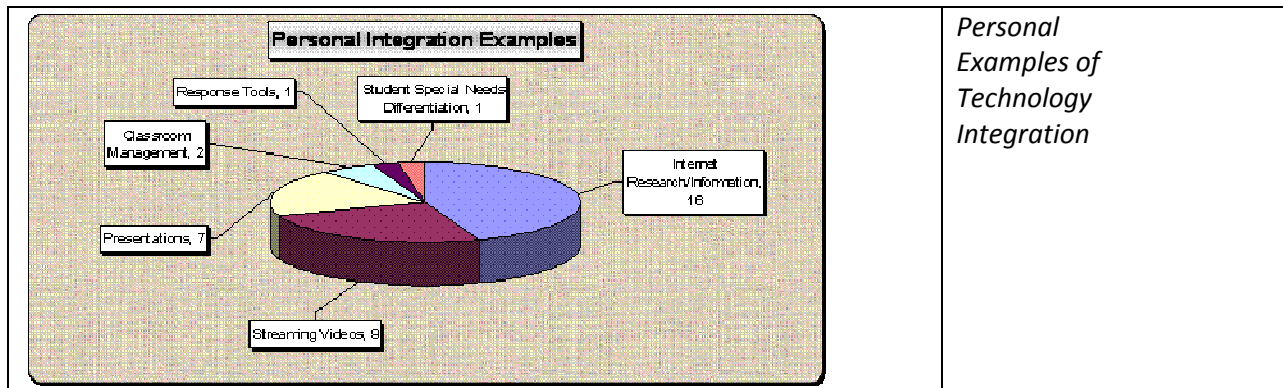
Greatest Impact of Technology on Professional Responsibilities

Section five of the school technology online survey was focused on teacher attitudes within the school. Survey-takers chose their responses to attitudinal statements ranging from *Strongly Disagree* to *Strongly*

Agree in a one-to-four ranking of statements. Averaging responses again, all of the statements indicated general agreement (3), but the lowest areas of agreement were in feeling comfortable in helping others which closely coordinated with the previous question among the obstacles regarding troubleshooting, and in taking personal time to learn and practice technology which also underscored the obstacle question regarding time to plan and implement technology. Most of those teachers who disagreed with statements were novice teachers who spoke out in small team meetings about feeling uncertain in various areas mainly because of their own lack of self-confidence in many areas of teaching.



The last section of the survey asked teachers to give a brief example of their own best practices for using technology were broken down in to six areas. The highest response from teachers indicated use of the Internet for either professional or student research as their own best practice in the use of technology (16), and following Internet use, teachers felt that they demonstrated technology integration in their professional and student use of technology to create and present content (9), and infusion of streaming videos into content presentation (7). The other categories had one and two responses each. From these examples of technology integration, I drew information regarding areas of comfort among the faculty and campus experts who could be utilized for demonstration and assistance with available technologies.



Answering the Cycle 1 Question

Will identifying staff needs for technology training provide a viable baseline for promoting an increase in the use of technologies already present on campus? The Technology Usage Survey created and implemented online through ProfilerPro for my target campus provided ample baseline information for creating technology professional development. The core data gathered from the survey and subsequent meetings with teaching teams indicated areas of need in learning hardware, technology integration into the curriculum, obstacles and attitudes to overcome, and in areas of comfort and expertise among members of the learning community.

Cycle 2

Throughout the in-service, teachers expressed a great deal of appreciation for the time they were given to spend in a hands-on environment learning about those things that were most important to their practices from survey data and from our planning meetings. From the first few sessions, reflections from the teachers came more in the form of thank-you letters, but their engagement was evident as well as their appreciation for the format of the training time offered. Other reflections from later sessions were more helpful because they showed me how teachers planned to use the learning, and offered thinking points for some problem solving that I might be able to help with so that they would not find obstacles to using the new learning.

From all of the responses, however, I learned that teachers were most impressed with and excited about the technologies that they felt would benefit them in lesson presentation. These included the digital projectors, TurningPoint software that is used with interactive response devices, and the Mimio whiteboard presentation devices. Other interests included software that would provide technology integration opportunities for students including NetTrekker for research, Kidspiration for writing and mapping activities, and the Texas Math and Science Diagnostic System that is an online software for creating customized online activities, quizzes, and tests related to the Texas Essential Knowledge and Skills as well as the integration opportunities we brainstormed using the digital cameras. Finally, the two groups who wanted more training for our Lotus Notes email system were amazed with what they were able to accomplish in their own organizational skills and communication productivity.

Answering the Cycle 2 Question

Did providing opportunities for professional development increase teachers' knowledge base for technology integration? Collected evidence mainly in the form of email communication indicated that teachers had a very positive response to their half-days of technology professional development training. First, their reflective emails showed that they appreciated the opportunity to be a part of planning their own professional development based on their needs as expressed in the online survey of cycle one, and in our planning meetings. Also, teachers expressed that they felt that they learned more in a relaxed environment during the school day when they had time for hands-on learning and could practice with their actual classroom materials. Additionally, the comments and questions which I received after the trainings showed that teachers were thinking about and applying their new knowledge.

Cycle 3

The first noticeable response I saw in teachers was an increase in willingness to take risks. As we had worked side-by-side in cycle two, teachers noticed that I did not have an answer for every question that they had and that sometimes the hardware or software didn't work exactly as I had planned. They saw that I could work through the problems, sometimes reading through manufacturer help files, sometimes calling outside experts for assistance, and sometimes just trying repeatedly until that moment came when the solution appeared. Additionally, the librarian and I continued adding sets of directions in the Technology folder on our network's shared drive for using school and library equipment. With my help, the help of other pioneers and experts on campus, working with new hardware and software didn't seem like such a big risk after all.

With individuals taking these risks, the use of technology had a domino effect among teachers who began to notice others embracing new practices with technology. A third grade teacher whose daughter was in fourth grade and participated in the podcasting project wrote to me saying that she, too, would like to integrate this kind of learning into her plans. She suggested that I add to the Technology folder on the shared drive a list of ideas that teachers could use as they plan units together.

Almost immediately, my efforts to increase the use of technology also increased the workload of the librarian who said that suddenly there was a rush to check out equipment that had remained dormant for some time on her shelves. She didn't feel prepared for the numbers of teachers wanting to use digital cameras, display projectors, laptops, or TurningPoint kits. She wrote:

The technology training definitely made teachers more aware of the technology available on campus. They are now much more comfortable with the technology and request to use it on a regular basis. Equipment that had been lightly used in the past is now used on a regular basis. There has been such a demand for data projectors, laptops, and digital cameras that the items are often booked for weeks in advance. It is a juggling act to try to provide the technology each teacher requests at the time they need it for instruction. Teachers frequently must reschedule their lessons for a time when the technology they need is available.—Emily G., Librarian

Because of this unpredicted need, Emily and I had to work on a long-range plan for acquiring and refreshing more of the equipment in demand. This included looking at the library and technology budgets, since we felt that we had a better sense of what our community needed and wanted to use in the classrooms. We also had to revisit our calendar and policies for checking out equipment so that it could be more evenly distributed and available for more users on an equitable basis next year.

Parents became excited about the learning that their students were doing toward the end of the school year. Parent groups wanted copies of the products their children had completed including original audio books second graders created. One parent was so excited about the fourth grade podcast project that she sent an email with the link to her son's former teachers, one of whom works on my other campus. This teacher sent me a complimentary note and copied it to the principal who asked me to lead the same project on her campus.

Answering the Cycle 3 Question

Will professional development opportunities crafted to meet the needs of teachers translate into changed practices related to technology integration? The clearest form of evidence was the dramatic increase teachers' checking out a range of digital tools following my work with teachers. Anecdotal evidence pointed toward a change among many teachers' practices in both their professional responsibilities and especially in classroom technology infusion that led to an increase in student learning and engagement. Based on the questions, comments, observed activities, and student products produced since the end of the professional development sessions in cycle two, there was a marked increased incorporation of technology into the curriculum. Enthusiasm for learning new applications for technology equipment and software increased also. As long as the creative uses continue to build new ways of teaching, it is likely that the process of sharing these changes will continue to inspire other teachers to take the risk to integrate technology with their lessons. Additionally, the comments and questions that I received during cycle three showed me that teachers continue thinking about and applying their growing knowledge and skills in new ways as they preparing through the summer months for next year's classes. Keeping the available equipment in sight, making continuing education available, providing assistance that is easily accessible, and promoting enthusiasm remain at the forefront and seem to be key in changing practices of teachers as they integrate technology.

Final Reflection

I wish that I could say that the entirety of my action research project was carefully planned and crafted from a thought that came to me in a lightning flash early in the OMET program. The project was not and did not come easily. Some of the best parts of the project seemed to fall into my lap from nowhere. At the outset, I had a general idea for my project that was a product of frustration with underuse of campus technology, but the fall semester saw me working as I had in previous years making attempts to bring about change that led to limited success. It wasn't until halfway through the program that the process began falling into place and making sense to me. I saw that all of the pieces we had completed in class including the force field analysis, framing the research and action research timeline were purposeful and helped me to clarify my thinking. I found that without research, a plan, careful preparation, and reflection, serendipitous events such as being given district money for teacher technology training would only lead to more unproductive professional development that would not shape change.

I believe that I was able to accomplish what I set out to do with reserved success, but success which will continue to grow and bear fruit. As I consider the reason for this success, I attribute it to several causes including my own tenacity and organizational skills, and to my genuine interest in changing how technology is integrated into the curriculum. Credit must especially be given, I have also realized, to a working environment that includes an organization and staff who promote mindful efforts to do whatever is necessary to help children learn and grow as members of a world now defined by a broader view, and who encourage leadership at all levels.

Learning came for me, as it tends to for many, in the mistakes I made along the way as well as through thoughtful collaboration with my learning circle and with critical friends. At the beginning of the survey process, I found myself creating the instrument much as I had created activities and tests during my

early years of teaching. Little thought was given to how I could disaggregate the data once it was before me and how I needed it to speak in order that I could move to appropriate action. With review, discussion, and suggestions from my learning circle and discussions with my assistant principal, however, I was able to gain a better perception of how to craft questions and about how many questions should be asked of a willing survey-taker. Coaching from Dr. Riel in Orlando taught me how to word questions and answer choices in order that I might receive the most accurate feedback. Learning from a small amount of survey-taker questioning, however, I now know as well that it is important to pilot a survey before it is offered to its intended audience so that confusing areas in the survey can be made more transparent before its introduction.

After looking through survey data and discussing it with teacher groups, it became apparent to me that teachers have a genuine need to have a part in planning their own paths for learning. For most of my teaching career, faculty meetings have been planned by administrators and professional development options have been created for teachers by experts in varying fields. The action research experience has taught me the importance of going to teachers first to discover their needs before planning and then, if necessary, melding their needs with other critical information. I was truly warmed by the positive response the teachers had to this part of the process, and believe that we have forged new, trusting relationships that lead to a willingness to take risks that will, in return, promote future successes.

There is a myriad of small pieces of learning that I fit together during the process of trying to create effective professional development. First, I found that a comfortable environment and positive feeling tone created a sense from the beginning that we were all learning together and that experimentation and risk-taking was not just allowed but desired. Though the food I provided was appreciated and important in creating the comfortable atmosphere, even more important was the negotiable agenda, folders of instructions, prepared software and equipment, and a hands-on opportunity to experiment. After the first session though, I found that having equipment prepared was a start, but testing it ahead of time was a more important factor in success. When the Mimio didn't perform during the first session, however, the environment allowed for mistakes and learning took place as we solved the equipment failure together, offering an opportunity to address the troubleshooting obstacle from the survey. It was gratifying to everyone, I think, to see that I was still learning with them.

Looking back to cycle three, I will first say that learning to account for timing as well as planning the actions for research is critical. If I had begun cycle one earlier or had at least been able to bring its data collection to a conclusion sooner, more time would have been left on the school calendar to complete the actions which I thought would bring my research to a satisfactory point of closure. While I had hoped to have teachers meet to share their learning in vertical teams, other end-of-the-year-activities kept this from happening, making the cycle seem incomplete.

Perhaps the greatest realization that I had was not so much the fact that teachers were or weren't using their knowledge, but that after training they *wanted* to infuse more technology into their learning experiences with students. They started coming to me to ask what more they could do, watched each other's lessons and asked, "Can I do that, too?" This felt like a great success as I noticed a culture of interest and a building vision. I learned that not only did the teacher interest help them to construct vision, but it increased my enthusiasm for continuing to plan new ways to build an environment in which the technology we have present on campus can increase efficiency in professional responsibilities, renew an interest in crafting engaging lessons using technology, and promote the educational community awareness of expertise among its members.

In no way does this reflection signal an end to my interest in this action research. First, I plan to begin the coming year with the vertical team meeting that I was not able to schedule during cycle three; I feel determined to make it happen. This will serve to begin the new school year with a review of what we learned the previous year and to show the new teachers some of the possibilities for our continued journey into technology education as a team. This will offer a time as well for the new teachers to share ideas that they have for our technology that they might lead in our learning community. I would like, in addition, to bring this entire process to the other school I serve, where we can all benefit together from the successes and mistakes encountered this year. This is indeed not the end, but a beginning for more and better use of technology in schools. My feeling of new opportunity was expressed well, I think, by a newspaper columnist who wrote:

“I’ll admit I’m a big fan of Peter O’Toole. Recently, I saw him in an interview where he was asked his favorite role. His response was perfect: ‘The next one.’ I couldn’t come up with a better way to approach your job than feeling like your best work still lies ahead” (Rosner, 2007).

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Appendix

Appendix A

"I plan to take advantage of the Math and Science TMDS [Texas Math Diagnostic System] for creating assessments and for online activities with my class as reinforcements."—Marta V.

"My goal for myself is to use technology beyond what I am already using at least once per week."—Valerie T.

"I enjoyed learning about some of the useful features in Lotus Notes. I now have my spell check working and need to set up my signature."—Amy G.

"We learned a lot of useful information which I have already begun to apply. I was even able to convert our taped music onto CD."—Sandy D.

"I am very interested in using the Mimio. I am thinking about using it during a video streaming to model note taking. I am used to stopping the streaming [video] and telling them what to write. With this I could show them."—Teresa O.

"I really enjoyed getting to work with TurningPoint software. I have felt comfortable using PowerPoint, and it really surprises me how easy it is. I like the fact that we can keep the correct answer saved. I would like the opportunity to spend more time on creating these slides because they can serve as a review or even a pre-test."—Rebecca S.

"As a follow-up, can you continue to be available for trouble-shooting and helpful hints? As you learn new things about Power Pak Pro and TurningPoint, you can share these with us."—Lydia P.