Ready for a Change

Tom Thompson

Foreward

Sheridan High School is located in the town of Sheridan, Oregon. The town of 2500 sits about 20 miles west of Salem, the state capitol. The economy is based heavily on agriculture, primarily logging. In addition, a federal correctional institute recently opened and employs several hundred local people. The high school, grades 9 to 12, has about 230 students. Many of the students have lived in Sheridan all their lives and have parents who were born and raised in Sheridan.

I was ready for a change. It seems like most teachers go through some major self-evaluation sometime in their career. My mid-life teaching crisis took place in the 1988-89 school year. After about five years at Sheridan High School teaching earth science, physics, chemistry, and computer classes, I wasn't sure I was making a difference. Sure, there were lots of hands-on activities. My students seemed to enjoy science. But after a 48-minute period each day, I didn't really know whether I had accomplished anything other than keep them busy. Where was the excitement? Where was the wonder? Where was everything that made science so interesting to me?

About the same time, I had generous support of my district to participate in a state-wide science curriculum project. The Oregon State Department of Education was trying to lead Oregon schools into major reform. The traditional content-oriented program was going to be slowly replaced by a science curriculum focused on concepts and processes. I had a new direction. I also had more questions. How was I going to do this? In a rural community with a high school of 230 students and 1.5 science teachers, how was I going to obtain the resources I needed?

The Star Schools Project

I was looking for answers. One possible answer arrived at school with announcement of the TERC Star Schools Project in Oregon. Here was a project that involved telecommunication and some interesting sci-

ence curriculum that seemed to fit my evolving ideas about science education. I had some experience in telecommunication by using a commercial network at home, but I was still quite the novice. I applied to be part of the project and was accepted.

The Star Schools Project was a blend of written curriculum and telecommunication. Each participating school chose a unit that best fit its needs. The nine units included weather, polls and surveys, triangle chaos, and solar house design. Clusters of about seven schools communicated about a common unit. Each unit began with classes introducing themselves followed by a series of short activities and then a final project. Each unit was designed to last about 9 weeks.

With a new modem on my Apple IIe, purchased by the district, Sheridan High School plunged into the telecommunication age. I chose to involve my earth science classes in a solar house project. Ultimately, each group in my classes was to design and build a model solar house. We were also asked to use the modem to communicate with other schools throughout the nation about our progress. I was excited, even if my students weren't sure they wanted to send messages to "science nerds."

As the project progressed, some interesting things began to happen. My students attempted to get to know some of the other students on the network. They found that musical tastes were not that different between the East and West. There *were* schools smaller than Sheridan High School. And students from New York weren't all rude (but they didn't know anything about Oregon). Two of my students still correspond by mail with some of their electronic friends.

The penpal discussions were fascinating, but where was the science? We built our model houses and collected data. We even shared the data with other schools. There was even some discussion over the network on how to have a fair test in order to compare houses. The test in the curriculum materials called for a 100-watt floodlight. Because I wasn't able to get one, we had to check with other schools in the cluster to see if we could use a different bulb. Most of the science discussion happened in the groups in my classroom

---

Tom Thompson teaches integrated science (freshmen), physics, chemistry, and advanced science at Sheridan High School in Sheridan, Oregon. His address is 2279 Dallas Highway, NW, Salem, OR 97304.

with little spilling over onto the network. I still use the solar house project in my freshman classes, but I don't incorporate the telecommunication.

The work with the Star Schools Project did give me some insight into how telecommunication could help me teach and how it couldn't help me. The solar house project is a valuable tool, but it didn't have any natural reasons for use of telecommunication. We could communicate design ideas within our school and learn just about as much as if we contacted other schools. The weather and radon units, also part of the Star Schools Project, used telecommunication to share data not available in one school. I also found that rolling my computer to the library to hook to the phone line really reduced the amount of time I was online.

In spite of some of the drawbacks, it was obvious to me that telecommunication had something to offer. My students were not limited to the resources of our small school. They could contact other students, teachers or scientists by modem to ask questions. Here also was an opportunity for me to link with colleagues so that I didn't feel so isolated. Because of the advantages, I decided to expand how I was using telecommunication.

The TERC LabNet Project

My next big move was to become part of the TERC LabNet project. During two summers, I attended workshops sponsored by TERC that focused on project-based science and telecommunication. After the first workshop, I was given subsidized access to the LabNet telecommunication network. The LabNet network provided a less structured way for participants to continue discussions after the workshops. Students could also use the network, through their teachers, to expand their available resources in science projects. I would frequently monitor discussions on the network, contributing where I felt I could and seeking ideas when I needed to. I wasn't a frequent contributor to the network, but it did rapidly become a valuable source of information. At one point, I was looking for a way to demonstrate magnetic fields in three dimensions without buying expensive equipment. I received several ideas from LabNet teachers. I also monitored a discussion about activities people used to teach vector concepts in physics. I have included those in my teaching resource file.

TERC provided an exciting opportunity for participants in the LabNet project. Using the network, we were asked to submit ideas for projects in our local community. TERC staff assisted in writing grant applications to have these projects funded. All the writing and editing was done online. My proposal was to implement a telecommunication network in Marion, Polk, and Yamhill counties and use it as a vehicle to enhance project-based science. The $16,000 grant request was funded and Sheridan High School soon became a leader in telecommunication in the three county area.

This project had two principal objectives: to improve communication among science teachers, and to provide them with greater access to Microcomputer-based laboratories (MBLs) and interfacing units for exploratory activities. (An MBL is a microcomputer equipped with one of a number of sensing probes for collecting the data of various physical phenomena in real time, and special software for recording and displaying results.)

Because there has been a serious need in the Polk, Marion, and Yamhill county districts to improve communication among science teachers, the first component expanded the telecommunication system that connects these three districts. This project chose to use PSINet for its network because the Oregon server was already located in Portland and because, although it is currently dedicated to physics, it has the capacity to be used for more than just physics. To encourage involvement in telecommunication, this project funded inservice training for teachers and small matching grants for the purchase of telecommunication equipment. In addition, districts committed additional release time for continued training sessions.

For the second component, interfacing units were purchased for an interface "loan library." Many teachers, although interested in using MBL materials, have been unable to afford a classroom set. The MBL materials will become a permanent resource in the interfacing lending library located in the Yamhill County Education Service District.

As I have worked with the other schools in these three counties, I have found recurring questions and problems associated with telecommunication. One of the earliest questions is that of cost. Many teachers are under the assumption that telecommunication costs can get out of hand. They still remember hearing the horror stories of someone racking up hundreds of dollars of network charges while chatting. This was a major concern when designing the network for the three-county region.

Expanding the Use of Telecommunication

The solution to the cost problem was the use of PSINet, a decentralized network of PCs linked in a web. An individual teacher uses a MS-DOS computer with modem and special software to access a server, which communicates with other servers and passes information around the network. Since there are no user fees

and one only pays his or her own phone bills, for a very low cost each workstation can contact other workstations around the nation. Recently, I received 47 papers from 12 different states on PSINet. (Two papers were information on library resources I needed to complete my science budget for the next year.) I obtained all of this in a 13-minute call to the server in the next community at a cost of about $1.80. That's quite a return on the investment!

The low cost of telecommunication has really helped to expand its use. At Dayton High School, another rural school in Yamhill county, students in an environmental science class were curious about the national level of awareness on issues surrounding old-growth timber. Many families around Dayton rely on the timber industry for their livelihood. A simple survey broadcast on PSINet showed many people had no knowledge of the issue. Students at Dayton were really surprised that what was so important to them was of little importance to others. All of that for a few dollars in long-distance phone calls. Students at Sheridan High School compared how much people paid for home heating; students at Jefferson High School, a rural school in Marion county, learned about solutions to the problem of littering. Telecommunication was the only source for this information.

Ease of use is another important reason for the growing popularity of telecommunication. Although many teachers in our area are computer literate, most have no experience with telecommunication. PSINet uses specific software to deal with this problem. The only drawback was that the software is only available for MS-DOS computers for the moment. After using the PSINet software for a year, most users now feel confident to move into systems that use more generic telecommunication software. Other user-friendly telecommunication software is being developed to solve this problem.

Student and Teacher Use and Other Technologies

In a small high school, teachers frequently are strapped for time. Preparation for numerous lab classes and extra duties mean that anything new that consumes time must be really useful. Telecommunication does consume time, but how useful is it? My experiences have shown some expected and unexpected benefits. A parent once asked me for ideas to include as competitions in the local science fair. Rather than dig through my files, I used telecommunication. With a brief message on LabNet, I was able to provide this parent with a list of some very good ideas sent by other LabNet participants. I estimate this saved me about 2 hours searching through back issues of magazines and

my files. Similarly, I often use networks to search for teaching ideas.

Some unexpected things have happened when students use networks. Several of my classes are required to use a network to supplement the work they do in class. If students are researching an issue, for example, they may decide to use the network to help in that research. The workstation is in my room, so they can compose a message during class or they can write a message anytime on our school-wide network and I can pick it up and send it out. Since these classes have only 10 to 20 students and not every student uses the network everyday, we are able to get messages out on demand with only one computer on a modem.

I have found that, when using a network, students become more precise in the questions they ask. For example, instead of asking for everything available on "virtual reality"—a request that usually doesn't get a reply—students begin to ask for specifics that they can't locate through other resources available to them. A student at Jefferson High School once asked if anyone knew anything about caffeine. After no response, his questions became more specific. He indicated that he would like to extract caffeine from various products and measure how much was in each product. A reply soon came from Iowa suggesting a method of extraction using chloroform. (The respondent even pointed out the hazards of such a technique.) The student from Jefferson began digging a little deeper; one of his last questions spelled out a very specific method by which he was going to extract and measure caffeine. In the end, he wanted to know what wave lengths of light would best be used to identify the caffeine. Finally, the contact in Iowa offered to have his chemistry students try to replicate the procedure.

To be sure, not every student is eager to use telecommunication. Sometimes students suffer from stage fright. Even though they are really rather anonymous, they still fear what others might think of them. Once that first message is sent, however, students hover around the electronic "mail box" waiting for a reply. I haven't had too many students wait that eagerly for me to reply to their questions.

Personally, I have found telecommunication to be extremely valuable. Each day when I go online, it is like being in a room full of very talented teachers who are sharing all these wonderful ideas. The isolation that is common in a rural school is suddenly gone. The resources often missing in a small school are at my fingertips. Taking this one step further, the teacher at Willamina High School and I plan to use telecommunication to link with other teachers and develop a project-based chemistry class. It sure keeps me going.

Each year, Sheridan High School seems to expand its use of telecommunication. I now have a computer in my room to use whenever I need it. Each classroom now has a phone line so other teachers can begin to use telecommunication. The library now uses a modem to link students to the Oregon State Library and a regional network of libraries. Students can browse through catalogs and order books delivered to the high school. A new phone system was even installed to help in the expansion of telecommunication.

In the three-county region, telecommunication has expanded as a direct result of what we have done at Sheridan. The Yamhill County Education Service District now includes PSINet and other telecommunication services as a major focus in their technology plan. Discussion has begun on how to link schools to share resources now that many schools in the county can easily tap into teachers at other schools. Statewide, telecommunication is expanding partly because our state science coordinator has seen the benefits that telecommunication has provided for the schools in our region.

Telecommunication for Sheridan is not just modem and computer. As we were experimenting with networks, we were also experimenting with satellite technology. In the first year that I started the Star Schools Project, Sheridan High School offered its first satellite class. Four students took Japanese. The class was transmitted from a community college and received by our local cable station. We received the broadcast through the cable system and communicated with the instructor by phone.

The satellite classes have grown since. Sheridan High School has its own dish and receiver. Classes in calculus, marine biology, psychology, Spanish, Japanese, sociology, and astronomy are offered throughout the day. Teacher inservices are being offered as well as college credit classes. We even have the ability to scan student homework and transmit it to the satellite instructors. It hasn't been cheap, but the benefits to our students have been immeasurable.

We're just beginning here at Sheridan High School. What started as a single unit in solar house design has grown to become an integral part of the science curriculum. The questions I began asking myself about five years ago are still not completely answered, but I think I am getting there. Telecommunication is becoming a valuable tool for me and my students. The isolation I once felt doesn't exist. The uncertainties I had I can now share with my colleagues. The excitement and curiosity I didn't see is now surfacing.