Abstract

After the smoke of school network installation clears, schools find themselves in need of qualified network managers. Most school districts cannot afford to hire trained network administrators, so they seek training for current personnel. Such training is usually oriented toward single-vendor business networks rather than the patchwork of legacy systems found in many schools. To address the need for school network training, the University of South Florida’s Instructional Technology program has developed a menu of options including a guidebook, a website, a workshop series, a graduate credit course, and a graduate certificate program in school networking. Each of these resources was developed through collaboration between university faculty, instructional technology center staff and school district technology personnel. The School Networks course, offered on an attractive alternate calendar schedule, focuses on the specific needs of the multi-vendor school environment. The class provides fundamentals of network architecture and operations, along with practical hands-on maintenance, trouble-shooting, and legal issues.
Developing a School Network Course

The Need

Schools and school systems worldwide are struggling to reach a state of computer connectivity. Educators realize the inevitability and necessity of building school networks for education. While funding exists for most schools to install hardware and infrastructure, there remains a critical shortage of funds for staffing and training school network operators.

Why is there a shortage of school network support?

- The climate of many school districts severely restricts the hiring of additional personnel who are not classroom teachers.
- Technology grants and budgets have consistently under-allocated for support personnel and training.
- Network training is very expensive and trained network administrators and support technicians can usually earn vastly higher salaries outside the schools.

How have schools kept their networks operating?

- Schools have implemented creative solutions.
- Some schools increase class sizes to free a staff member for network tasks.
- Parent or community volunteers are asked to contribute their time and skills to man technology help desks and perform troubleshooting.
- Media specialists and computer teachers are called upon to serve as ad hoc network technicians, often part-time in addition to regular duties.
- Districts may require schools to share a network specialist.
- Students have been tapped for their technical knowledge.
- Some districts contract with commercial services.

The majority of these solutions are piecemeal, oriented toward crisis management rather than prevention of problems. Generally, staff members with network responsibilities have little or no formal training in network administration, although they perform admirably as self-taught gurus. The serious lack of education on school networks came to the attention of the University of South Florida’s Instructional Technology faculty when graduate students expressed a need for network knowledge and experience, and when area school personnel with network responsibilities expressed their need for more resources. These people had investigated alternatives such as Novell and Microsoft certification classes and community college technical training, but found them to be too business-oriented. While the instructors of the classes were very technically skilled, they were not helpful in solving school-specific problems, or in cases where multiple vendors and platforms were deployed.
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Course Development

Meeting the immediate need

The IT faculty at the University of South Florida and the Florida Center for Instructional Technology responded to requests for support of school networking first by developing a guidebook. An Educator’s Guide to School Networks was designed with the assistance of a graduate advanced design class, and served as a reference for educators in a networked environment. The guide was published and distributed statewide in print and online. In addition to the guide, network topics were incorporated to a limited extent into the existing Microcomputer Hardware Systems for Education course. The course focused primarily on the physical aspects of networks, but legal, software and management issues were outside the scope of the course.

Course planning

To more fully address the need for qualified school network operators, USF developed a graduate course in school networking for educators. The University’s College of Education offers graduate degrees in Instructional Technology at the Master’s, Specialist, and Doctoral levels. In 1999, the School Networks course was added to the program as an elective. The course is available to non-degree seeking students as a stand-alone training experience and as a component of the School Network Certificate program.

Stages of content planning:

- Decision to include both Macintosh and Windows networking.
- Listing of tasks that occupy the majority of time at work, the materials and resources used most often, and the skills and information found most necessary to do their work
- Survey of area schools to learn about the network systems in use.
- Consultation with successful school network operators and district technology coordinators.

Course emphasis:

- Help learners to organize the knowledge of networks that they have gained haphazardly.
- Fill in important gaps in knowledge.
- Provide a trouble-shooting framework.
- Use a practical, hands-on, cross-platform approach
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Pilot Program

Course pilot
An instructional partnership was formed in which a local school network operator and trainer worked with university faculty members to develop and co-teach a preliminary version of the course. The structure of An Educator’s Guide to School Networks was adopted for the framework of course content. The guidebook material was fleshed out with the practical needs identified by school district network managers. District personnel suggested several reference manuals that they depend upon heavily in their work. Each manual was evaluated for its merits as a course text. Before the course was offered, a series of school networking workshops was offered during the summer of 1999. The School Networking with Windows and the School Networking with Macintosh were each offered as a 12-hour, two-day workshop at the Florida Center for Instructional Technology. The workshops functioned as a trial course, in which methods were tested and revised for the credit course. The workshops were advertised through school district staff development calendars and direct mail to schools. The number of participants ranged from 8-12 per day, with two instructors. The workshop evaluations became useful tools for preparing the course.

Course schedules
To accommodate the scheduling restraints of working adults, the inaugural course in the summer of 1999 was scheduled for one week of class meetings, Monday through Friday 8 AM until 5 PM. Fifteen students enrolled in the course, and gave it excellent ratings. For the Fall semester of 1999, the course was reorganized to account for the school workday. The class was scheduled during one month on Friday evenings and all day Saturdays. Again, fifteen students enrolled. The composition of the class has been primarily teachers and media specialists who are responsible for school networks, along with full-time IT students, and a few school and district technology staff members. The course earned very favorable evaluations from students. The course is under consideration to become a requirement for the Master’s IT program. Spring 2000, the course was again provided on the four-weekend calendar to 15 students.

Course Implementation

The following topics were proposed for the course

- Overview of networking fundamentals, including peer-to-peer and client-server models for LANs
- Network topologies
- Network components, including workstations, servers, hubs, switches, network interface cards, cabling, wireless systems
- Network connections, including installing and configuring drivers and NICs, connecting cable
- Basic server setup, file sharing, users and groups, directories
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- Network functioning, including the OSI layers and 802 standards, packets and data, protocols, access methods
- Network architectures, including Ethernet, token ring, AppleTalk
- Network operating systems, including Windows NT, AppleShare
- Network administration, including planning, performance monitoring, security, backup systems, budgets and purchasing

A variety of instructional strategies was employed:

- Instructor presentations to introduce and illustrate concepts
- Labs on installing network cards
- Planning a school’s network configuration, and organizing orders and budgets
- Computer simulations on configuring drivers, setting up groups of users, file sharing, and server setup
- Authentic problem-solving scenarios
- Internet research for the student projects on developing a management tool for a network operator, such as an inventory, service log, or troubleshooting flowchart
- Student presentation on a network issue for a school audience, such as netiquette, copyright and licensing, security and safety
- Field experiences with K-12 school network administrator on a school site, the College of Education LAN, and the university’s WAN
- Guest speakers on related topics
- Short final exam

Course materials:

- A fully networked Macintosh and PC lab
- Course text: Microsoft *Networking Essentials*, chosen for its breadth, general approach, CD-ROM resources and availability. Students use the text as a springboard to MCSE certification.
- Current hardware and software price lists from common school district vendors
- School floor plan to use for network planning lab
- Network guides from Apple and Asante
- A dynamic list of appropriate web sites

National Standards

ISTE standards met by the course:
The School Networks course meets 35 of the International Society for Technology in Education teacher standards. The class meets standards in each of the five areas:

1. Prerequisite, Preparation, and Foundations
2. Specialty Content Prep in Educational Computing and Technology Literacy
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3. Professional Preparation in Educational Computing and Technology Literacy
4. Specialty Content Preparation for Educational Computing and Technology Leadership
5. Professional Preparation in Educational Computing and Technology

The standards codes satisfied by the class are:
1.1.2, 1.1.5, 1.2.2, 1.2.4, 1.2.6, 1.2.7, 1.3.4, 2.2.1, 2.2.2, 2.3.1, 2.4.2, 2.4.3, 2.4.4, 2.4.7, 3.1.5,
3.2.4, 3.2.5, 3.2.6, 3.2.7, 3.2.8, 4.2.1, 4.1.1, 4.4.2, 4.4.3, 4.4.4, 4.5.2, 4.5.5, 5.4.1, 5.4.3, 5.4.4,
5.4.5, 5.4.6, 5.6.3, 5.6.4