A Case Study of Project OWLink: Teachers' Reflections

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In light of the information revolution, there is a growing clamor for schools to prepare students for the demands of life and work in the Information Age. This requires teachers to evaluate and master those techniques that students are also mastering. Indeed, Seymour Papert (1993) points out that children already are racing ahead of their teachers in their use of technology.

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Hypermedia designs provide a rich and unstructured learning environment for learners, and various forms of telecommunications (e.g., Internet, teledistance links) can provide a more collaborative environment (Driscoll, 1994). Terms like "cooperative learning" and "problem-based learning" typify the changes for students and teachers from passive to active participation in the educational process. If used correctly, technology encourages student-centered learning and new ways to examine the process of learning. Teachers at the K-12 level have a pivotal role in this transformation. Their success in redefin-

ing the classroom to achieve high levels of student competence is critical. However, traditional classroom training is inadequate in preparing teachers to incorporate technology into the classroom (Cuffin & Macrae, 1996). Indeed, few faculty development programs exist that allow teachers to incorporate interactive technologies into the classroom (Cuffin & Macrae, 1996). This case study focuses on the impact of Project OWLink technology training on teaching practices by presenting highlights from interviews with six teachers.

The OWLink Project

The OWLink Project is a distance education project of the Center for Technology in Teaching and Learning at Rice University, underwritten by Southwestern Bell Telephone Corporation. Through using a fiber-optic network, five Texas K-12 schools have been linked since June 1994. The system provided each school with twelve multimedia computers as well as two-way interactive teledistance equipment, which linked them to Rice University and to one another. This technology allows data, video, and audio to be delivered simultaneously over a single high-speed network connection.

The aim of Project OWLink is to develop a community-of-practice among teachers and students that emphasizes the use of technology to change instruction from the teacher-centered model to one in which emphasizes the collaborative nature of learning. The OWLink project promotes a particular "point of view"—technology should be used to "rethink" processes rather than merely making them more efficient, more consistent, or less expensive. This viewpoint recognizes, however, that the transformational power rests not in the technology, but rather in the people who can re-purpose the technology for positive or negative impacts. Further, the processes by which the transformation takes place are not osmotic, but take purposeful and perhaps revolutionary strategies.

The OWLink Training Program

In the two-week training program, six (3rd-grade to high school) teachers learned to use the Internet as both a research and communication tool and as a repository for their own work, which could, in turn, be shared with others through on-line lessons. The teachers from the six different campuses collaborated to produce inter-disciplinary units that often combined subject areas and grade levels. The training program ascribed to a particular training model, which was congruent with the philosophy of the OWLink project (see Kumari, 1997, for a description).

During the OWLink course, the teachers were trained in the use of the Internet, creating Web sites, electronic mail, teledistance facilities, and other multi-media resources. An important requirement of the training was that teachers create collaborative lesson plans. One collaborative project, designed during training,

involved producing a Web site containing information on George Orwell's novel *Animal Farm*. To enable the students to understand the allegorical links in the novel to the Russian revolution, two teachers searched the Web to find suitable sites for their students. The Web page was replete with links to historical figures and the events of the Russian revolution. Students were required to present, using the teledistance equipment, to their peers and teachers information on these allegorical figures.

The lesson plans were created to promote student learning through focused exploration of the Internet, exchange of thoughts and ideas, presentations to peers and teachers, and culminating in formative and summative peer-review.

OWLink Case Study

What was the long-term impact of OWLink technology training on teachers' behavior? To try and answer some of those questions, the six teachers were interviewed twelve months—or in the case of one teacher, twenty-four months later—following the OWLink project technology training. During this time, the teachers had joined an electronic community that interacted via e-mail and video-conferencing throughout the school year. Most of these teachers were self-selected. They had volunteered to participate in the OWLink training because of their wish to integrate technology into their curriculums.

Participants were six (three male, three female) K-12 teachers. Grades taught ranged from third grade to high school. Three taught English, two taught mathematics at the secondary school level, and one taught a self-contained, multi-grade 3-5 classroom. Teaching experience ranged from two years to 21 years. Once the participants had agreed to participate in the study, the first author, who had no prior contact with these teachers, interviewed them individually. Each interview lasted for approximately thirty minutes. The interview covered such topics as how the teachers assessed the students when using the technology and how they incorporated technology into the curriculum, their initial reactions to the technology, and how the teachers saw their role in the classroom since the introduction of the technology.

Results

The interviews revealed common themes that gave insight into how technology training influenced teacher behavior. These common themes are explored in more detail in the following sections.

Support of Electronic Environment in Larger Community

Many teachers spoke about the support that they had received from their respective schools during their implementation of the technology into the curriculums. For many teachers, time scheduling of rooms to use teleconferencing equipment was essential. School administration gave tremendous support to many teachers in coordinating schedules between two locations. One teacher spoke about

the importance of educating the school administration on the best ways to integrate the technology into the curriculum.

Comment: Administration support played a significant role in Project OWLink from its inception. When Project OWLink was introduced in 1994, the principals approached twelve teachers who were willing to integrate and be responsible for the new technology introduced into classrooms (Miller & Kumari, 1997). In this sense, the teachers were self-selected. However, the degree to which principals continued to support the participants in acknowledging their contributions, and in relinquishing control over resource decisions, varied greatly. Also the level of the principals' desire to invest training in participants who found themselves with little affinity for the project was also a factor that affected teacher attrition. A final factor was the demand made on several participants' time from other innovations for which they had also been enlisted. This support impacted the desire of teachers to continue with Project OWLink. By the time of the Project OWLink training, the number of teachers had been reduced to six. These remaining six teachers who chose to stay in the program appeared more optimistic about the Project than those who had chosen to leave because they felt confident they could improve some of their present teaching practices through the technology (Miller & Kumari, 1997).

Teacher Reactions to Technology

Reactions to the technology varied from "excitement at possibilities" to "burden" and "trepidation." In terms of integrating the technology into the curriculum, the main challenge for all teachers was finding the time to prepare and plan each lesson. One teacher said that initial time to construct an OWLink classroom was considerable and that it took more time to prepare an OWLink lesson than an "ordinary" lesson. Another teacher spoke of the amount of time spent planning when using Teledistance. This teacher normally taught 3rd, 4th, and 5th graders. However, when Teledistance was introduced into the classroom, she also started to teach high school students. This required investing time in planning presentations that were correctly pitched for this new target audience.

One teacher spoke of how she had to ensure that when preparing a lesson plan, the essential components that were required by the state legislation were integrated into the technology-based curriculum. By breaking the required units down into specific objectives she was able to perceive where the technology could be useful. She started to see the technology as just another tool for teachers to use.

Use of outside expertise also provided an opportunity for teachers to increase their knowledge and expertise. One teacher became more familiar with psychological research through interacting with a university statistics professor.

Knowledge was also passed from these six technology experts to teachers within their schools. One teacher spoke about the challenges of educating technology illiterate teachers,

> Part of it is getting the other teachers involved, to get them to use the equipment and see what they can do with it. That is an on-going challenge.... You have to have a certain kind of attitude to commit to using the technology.

Comment: These teachers not only increased their understanding and effectiveness in using the new technology, but they also learned how to adapt the technology and how to integrate it into their curriculum. The teachers emphasize the importance of adopting an optimistic, yet realistic, attitude towards technology. Other studies have documented the impact of technology training on teacher learning and change in attitudes towards technology (e.g., McEwan, 1996; Martin, 1986). It seems increasingly important that in addition to teachers mastering the technology, they also need the necessary skills to effectively integrate technology into the curriculum. Finally, time is an important factor in determining the success of the integration of technology into teaching practices. Teachers spoke that preparing OWLink lessons on top of regular teaching duties took a considerable amount of time. Of considerable importance is that administration allows developmental time for teachers to occur, particularly in the initial stages when teachers are integrating technology into the curriculum.

Uses of Information Technology in Teaching Practice

The amount of time spent using the technology varied considerably. Time spent largely depended on the location of the facilities and access. Four of the teachers used the technology about 8-to-10 percent of their time. One person used the technology 50 percent of the time when teaching an English class. One teacher used the technology 100 percent of the time because he was teaching a distance learning class. It is also important to mention that this is time spent in the classroom and does not include preparation time. As mentioned previously, preparation time was a major barrier in incorporating the technology into the classroom. Further, scheduling use of teledistance equipment proved challenging, though the level of support and guidelines set within each school attenuated this. One teacher said:

> We had some challenges with scheduling, but other people in the building were extremely flexible. We had also set clear priorities that teledistance would take precedence over other technology lesson held in the same classroom.

The teachers incorporated the technology into their curriculum in various ways, and this depended on the type of technology they used. For instance, the teledistance equipment allowed for guest speakers to give lectures. The teachers also allowed students to access the Internet to discover information about a particular topic. Teachers also created websites as a repository of information for students to access. Typically, students would use technology such as PowerPoint, which is a presentation package, or Microsoft Word, to write and present their papers. For most teachers, formal teaching practices remained in place. The teachers still lectured and formally assessed their students. Several teachers

mentioned that their student evaluation assessment had not really changed. They still used the standard tests that they had previously used in the classroom, before the introduction of technology.

For example, the mathematics teacher still used the "same papers, tests, projects, lab, and calculator activity as before." Another teacher spoke of the challenge of assessing work in a technology-driven classroom:

> If a student uses the Internet to do research for their research paper, it's the same grading systems as always; they have to find the primary source, give proper credit, etc. For other things, such as teamwork, it really just comes down to participation—making WebPages with other students for example. This makes assessment more difficult because in grading participation it becomes more subjective.

The most popular technology tool was the Internet. Five of the teachers stated this was the technology they utilized the most. Several teachers integrated the technology into research projects, where students were required to search for information using the Internet. For example, one teacher, who teaches 3rd, 4th, and 5th graders, described how she incorporated IT with objectives that are required by the state:

> One of the objectives is to learn about different cultures. So we did a unit on China and the lunar new year in China. The children researched this, using the Internet. They found all the different kinds of celebrations that they have in China. Then they went into the lunar New Year and they found out what that was about. They were able to create PowerPoint presentation showing graph of populations in China, timelines, and they did all of it using technology.

The teleconferencing also enabled teachers to take advantage of guest lecturers. An advanced placement calculus class took advantage of outside expertise from a Rice University statistics professor, who encouraged the students to utilize the software while he explained statistical concepts. Furthermore, the knowledge imparted by the Rice professor was more advanced than the students had previously been used to. The mathematics teacher commented that this level of expertise had not been available to them prior to obtaining the teleconferencing. Another teacher spoke how the technology allowed her to devise complex and creative projects for the students:

> I used the technology with my speech students to force them to learn how to take a speech and tailor it to particular audience. They gave presentations about U.S. presidents to third, fourth, and fifth graders. They really had to change they way they had presented it. Some of them came up with pre-imposed quizzes, some acted things out, some brought in video clips. They changed their vocabulary. They added more pictures. They did everything they could to really adapt that message to the appropriate audience.

Comment: Teachers through understanding the capabilities of technology were

able to integrate it into the syllabus by devising novel ways of learning for students. However, this process took a considerable amount of planning and effort.

The Office of Technology Assessment, in a 1995 report, underscored the importance of staff preparation:

> Even very motivated teachers require substantial amounts of time before they feel fully versatile with a complicated new technology and are able to expand technology tools to fit their particular teaching goals. (p. 41).

One of the reasons for teacher attrition during the OWLink study was a lack of commitment by teachers and administration to devote adequate preparation time for OWLink classes. Other studies have reported the importance of development time for teachers (e.g., Harvey, 1990), and have concluded that time, resources, and support are necessary for the successful implementation of programs such as this one.

Impact of Technology Training on Teacher Role

The majority of the teachers in this study found that the technology suited their collaborative philosophies. One teacher commented:

> Even before the technology, I was convinced that you don't just stand in front of the class and drone on with the lecture. I was already trying ways to get students to collaborate, trying to find ways to break up the lesson into various activities, and foster collaborations. I don't know the technology changed those goals, but it made it easier to achieve those goals.

Another teacher emphasized the importance of having a flexible attitude to teaching and foregoing the idea "that things have to be done in a certain way." Like other teachers, she believed that the technology allowed her to be to a facilitator who encouraged independence in student learning, rather than merely a purveyor of knowledge.

However, this was not true for all teachers. One teacher saw the technology as a burden. This teacher was required to teach the same lesson to two classrooms, which were in different locations, at the same time. The teledistance equipment allowed him to do this. No collaboration occurred between the students in the different classrooms. The teacher did not believe the technology impacted his role. He said, "I have the same role as I do in a regular classroom. I am a provider of knowledge. I can't see how technology can influence this role; it is just an instrument." In this teaching situation, the teacher saw himself as the giver of knowledge. He did not regard the students as being responsible for their own learning. In fact, he increased the number of pop quizzes to "keep students on the edge, because since I wasn't physically present at one of the sites, I had to make sure they were all concentrating."

Comment: This case study echoes other findings (e.g., Kumari, 1996; McEwan, 1996; Martin, 1986) that teachers with a student-centered approach are able to use the

technology to fully realize their teaching style. Like other case studies, individual differences do appear to play a role in determining the extent of change. Barbara McEwan (1996) found that introducing new technology into the classroom allowed teachers with a more democratic philosophy to behave in a more cooperative and collaborative way. However, those with a more traditional approach were less flexible (McEwan, 1996).

Effect of Technology Training on the Wider Learning Environment

For many of the teachers, the opportunity to collaborate with their peers and to liaise with schools and universities was extremely rewarding. It proved beneficial for both students and teachers. One teacher spoke about collaboration between students from two schools in creating a web site on Greek mythological characters. Students in one school were responsible for illustrating the text, while students in the other school wrote the text. This collaboration involved students negotiating on suitable illustrations and text. Additionally, their peers were responsible for assessing the final product. The teacher commented, "the children worked harder because their audience was broader. They were not trying to please the teacher."

This "authentic" activity engendered critical thinking and problem solving at a very basic level. It was also open-ended in that students were not told the "optimal way" to design this Greek Mythology web site. Students also collaborated; the activity required them to adopt the perspectives of others.

For many teachers they found that they now had the ability to broaden the learning environment for their students. For example at one school, the children had a visit from a senior executive from the Center for Disease Control. His talk was broadcast over various schools and a web page was established that enabled students to ask him further questions.

Technology also facilitated collaboration between two of the teachers. These two teachers collaborated to create a website on Shakespeare. Each brought a particular skill to the project. One teacher dealt with the theatrical aspects of Shakespeare using the Teledistance equipment to help students parse Shakespearean prose. The other teacher created a Shakespeare WebPage that contained different links and students activities.

Comment: The opportunity to cooperate and collaborate with peers allowed the establishment of interdisciplinary curriculum development. The teachers shared ideas about content and approach and were able to produce important innovations. Here the teachers are producers as well as consumers of information on the World Wide Web. Web pages overcome the temporal barriers currently inherent in inter-school collaborations. Traditional class intervals problematize much of the inter-school and cross-disciplinary work encouraged by Project OWLink. Teacher collaboration also allowed new critical ways of thinking that engenders creativity and innovativeness.

Conclusion

The main aim of this case study was to investigate the impact of Project OWLink technology training on teaching philosophy and practice. The study suggests that the five teachers who held a less rigid attitude were able to adapt to the technology by adopting a facilitator role. This was something that they wanted to do and that the technology allowed. However, this study also shows, in the example of one teacher, how integrating technology into teaching practices is not always successful.

One possible message from this is that schools need to carefully select those teachers spearheading these types of initiatives. Individual differences in teaching style may be an important factor in determining the success of programs like Project OWLink. For this teacher, the inability of technology to enable close monitoring of students proved frustrating. Indeed, this study demonstrates that technology does not fundamentally change teaching style-it merely allows for freer expression within the classroom for those with a facilitator or student-orientated style.

One factor that may affect teachers' willingness to embrace new technology is their level of openness to new experiences and novel stimuli (Jorde, 1985). The two teachers who collaborated on the development of the William Shakespeare and *Animal Farm* websites showed this enthusiasm. This study also shows the importance of planning and development time in preparing technology-rich classes. It seems probable that without the support of school administration who were flexible and gave these teachers the preparation time they needed, even fewer teachers would have stayed in the OWLink program.

However, this study also shows the benefits of integrating technology in the classroom. The technology enabled the teachers to widen their collaborative network. Experts contributed to the learning environment and teachers collaborated in devising website activities. Moreover, in terms of evaluation, the use of the teledistance equipment and the Internet allowed teachers and pupils to collaborate. Students presented material to older students and hence had to pitch material at a much higher level.

In conclusion, learning through technology, such as teledistance and internet access, holds promises which are closely tied to what most educators believe to be "best practice" in schools. However, we should not underestimate the factors that mitigate its impact.

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