

A Teacher's Guide to Videoconferencing

How to Plan, Produce, Present,
Manage, and Assess a
Distance Learning Class

by
Susan Mason and Mike Davis

edited by
Gary Graves and Kirk deFord

Preface to Teacher's Guide

This Teacher's Guide provides a comprehensive set of information and advice regarding one particular model of distance learning, the delivery of full courses. It also assumes that the environment for course presentation includes . . .

- multiple receiving sites
- full classes of students at those sites
- room-size videoconferencing equipment and facilities at the sending and receiving sites
- certified teaching staff present at all sites with the student groups

Other important instructional uses of videoconferencing not directly addressed here include supplementing classroom instruction, connecting students to outside experts, promoting cultural interaction and comparisons, collaborative student projects at a distance, and providing remote support for students with special needs.

Much of the information in this Guide is applicable even in situations where some of the above characteristics are not present. Readers need to judge the applicability to their own situation.

Introduction

This guidebook was written to help teachers and others who are delivering or are planning to deliver courses through videoconferencing. It is intended to be a practical guide and the information and tips in it are gathered from the authors' eight years of videoconference education experience. It should be remembered while reading this guide that each situation is different and that the comments, observations, and recommendations in it are the result of those experiences, which will have some similarities to your experience, but will not be exactly the same.

To be successful in providing videoconference education, you will need to have the following qualities: be passionate and enthusiastic about educating your students; believe in the possibilities of videoconferencing while being aware of its limitations; be flexible; and be prepared to push the envelope, which always means putting in lots of time and thought. Preparation for a videoconference class takes anywhere from three to 10 times as much time as for a traditional class. Please use this guide in the spirit in which it is offered--a sharing of our experiences and lessons learned.

We have used videoconferencing for eight years while working for the North Slope Borough School District (NSBSD), which is located on the Arctic coastal plain of Alaska and is approximately 88,000 square miles in size (just slightly smaller than the state of Oregon). NSBSD contains eight villages (200 to 4,500 population). Secondary schools range in size from 10 to 250 students. Because of the small number of staff at each school, secondary teachers become generalists who teach many subjects outside their area of certification.

Because of these factors the district needed to improve the equity of course offerings for the smaller schools, increase the ability of students and staff to interact with people outside of their villages in order to increase collaboration and support, to promote a greater feeling of district cohesiveness, and to provide more high-quality staff development opportunities for all district staff.

The greatest challenge for the staff and the school district was not keeping the network going and upgraded, but rather in learning what the new opportunities were and how to use them to improve the education of their students. As with any new "tool," a lot of experimental play, question asking, getting technical instruction, and reading guides took place while learning how the system worked. There was also lots of trial and error and lots of impatience, both by people who did not believe in the system and by those who did. Through it all we learned much about what didn't work for us as well as the processes involved in developing successful education programs using technology.

Although this guide shares what we learned about videoconferencing in this district's technology program, it was not written to be a blueprint for your program. Rather it is meant to help you develop a program appropriate to your needs.

We hope you will find this guidebook useful and that it helps you deliver passionate,

enthusiastic, and quality interactive education to your students.

Susan Mason and Mike Davis
EduLynx, Inc.
February, 2000

Planning

A videoconference connects two or more sites with audio and video links so that participants can converse, interact, and share documents. As a distance education tool, videoconferences help teachers reach any students who are isolated in distance or time from an instructor.

Like other technology--from television to e-mail--a videoconference is a tool to deliver course content. Distance education in general and videoconferencing in particular bring considerations and challenges not encountered in classrooms bound by four walls, but it can also make learning more accessible, relevant, and exciting.

The goals of distance education courses should be aligned with the educational goals of the school and district. Keeping this in mind during the planning stage helps ensure that courses, and the entire distance education program, meet students' needs.

Planning is always the first step in introducing a new instructional technique, and this chapter addresses the crucial planning needs for teachers new to videoconferencing. This chapter covers:

- Uses of videoconferencing
- Hardware and software
- Classroom teams
- Training needs

The North Slope Borough School District in Barrow, Alaska, first began using videoconference technology to reach outlying villages. The goals of videoconferencing were drawn from the district's technology integration goals, which were directly related to the district's strategic planning goals to:

- Deliver instruction to students of diverse cultures
- Offer equitable instruction to all students
- Improve the quality and effectiveness of instruction
- Offer the means to acquire and process information
- Provide educational support in all areas of curricula
- Prepare students to work and live in the information age

These goals guided distance education teachers in identifying program objectives, prioritizing student needs, and designing courses. And because the district's strategic planning goals had been written with input from the communities served, the distance education team knew that the videoconference classes would contribute to larger community needs.

Uses of Videoconferencing

Videoconferencing can help teachers reach geographically isolated students; it can connect classrooms in different grades for collaborative projects, and it can allow a district to deliver in-service and other training to all teachers and staff. Below are examples of how the technology can be used for instructional and administrative purposes.

Instructional

- Semester and year-long courses in art, computer technology, drama, health, language arts, mathematics, science, and social studies
- Project collaboration between classrooms in and outside of a district
- Individual and group conferencing with students on particular topics or issues
- Curriculum development
- Continuing education or other college courses

Administrative

- Staff development
- Departmental meetings
- Staff organizational meetings
- Individualized Educational Plan (IEP) development and advice
- Job candidate interviews

Videoconferencing can also benefit the community at large, bringing together several towns or villages for special events or important meetings.

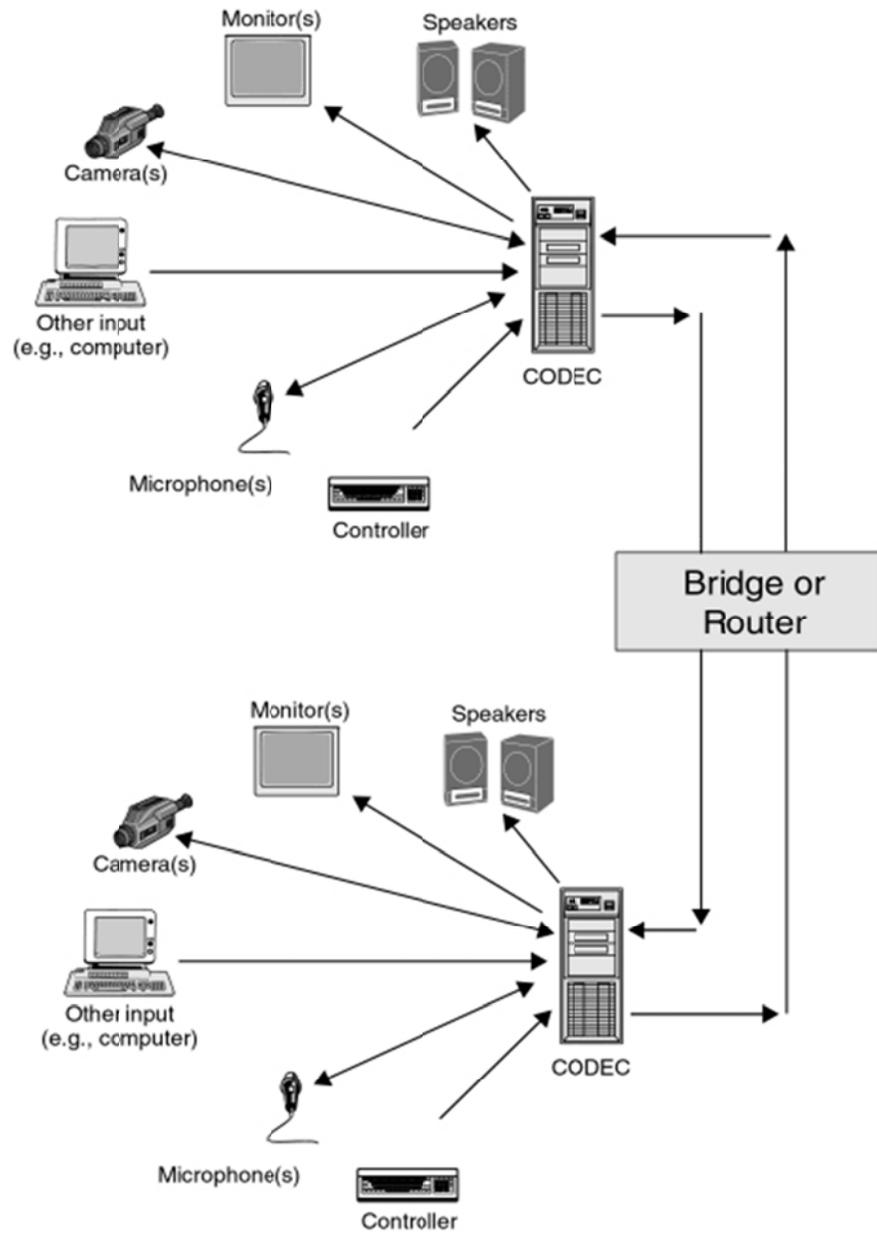
Hardware and Software

System

A videoconferencing system is a group of components that work together to support communication by sharing video, audio, and data files with distant sites. The diagram below identifies some of those components and how they interrelate. The different color lines show where the signals are generated and the arrows show the direction that information flows. The components can be grouped into viewers (monitors and speakers), senders (cameras, microphones, whiteboards, computers), controllers (keyboard, tablet, or remote), processors (codec and bridge/router), and carriers (wires, microwave in air, satellite signals, fiberoptic cable).

A Troubleshooting Scenario: We had a problem with the microwave system connecting our satellite earth station with the routers at the school district office. Our technician decided to go up in a "cherry picker" to work on the microwave can. The catch was that it was around -40° F with wind chills in the -70s. It wasn't that unusual to be out in cold weather working in the Arctic, but ending up stuck in a dysfunctional cherry picker for three additional hours was, and we were all relieved when he got down, cold but without much frostbite.

Interrelationships of videoconferencing components



Classroom Teams

Assembling and training a core team of teachers and staff who make up the videoconference or distance education team are key to the planning phase. A distance education team includes teachers and staff from several schools, each of whom has responsibilities that ensure the success of individual videoconferences and the effectiveness of the entire program. In most cases, the presenting site, where the video and audio connections are initiated, assembles other team members from receiving sites.

Because teams include teachers and staff in different schools, administrators at all participating sites should be included in the first stages of planning, including goal setting and team building. Though instructional decisions are made by the team, usually with one teacher at the presenting site acting as lead, building administrators at receiving sites maintain a supervisory role over their participating staff. When decisionmakers support the distance education program and understand the needs of its staff, they can provide team members with necessary planning time, allocate resources, and effectively resolve management issues.

Before videoconference instruction begins, all instructors and assistants should meet and review their responsibilities. Clearly defining responsibilities at the start will save time and frustration later. The make-up of any distance education or videoconference team varies across programs, but basic functions remain constant. The following descriptions outline a typical team of instructors and assistants and the responsibilities they usually handle.

Presenting Site

Lead Teacher. The lead teacher is responsible for developing and delivering course content. The lead teacher works closely with all other team members to ensure that students and staff are prepared for each videoconference. He or she also develops contingency lesson plans in the event the videoconference connection fails or other problems prevent the videoconference lesson from going forward. Other responsibilities include:

- Call the roll of participating sites (teaching partners take attendance in their own classrooms)
- Plan lessons and lead instruction
- Modify and adjust instruction and activities as needed
- Review videoconference etiquette and classroom procedures with students
- Provide opportunities for students to publish and share work
- Allow students to communicate with other students and staff
- Communicate any problems or concerns with team members
- Be enthusiastic (students may misread a neutral stance as negative)
- Design and produce class materials
 - Create lesson plans, assignment sheets, rubrics, test keys
 - Share materials in a timely manner
 - Identify supplies needed at receiving sites for lessons
- Provide a list of supplies and other materials to sites in a timely manner

Leading instruction at various, distant classrooms requires significant preparation time, open communication to resolve problems quickly, and the ability to be flexible or improvise when unexpected technical glitches occur.

- **Videoconference Coordinator.** The videoconference coordinator oversees scheduling and equipment concerns. The coordinator ensures that rooms, hardware, and software are available, arranges for connecting with receiving sites, makes and confirms schedules with all videoconference participants, building supervisors, and other necessary parties.
- **Producer.** The producer manages the video and audio equipment during a videoconference, which includes managing multiple video and audio inputs and organizing materials so that they can be easily displayed for the receiving sites.
- **Videoconference Technician.** The videoconference technician makes sure that the hardware and software are in working order during the videoconference.
- **Expeditor.** The expeditor receives, sorts, sends, and keeps track of documents, assignments, and supplies that are shared between sites.

Receiving site

Teaching Partner. The teaching partner is the lead teacher's counterpart at the receiving site, working directly with students there. Though the partner often has less instructional responsibility, he or she plays a crucial role in the videoconference, setting the tone in the far-site classroom, keeping students focused, and addressing any necessary disciplinary issues. The teaching partner coordinates with the lead teacher to prepare materials and students for the class. He or she must also understand the lesson's goals, activities, and pace, and communicate with the lead teacher when equipment difficulties arise or students cannot follow the lesson. When the teaching partner is also a certified teacher, the relationship with the lead teacher is more conducive to collaboration on course design and lesson planning. A teaching partner who is not a certified teacher (e.g., a parent or staff member) may take on a role similar to an assistant. Teaching partners' responsibilities include:

I often use Socratic discourse as one of the ways I interact with my students. I noticed early on, however, that during a videoconference involving a large number of students, I cannot involve all of my students in the discourse. The logistics of the media make it nearly impossible. I am, however, able to give students at each site time to discuss among themselves and then share the results of those discussions with the rest of us. You cannot, however, allow this to take too much time because you lose the students and this is even more pronounced than in a traditional classroom. The effectiveness of this approach is dependent on the teaching partner at each site.

- Turn on equipment 15 minutes before class begins
- Prepare supplies and materials before class begins
- Notify technician and lead teacher of connection or equipment difficulties
- Have students seated and ready for class
- Assign responsibilities and communicate classroom procedures for students in receiving-site classroom
- Assign a spokesperson to represent the site during the videoconference, and rotate this responsibility
- Allow students to speak and answer questions
- Communicate enthusiasm, encourage students, and support the lead teacher
- Communicate any problems students may have with lesson objectives or activities
- Publish or display student work on course Web site
- Grade tests and record scores for projects and activities

Videoconference Coordinator. The coordinator at the receiving site ensures that rooms and equipment are scheduled for the videoconference. The teaching partner may also take on these responsibilities.

Producer. The receiving-site producer has many of the same responsibilities as the presenting site's producer. He or she should know how the videoconferencing equipment works, and oversees it during a

videoconference. A student can fill this role.

Videoconference Technician. Like the technician at the presenting site, the receiving-site technician ensures all equipment is in working order and ready for the videoconference. The technician need not be professionally trained but should have good problem-solving and communication skills. The technician must let others know when a problem occurs that he or she cannot solve. This is also an appropriate role for a student.

Expeditor. The receiving site expeditor receives materials and supplies from the lead teacher and ensures they are delivered to the appropriate people in a timely manner. The expeditor may also send materials and return borrowed equipment to the lead teacher.

Students. Students at both presenting and receiving sites should expect to:

- Participate in class discussions and activities
- Come prepared for class
- Complete assignments on time
- Ask questions to clarify instruction
- Show enthusiasm and interest in instruction
- Share and publish work
- Work with others to complete assignments
- Encourage classmates
- Communicate any problems and concerns promptly

Other Supporting Roles

Successful systems can include individuals who are part of the system but are at neither presenting or receiving sites. These people include the following:

Connection Manager. Connection management and troubleshooting are often handled by the commercial provider of the videoconferencing equipment or by a state agency. It is important that all team members know who provides these services and how to reach a contact person so that connection problems can be resolved quickly.

Videoconference Equipment Support. Support for videoconferencing hardware and software may also be provided by a commercial vendor. All team members should know how to contact appropriate vendors in the event of problems.

Other Troubleshooters. The videoconferencing center, which may be in a school district or educational service agency, may designate additional staff to provide technical and equipment

support. All team members should be aware of these troubleshooters, the problems they can address, and their contact information.

Training Needs

This section addresses the areas in which distance education team members should receive training or instruction in order to begin using videoconferencing equipment, computer hardware, and software. Every member of the videoconferencing team should receive training. If students are not incorporated into the distance education team, they should receive a thorough orientation to the goals of videoconferencing, the process of a videoconferencing class, and expectations for their participation.

Equipment and Software

Anyone involved in a videoconference should be oriented to the videoconferencing equipment and software, including lead teachers, teaching partners, technical assistants, and students. When students are included in such training, they can become valuable assets to instructors and more active participants in their learning. Training on equipment and software should include:

- Using equipment and hardware (e.g., document viewer)
- Using software
- Connecting for a videoconference
- Troubleshooting equipment, software, and connection problems
- Basic computer skills
- Internet searching skills
- Developing and managing a Web site
- Using other equipment and software for communication (e.g., e-mail, bulletin boards, fax)

Instruction

Lead teachers and teaching partners should receive training on:

- Modifying courses for videoconference delivery
- Presentation strategies
- Material (paper, markers, props, transparencies, timers) used for production and presentation
- Team teaching strategies/assisting lead instructor

Teamwork

Teamwork and team-building training will vary based on the extent to

which the various sites collaborate. Initial training should address basic issues that will ensure that all videoconference participants know their roles and responsibilities. Lead teachers, teaching partners, technical assistants, students, and even building administrators should be familiar with:

- Goals and objectives for using technology in instruction
- Goals and objectives for using videoconferences as an instructional tool
- Roles and responsibilities of all participants

Other topics of training that will assist in teamwork include communicating effectively and supporting lead teachers.

Classroom Management

Lead teachers and teaching partners should receive training in effectively managing a videoconferencing classroom. Procedures and expectations for a videoconference course should be communicated to all participants, including technical assistants and students if they have not been involved in the planning stages. Briefings or training can address:

- Videoconference etiquette
- Techniques for effective participation
- Use of communication tools (e.g., e-mail, Web chat rooms, fax)

Training Tips

These training tips are for hired trainers or teachers who act as trainers to their peers.

- Define needs and objectives for training with input from participants
- Hire trainers who have experience in education or knowledge of teachers' concerns
- Define objectives for use of videoconferencing technology
- Define job descriptions and expectations for the members of the videoconference team
- Provide follow-up training after team has had experience with the equipment
- Provide incentives for training, such as college credit, release time, professional development
- Provide staff with resources that reinforce concepts covered in training
- Design a training project so that participants have hands-on experience with the equipment and software
- Provide a training that gives participants a project model directly applicable to their work
- Provide concrete examples when training
- Consider a train-the-trainer approach so that core distance education team members can train others at their sites
- Create peer mentoring opportunities, matching veteran team members with new ones
- Provide ongoing support through staff development, conferences, and networking with peers around the country

Production

This chapter addresses the steps involved in producing a videoconference, including choosing appropriate instructional techniques, arranging the presentation room, and using videoconferencing hardware and software.

Instructional Options

The instructional options available to a teacher in a videoconference classroom are similar to those used in a traditional classroom. Small and large group work, demonstration labs, and lectures are just a few ways that teachers deliver content and students engage the material.

Lectures

Delivering a lecture on the day's subject is appealing because a teacher can get through the entire lesson and eliminate the time-consuming work of facilitating numerous groups or demonstrations. Lectures are an effective means of delivering information to students at all sites during a one-time-only videoconference or in combination with more engaging activities. However, lectures can be counterproductive for both teacher and students if they are used as the primary mode of instruction throughout a videoconference course.

Activities

An interactive model of instruction allows students to actively participate in the lesson through demonstrations, small-group discussions, labs, writing, and presentations. Activities can be done "live" during the videoconference or after the videoconference. Preparation considerations and production time increase when a class is more interactive. Coordination with teaching partners and students at receiving sites is key to managing class time effectively and delivering the essential parts of the lesson.

Combination

Combining lectures with activities ensures that important material is covered while engaging students and giving them hands-on experience with concepts. The production needs of a combined lecture/interactive approach vary based on the kinds materials and participation activities required. It is important to balance flexibility with the lesson's priorities.

Presentation Room

The presentation room is the center of production for a videoconference class. Having the room and the presentation area organized goes a long way toward smooth and effective delivery. The tips that follow address many details of arranging materials and setting up the room to minimize

distractions during a videoconference presentation.

- Write out step-by-step instructions for connecting, using equipment, and contacting off-site troubleshooters, and keep them nearby.
- Mark off with masking tape and clearly label areas used for sitting and working; do the same for spaces used for cameras, overhead projectors, and other equipment.
- Use a large desk or table with a panel covering in the front.
- Connect a computer to a scan converter that is connected to the document camera to eliminate the awkwardness of constantly switching floppy disks.
- Keep a storage unit near the desk for presentation supplies such as paper, white-board markers, and felt-tip pens.
- Use plastic tubs to arrange supplies and materials for a particular lesson. These can be returned to the storage cabinet later.
- Have tissues, water, trashcans, paper towels, etc., nearby.
- Practice using the overhead camera before the videoconference.
- Place a clock on the wall that the presenter can always see without distracting students.
- Work closely with an assistant, if possible, to help with cameras and other equipment; have the assistant remain in the room during the entire class.
- Set the presentation camera at eye level with the viewing monitor so that the presenter can easily and naturally look into the camera broadcasting to receiving sites.
- Check for effective lighting:
 - Use additional lights to illuminate the presentation area if the room is dark or shadowy.
 - Set up and readjust lights before each class.
- Keep camera remote controls close for easier switching between cameras.
- Place the document camera on the presentation desk.
- Design a backdrop for the presentation room that establishes an appropriate tone for the class:
 - A bulletin board with student work (photos, drawings, graphic designs, etc.) can be changed periodically.
 - Rolling bulletin boards are also an option, though expensive.

Tools

The tools of a videoconference classroom are assets for quality instruction. Students can also use these software and hardware tools, enhancing their own skills and actively involving them in learning.

Document camera. This camera shows printed material, photographs, book pages, slides, and 3-D objects. The ELMO is a commonly used document camera. Lead teachers can most effectively use document cameras by:

- Preparing overheads in advance or make slides of notes using presentation software
- Stacking overheads in order and place them by the document camera
- Focusing and arranging documents prior to the videoconference to facilitate smooth transitions between documents
- Having books open to pages that will be displayed
- Placing materials for demonstrations near by and using the document camera to show each step

of the demonstration

- Using the document camera as a slide projector by placing slides on the camera table and turning on the backlight
- Placing paper on the document camera and writing on it as a whiteboard or chalkboard
- Using a black felt tip pen and write in large letters

Room camera. This main presentation camera is focused on the presenter and can be programmed to focus on others in the presentation room. Cameras can also be programmed to follow the presenter from the presenting desk to the white board or elsewhere in the room.

Lead teachers can most effectively use room cameras by:

- Preparing for the videoconference least 15 minutes prior to class
- Reviewing lesson script, arrange necessary materials and supplies, check room lighting, ensure hardware is working properly, and check appearance (e.g., clothing, hair)
- Pre-programming cameras for his or her movements so that the camera does not have to be refocused during the presentation
- Pre-programming cameras for other speakers and selecting these settings at the appropriate time
- Reviewing camera settings before class to identify any distracting items in their scope
- Removing plants, closing doors, and checking bulletin boards that will be behind the presenter
- Avoiding having students or others sit behind the presenter
- Focusing the presentation camera closely on the presenter so that students feel more connected to the presenter and the material presented

White board. White boards are used instead of chalkboards in computer and other classrooms where chalk dust can be damaging to electronic equipment.

Software. Presentation software, such as PowerPoint, can be used to display documents, notes, and other material to receiving sites. Doing so allows for a smoother presentation by eliminating loose paper that must be placed on and removed from the document camera.

VCR

- Cue tape to the appropriate segment to avoid delays during the presentation
- Stop and start the video using a remote control to emphasize and discuss points
- Assign students questions or other activities related to the video to help focus their attention

Specialized software and hardware

- Arrange for proper training of students and other team members on hardware
- Assign projects to give students experience on the hardware and software, reinforce learning, and give a purpose for learning
- Ensure computer software at receiving sites is installed properly and consistently with presenting site's set up

- Use and demonstrate on the same hardware that students have at receiving sites

Computer

- Use a computer equipped with a scan converter to display a computer screen to televisions at receiving sites
- Keep the keyboard close at hand
- Use large-sized, easy-to-read fonts and compatible background colors that avoid color blindness problems
- Use presentation software to outline the lesson, and eliminate switching and arranging papers on the document camera
- Preview presentations on the videoconferencing equipment before class
- Select a pleasing color for the computer background screen
- Avoid using patterns on background screen
- Avoid using screensavers, especially password-protected ones

Web site

- Post class assignments, presentation overheads, and other materials for students
- Post lesson plans so that teaching partners can access and print them at their convenience
- Provide links to resources students can use to complete assignments
- Post student writing and projects
- Load Web pages in advance to avoid waiting for sites to load in the midst of a presentation
- Minimize the windows and bring them up as needed

Contingencies

It is important to be prepared, creative, and flexible, especially during the beginning stages of such a program. Organizing materials and equipment helps create a smooth presentation; having contingency plans and being flexible can turn technical problems into teachable moments.

Production Considerations for Specific Courses

In a specific course, the combination of tools chosen will vary depending on content and teaching style. For example, in hands-on art and science labs, the following have been found useful in the North Slope District:

- Overhead cameras for demonstrations
- Science lab software and hardware for investigations and experiments
- Document camera to display graphics, artwork, slide shows, science experiments, and teaching examples
- Presentation software such as PowerPoint for lectures, assignments, slide shows, etc.

- Web site to post lesson plans, assignments, calendar, and other material
- Consistent equipment and supplies between sites
- E-mail for communicating with staff and students
- Image-editing software, scanners, and digital cameras
- Guest artists or science professionals (in person or on videotape) to do a special presentation or workshop

In math, health, and social studies, the following could apply:

- Consistent equipment and supplies, including calculators, between sites
- Overhead camera or white board for working math problems
- White board for brainstorming and sharing ideas
- Internet access
- Scanner
- Digital cameras
- Presentation software for staff and students
- Supplemental text and resource materials and a method to present this information
 - Document camera
 - Web site
 - Presentation slide software
- Guest health or social services professionals (in person or on videotape) to do a special presentation or workshop

Presentation

Whereas Production applies to organizing the tools for delivery, Presentation refers to planning and delivering the lesson.

Classroom Design

The participating sites will typically be autonomous classrooms, and the physical arrangement of each should allow for positive interactions between teachers and students, and among the students themselves. Prior to the first videoconference, the lead teacher should work with receiving sites to decide the best arrangement of classrooms given typical lessons, space, and resources. Though arrangement of tables and desks may change depending on a lesson's activities, there are two essential considerations in designing a videoconference classroom.

- All sites should have the hardware and software necessary to carry out a videoconference and the supplies to deliver particular lessons
- All or the majority of students should be on camera and able to see the presenting teacher

Some classrooms use long tables stretching away from the camera while others arrange desks or tables in an arc in front of the camera, but the key to classroom design remains arranging students and furniture so that the lead teacher teaches to all students.

Other elements of classroom design enhance both the individuality and interdependence of sites. Lead and teaching partners can work together to create engaging environments, or students themselves can take on such projects. Bulletin boards displaying student work or other materials can help create a comfortable learning environment that expresses each site's personality.

Delivery Pattern

How often you use videoconferencing (on air/off air delivery) varies with content, type of student activity, and teaching style. For example, the Alaska format was 3 days on videoconferencing and 2 days off:

Day 1 -- on-air planning and preparation for student projects

Day 2 -- off-air for students to work on their projects

Day 3 -- on-air for students to get feedback from lead teacher

Day 4 -- off-air for continued working and revising based on feedback

Day 5 -- on-air for students to share their final projects with lead teacher and all sites.

Lesson Planning and Delivery

Teachers who lead videoconference classes must consider the particular challenges of the technology when planning a day's lesson. Involving off-site students, coordinating with teaching partners, and anticipating problems with equipment--these are all part of preparing for a successful videoconference.

Lesson Planning. These tips for planning a lesson for a videoconference class are for lead teachers.

- Develop a script for each class, detailing material that will be covered, activities used, and hardware and software necessary.
- Outline how the lesson will proceed, and post the schedule on the document viewer for students and teaching partners.

Print this outline so that a hardcopy is available if there are problems with the document viewer.

Use graphic displays, such as transparencies, to help students follow the lesson and identify key points or information.

Print out graphic displays in case the viewer fails.

Post graphic displays to class Web site, or send them to teaching partners and/or students via e-mail.

- Keep an electronic and/or hardcopy file of script, displays, and other materials used for each lesson.
- Consider the most effective ways for student interaction and participation based on time and the lesson's objectives; this can occur:
 - Among all sites over the videoconference.
 - At each site while keeping the videoconferencing connection open.
 - At each site with the connection closed and later shared briefly with all sites over the air.
- Include activities that address all learning styles.

Delivering a Smooth Lesson. Class procedures set a tone for interactions between sites and let students know what to expect from instructors and what is expected of them. For one-time videoconferences, procedures provide

One year we had a major problem with our microwave link and were unable to connect with our distant sites for close to a month. Through the use of e-mail and our Web site we were able to get our classes going. We had regular contact with the teaching partners at each of the

guidelines to help participants make the most of their time together. For recurring videoconferences, such as weekly classes, procedures establish routines and expectations for students and teachers for every meeting.

six sites and, other than a few expediting issues and some telephone explanations about lesson plans, we felt the situation was as good as could be expected.

- Provide lesson plans, assignment sheets, rubrics, and checklists to teaching partners in a timely manner. Consider posting them on a Web site to eliminate confusion and keep communication open.
- Establish procedures to distribute and collect assignments, supplies, etc. One student may be assigned to pass out supplies, another to collect assignments and supplies. Rotate these duties until every student has had a chance to contribute to the orderly operation of the videoconference classroom.
- Establish a method of communication between the lead teacher and students. E-mail is useful and adds a personal element to distance education.
- Have equipment and supplies readily available but not in open view. If materials are out, students may be distracted by the objects and not listen to instructions.
- Arrange seating so that students are on camera. Rotate students who appear on camera so that all students will have an opportunity to be seen.
- Establish and follow routines for beginning and ending class times, and for particular activities. For example, students should be seated and ready for class when the bell rings, and should always begin each class with a writing assignment.
- Start class with an activity. A sketchbook, puzzle, journal assignment, or other writing assignment gives students time to settle down and time for sites to connect.
- Take roll of sites every class session. Rotate the order in which sites are called, and ask each site a specific question as a way of checking in.
- Allow each site to design an identifying sign or poster to serve as a backdrop for their classroom. Display this sign or poster on camera as soon as a connection to the presenting site is made. This enables the lead teacher to easily identify which sites are connected.
- Review videoconference rules and etiquette with students. Students should be respectful of their classmates, teacher, and partnering teachers.
- Assign a student responsibility for using videoconferencing equipment (e.g., document camera, connecting, etc.). Rotate this responsibility.
- Encourage participation from all students rather than focusing solely on students in either the presenting classroom or far-site classrooms.

- Help students develop patience when using new equipment or software, or when they are working a new classroom setting.

Coordinating with Teaching Partners.

One of the most enjoyable experiences of planning and producing a videoconference is working with teaching partners. Partners can bring unique perspectives to lessons, enhance the lead teacher's delivery, and enrich students' experiences. Teaching partners are the key to instruction at receiving sites and thus to the success of a videoconference. To ensure a smooth lesson at all sites, lead teachers should:

- Share lesson scripts and graphic displays with teaching partners at all sites so that they can keep pace and give students specific and timely instructions
- Provide ready-to-use images or detailed instructions for displaying images if teaching partners have no experience with equipment or supplies
- Know ahead of time if some sites will be unable to participate in the videoconference due to equipment problems or scheduling conflicts
- Remind students of class procedures and clearly state any changes in these procedures
- Train teaching partners and students on new hardware and software before they are used for a videoconference
- Work with guest presenters so that they are familiar and comfortable with videoconferencing equipment
- Ensure that each site knows what to do during the remainder of class if the videoconference connection is lost

Communicating with Teaching Partners. These tools help lead teachers

In 1991, I taught an art class for the North Slope Borough School District using videoconference technology. We had no idea of the capabilities of the medium and no idea how to use the medium to deliver instruction. Needless, to say we did lots of things that could have been done in more expedient ways had we known.

We wished many times we had someone to speak with about the best or better ways to deliver instruction. In many ways, it was like teaching blind. We did things and then waited for the reaction. We were almost clueless. But, we were dedicated and determined to make things work for our students.

I was determined to comment on every piece of art produced in 7 villages by 75 + students. Teaching partners packaged artwork and sent it to me through the mail. It took weeks for the art to arrive and I spent weekends commenting, matting and sending it back to sites. This process took a month to complete. Feedback in this instance was certainly not timely. I also spent hours every Friday sitting by the fax machine faxing assignments and lesson plans to sites. Of course, back then we didn't have a school district Web site and we were just beginning to learn the capabilities of e-mail.

It was a lonely teaching

and teaching partners keep in contact before, during, and after a videoconference.

- E-mail is personal and saves time. Communication can be sent to individuals or the entire class by creating mail group or distribution list.
- A Web site can be used to post lesson plans, assignments and resources for teaching partners as well as students.
- A fax can be used as backup tool. Though expensive and time consuming, faxing materials may be necessary for last-minute changes to the lesson.
- Regular mail is the last resort for videoconferencing communication. Mailing materials takes a great deal of time, but may be the only way to get supplies to teaching partners. Plan ahead for this delay.
- Video camcorders and digital cameras record in- and out-of-class activities to share with other sites during the videoconference.
- Telephone and voice-mail are useful in clarifying instructions or e-mail communication.
- Face-to-face site visits are necessary for the lead teacher. They are an excellent way to establish relationships with students and teaching partners.
- Internet chat rooms or bulletin boards provide students with immediate feedback from the lead teacher. Real-time chats require coordinating times with far-site teachers and students.
- Contact information for off-site technical support should be available at all participating sites and accessible to lead teachers, teaching partners, technical assistants, and student-assistants.

experience. My only colleague was the videoconference math teacher who was located in Barrow, 310 air miles away. I felt deep depression regarding the effectiveness of the class two months into instruction. I shared this with my colleague and he indicated the same feelings overwhelmed him at about the same time. Over the years we have found this phenomenon to be consistent for teachers who have delivered classes via videoconference. I must emphasize that videoconference instructors and teaching partners need to receive lots of support.

Looking back on this experience I will have to say that I tried to do too much and in the end depleted my energy. I could have made things a lot easier for my students, my teaching partners and myself. I think that everything probably took twice as long as it would take us now.

Eight years later, I was fortunate to have an opportunity to teach another videoconference art class. Students shared that students who participated in the class eight years ago still have their artwork proudly on displayed on their walls at home. I feel that the students I taught would not have had the opportunity to take an art class without videoconference technology. Student experiences illustrate the value of videoconference education.

Assessing the Videoconference

- Know how students will be assessed in videoconference classes, and share this information with both teaching partners and students
- Provide opportunities for teaching partners and students to give feedback on the videoconference experience and procedures
- Revisit procedures occasionally and make adjustments for smoother, more effective videoconference presentations based on feedback

Videconference Session Plan

- The session plan below divides preparation for a videoconference into four sections: Presentation, Production, Management, and Assessment. The italicized text highlights considerations for each stage and step.

Goals of Course	Articulate goals of course and the role of videoconferencing in achieving them Share goals with teaching partners and students
Objectives	Consider and plan for day-to-day activities and lessons that lead to accomplishments of overall goals
Team Members	Identify every role that must be filled to carry out videoconference lessons and who will fill those roles
Responsibilities	Define and agree on responsibilities of each team member

Presentation: <i>What presentation methods will best meet lesson objectives and effectively engage students?</i>	
Demonstrations	Script any demonstrations Have necessary supplies easily accessible; if demonstrations will be performed at receiving sites, ensure those sites have necessary supplies Arrange cameras and other equipment to clearly show demonstration Complete preparations for demonstration before the videoconference connection is open Consider what students should be doing during the demonstration; having them work during a demonstration can help with time constraints but may distract them from the lesson at hand Practice demonstration beforehand to know how long steps will take; allow for extra time if far-site partners or students will participate in demonstration
Graphic or Digital Images	Use graphic or digital images to clarify important points, stimulate discussion, or expound on a subject Use images relevant to students; use a digital camera or scanner to capture them Use captions and labels to clarify the meaning of images

	<p>Keep images simple so that they display clearly and cleanly</p> <p>Create continuity and connections for students by using the same images on class Web site and e-mail as in presentation</p> <p>Provide images to teaching partners and students for their own use</p>
Overheads	<p>Use a document viewer to display information traditionally displayed on an overhead projector</p> <p>Create overheads in the landscape layout (11" x 8 1/2")—most monitors display in landscape rather than portrait</p> <p>Use large font sizes and dark colors for lettering overheads and off-white or light colored paper for background so that documents display clearly on monitors</p> <p>Limit text on overheads to six or seven lines</p> <p>Send documents or post on class Web site</p>
Work Samples	<p>Prepare work samples or examples before the videoconference</p> <p>Use a scanner, camera, or digital camera to create images of samples that can be displayed on the document viewer</p> <p>Create a series of images to show the stages in creating the finished example</p> <p>Provide receiving sites with opportunities to share work samples and other material</p> <p>Post work samples to the class Web site, or send via e-mail to share with teaching partners and students</p>

Production: <i>What hardware, software, or other equipment are required to produce the videoconference?</i>	
Equipment	<p>If possible, use a separate computer for displaying overheads and scanned images than the one for viewing the videoconference sites (Using the same computer for displays as the videoconference CODEC can cause difficulties—if the computer crashes then the videoconference connection will be lost)</p> <p>Connect VCR, or laser disk or DVD players to videoconferencing equipment to directly display images and audio to receiving sites</p>
Supplies	Carefully consider all of the supplies presentation requires of presenting and receiving sites; have supplies close during the presentation
Software	Know what software programs a presentation will require
Interactions/ Participation	Plan ways that help students at all sites engage the material and each other

	<p>Detail expectations and procedures for student participation; remind students of these procedures periodically</p> <p>Communicate any special instructions for participation during particular lessons or activities before the videoconference begins or at the start of the class</p>
Activities	<p>Allow students to participate in at least one activity during a videoconference (videoconferencing as an effective educational tool diminishes when students only watch a television monitor and listen to a lecture)</p> <p>Plan activities that engage students' multiple intelligences</p>
Projects	<p>Plan steps for projects and develop a rubric so that students and teaching partners know what is expected of them</p> <p>Work with teaching partners to identify any concerns or problems early on, and to ensure projects keep on pace</p> <p>Allow off-air organization and work time for students</p> <p>Plan for on-air updates from receiving sites</p> <p>Consider holding individual or group videoconference meetings with students if necessary</p>
Questions	<p>Allow for all sites to participate in question-and-answer sessions and discussions</p>

Management: <i>What can be done to prevent confusion or rushing during class time?</i>	
Preparation and Delivery Time	<p>Allow for more time in preparing and delivering a class via a videoconference</p> <p>Have overheads, images, and other materials organized and easily accessible during class</p> <p>Be aware of hardware and software problems that can occur (e.g., lost connection to receiving sites), and have contact information for troubleshooters on hand</p> <p>Make a schedule for each class and share it with teaching partners</p> <p>Follow the schedule but be flexible to allow for a vital, responsive learning environment</p>
Communication in Class	<p>Display a countdown clock showing the time until class begins</p> <p>Have each site display a unique identifying image, through digital or document display, at the start of class so that the presenting site can take a roll call</p> <p>Have each site designate a spokesperson for all interactions; rotate this responsibility</p>

	<p>so that all students have an opportunity to represent the site</p> <p>Plan for ways to communicate with students and teaching partners while off the air—e-mail, chat room, telephone, and fax are all ways to keep in contact during class but when the videoconference connection is off</p> <p>Know which methods of communication will be most efficient and effective for each activity, and communicate with teaching partners about when these transmissions should occur</p>
Communication Outside of Class	<p>Allow for off-site students and teaching partners to communicate with others (presenting site and other off sites) via e-mail, chat room, or Web-based bulletin board</p> <p>Provide opportunities for students to communicate with the lead teacher outside of class</p> <p>Plan regular communication with teaching partners to discuss upcoming videoconferences, students' progress on projects, presentation methods, and procedures</p>

<p>Assessment: <i>What are the best ways to assess student performance, and how will assessment responsibilities be shared across sites?</i></p>	
Methods	<p>Consider a combination of these options for assessing student work:</p> <p><i>Demonstrations Participation</i></p> <p><i>Displays Portfolios</i></p> <p><i>Essays Projects</i></p> <p><i>Journals Tests, written or oral</i></p> <p><i>Oral presentations</i></p> <p>Allow for evaluation of the videoconference course, procedures, and lead and presenting teachers at mid- and end-of-course</p>
Responsibilities	<p>Work with teaching partners to develop appropriate assessment tools and rubrics</p> <p>Decide who will be responsible for administering assessments and grading student work based on a shared rubric</p> <p>Designate how lead teacher teaching partners, peers, and others will be involved in assessments</p> <p>Consider delegating assessment responsibilities to each site's teaching partners (sharing assessment responsibilities among teaching partners eases the lead</p>

	teacher's load and allows students to be graded by those most familiar with their classroom work)
--	---

Classroom Management

How does a lead teacher control what occurs inside distant classrooms, perhaps many miles away?

First, it is vital to have a teaching partner at each receiving site in the classroom with students. Their task is to assist the lead teacher in achieving course goals and objectives, and they are essential for successful classroom management. The success or failure of videoconference classroom experiences is often directly related to the support of the teaching partner. In addition, classroom management consists of three issue areas: time, motivation, and communication.

Time

Videoconference instruction will take more time to prepare and deliver than a teacher new to the lead role expects it will take not only because of the technology, but also because of the number of sites and students involved. Preparation, production, communication, and instruction time will likely be more than double that of a regular, live course.

- Start class with a count down clock, so that all sites will begin class on the lead teacher's schedule.
- Set reasonable deadlines for activities and projects.
- Plan flexible activities and projects so that objectives and time can be adjusted. This is more important when lead teachers are working with multiple receiving sites. Allow sites to complete activities before moving on. Those sites that are really focused on an activity and exploring its possibilities should have the time to do so without feeling that they are behind schedule and must rush to finish. Have an extra credit activity or challenge activity for those that may finish early.
- Use a clock on screen when students are working in class.
- Avoid trying to troubleshoot technology and connectivity problems on the air during class; have a backup plan in case the videoconferencing technology fails.
- Save time during demonstrations by preparing finished examples of the steps to be completed in a project.
- Lead teachers should not ask students to complete a project step-by-step with them during a videoconference class, because such projects entail time management and classroom management problems. Several sites will finish early and others will take much longer; early finishers will be-come distracted while late finishers will feel rushed.

Motivation

Motivation: The technology of videoconferencing helps to motivate students, who see that they can share their work with a broad audience.

- Be enthusiastic and flexible--a sense of humor is a valuable asset.
- Connect sites in a conference and have students from several classrooms solve a problem

collaboratively.

- Have students introduce themselves and participate in a project that provides information about their interests, hobbies and goals.
- Encourage student questions and interactions.
- Award points for answering questions and participating in class activities.
- Encourage and assign group work. Students enjoy working together.
- Assign investigations and field trips to provide students with opportunities to work together outside the classroom. Students can share information with videoconference classmates. Students enjoy sharing their work and are motivated to do their best work when they know they will publish and share.
- A Web site makes a great bulletin board or gallery for a videoconference class.
- Presentation software, Web software, digital cameras, and scanners are excellent ways to publish student work.
- Students are interested in videoconferencing technology and should be encouraged to use it.
- Encourage the use of "e-mail pals" to solve questions and problems.
- Videoconference classes should be interactive and the pacing dynamic, so that students miss important information if they are not paying attention.

Communication

Course design and delivery is student-centered, so projects must be clearly defined, well organized, and communicated simply. Communication should occur before, during and after instruction. Feedback is important so that instruction can be modified to address student and staff needs.

- The lead teacher must provide instructions and feedback in a clear and simple manner.
- Lead teachers must let students know who they are. Lead teachers should share personal interests and experiences in order to become real to students. Students tend to view lead teachers as television celebrities.
- Lead teachers should use specific student names as often as possible when asking for a site response.
- The class should include time for students to communicate and share with one another.
- Lead teachers must be aware that "body

It is difficult for a teacher who is used to controlling the tempo and content of their class to give that over to another teacher. It is hard for them to remember that they are not always aware of what is happening at the other sites that influences tempo and content. My own experience as a teaching partner showed me that. In one case I was a teaching partner in a math class that I was qualified to teach and I had a hard time relying on the judgment of the lead teacher when I could see other avenues that were open to my class even though I was aware that there were reasons for the decisions he was making. My other experience was as a partner in an art class, which was outside my area of preparation, and I had fewer problems there because I did not have strong opinions about how

language" is exaggerated via videoconference. Lead teachers should use gestures and facial expressions communicate a friendly, caring and confident demeanor.

- The teaching partner or site facilitator becomes the lead teacher's "eyes" in the classroom. Lead teachers need to check on what is going on in receiving site classrooms on a regular basis, and to emphasize that they want to be aware of any problems immediately in order to adjust course delivery.
- The teaching partner must communicate problems and needs immediately. This includes missing supplies, unclear instructions or lesson plans and any classroom management problems relating to course delivery. The special needs of students must likewise be communicated to the lead teacher.
- It is important for teaching partners to communicate positive things that occur during delivery of a videoconference course, because lead teachers have few peers or colleagues with whom to share their experiences or from whom to hear about similar experiences. Positive feedback is important!
- Lead teachers should use site-to-site videoconferences as well as one-to-many sites. A site-to-site conference lends itself to personal communication between the lead teacher and students at one site. Students feel more comfortable in communicating problems they may be having when other sites are not connected.

to conduct the class.

To avoid this it is important that lead teachers communicate clearly not only what they need but also why it is needed. The best teaching partners will hold opinions, will want the best for their students, and will want to know the why as well as the what. The lead teacher should want their honest feedback about how things are going, listen to any ideas they have, and collaborate on strategies as much as possible. But it needs to be understood that lead teachers make the final choices and set the direction of videoconference courses because they have a better overview of what is happening in their classes as a whole.

Interaction

Videoconferences provide unique opportunities for students to interact. In a videoconference class, students can talk with instructors, students, and others at receiving sites, and they can publish and share their work with an audience beyond the classroom. However, interactions during a videoconference require careful planning and structuring to make them effective and enjoyable. Instructors must plan for hardware and software needs at all sites and coordinate with teaching partners. Generally, interaction via a videoconference is more complex than traditional classroom interactions and requires more time in both preparation and implementation; the more complex the activity, the more time an instructor must take to chart out the steps and coordinate with the videoconference team. The following information offers issues to consider when planning interaction and activities.

Activities to Consider

Interactions may occur among students, the instructional materials they study, the technology, their classmates on site, classmates at receiving sites, instructors, and the world. These activities can foster interaction in during a videoconference.

- Projects
- Demonstrations
- Discussions and debates
- Experiments and investigations
- Skits, plays
- Role-plays
- Presentations
- Questions-and-answer periods
- Brainstorming
- Sketchbooks and art activities
- Story boards, organizational charts, or outlines
- Games
- Writing assignments and journal activities
- Worksheets, puzzles, tests, and other paper-based activities

Projects

Projects are excellent tools for creating interaction in a videoconference course. They involve hands-on learning, and they engage students in the application of concepts. Projects promote critical-thinking and problem-solving skills by providing students with the opportunities

Arctic Celebrations and An Arctic Year are examples of two student projects that were part of a Web Development and Management videoconference class. North Slope Borough School District students in six outlying villages designed and produced Web sites. They recorded observations, images and elder's stories about their Arctic home. You may view these projects at:

to analyze, synthesize, and evaluate their activities. Additionally, project-based learning provides flexibility with class time and enhances instructors' abilities to address individual site and student needs. This instructional model also provides time for the lead teacher to speak with students individually, provide encouragement, comment on work or clarify instruction.

<http://www.nsbsd.12.ak.us/projects>

Videoconferencing is best used with projects as a way of linking students with the lead teacher, and these meetings are most productive when students are actively engaged in the concepts, rather than simply presenting outcomes. These meetings with the lead teacher can be with the whole class at a single receiving site, a group of students, or individual students. Conferencing with students in this manner can involve connecting with all sites two or three days per week and with individual sites as needed. Student presentations on projects via a videoconference can be shared with all sites; however, presentations are best given over several days because students lose interest quickly when not presenting or not directly involved with the broadcast. Projects are most effective as teaching tools when a lead teacher:

- Keeps project instructions simple and clear
- Provides assignment sheets with a well defined evaluation rubric
- Provides examples so that students know what they are expected to accomplish
- Anticipates difficulties and problems students may encounter to better help students to work through them
- Assigns projects that at least one instructor has had experience with
- Has supplies and materials delivered to receiving sites prior to assigning the project
- Has surplus materials available
- Designs projects that involve students' and the community's interest
- Shares students' work and projects with all sites
- Includes specific criteria for final project assessment, but remains open to

We have had great success with large projects as culminating events to skill development. These have included Web sites on specific topics, scientific investigations, science fairs, art shows, and community presentations. Projects can be highly motivational, they give students practice in the skills they will need as adults, and they are effective assessment

interpretation and individual solution

tools.

Planning for Interaction

Students learn more when they are actively involved in their education. A minimum of 50 percent of a videoconference class should involve students interacting with each other. The following are questions to consider when planning for interaction in a videoconference course.

- What type of interaction will occur?
- How will the interaction occur? (E-mail? Videoconference session? Web site?)
- Does interaction support learning objectives and goals?
- When will the interaction occur?
 - During the scheduled videoconference class time?
 - During class with the videoconference connection off?
 - Outside class time?
- Are support materials available at sites for class activities?
- Are activities pursued individually or within small groups?
- Will group activities involve small groups of students or sites?
- Will every student interact, or will each site select a spokesperson?
- Does interaction have a culminating activity that allows students to share or publish?

Strategies to Encourage Interaction

- Use a checklist to ensure interaction occurs with each site or student. The sample worksheet below shows how to plan for the number and type of activities for a lesson. A blank worksheet can be found at the end of this chapter.
- Plan group activities that culminate with opportunities to share work or projects with the entire videoconference class.
- Allow time for introductions, and introduce people that may not appear on camera. Whenever possible, move cameras so that people appear on screen when they are introduced.
- Allow ample time for students to answer questions and interact. Interaction will require more time than in a traditional classroom because of the need to set up hardware and software and because of possible transmission delays.
- Assign a site spokesperson and rotate this responsibility. This allows for interaction but requires less time.
- When asking questions, call on a specific site or student. Rotate the order in which sites or students are called. This eliminates problems of no one speaking or everyone speaking at once when a question is

asked.

- Ask specific sites to respond to comments made by another site in order to enhance discussion.
- Display discussion questions on screen in via document camera or presentation software

Assessment

An assessment plan for courses delivered by videoconferencing can be more complex than for regular classroom instruction because there are more components than an individual teacher and his or her students. These include especially the technology and the teaching partners at the receiving sites.

Assessing Student Work

The lead teacher is responsible for the design of the assessment plan and the selection or development of tools and criteria as an integral part of the overall course design. This includes deciding who will develop assessment tools, who will administer them, and how students will receive timely feedback about their performance. Assistance in development and administration of assessment can be assigned to teaching partners depending on their skills and training. Although some assessments can be administered by computer and transmitted to the teacher, effective administration of assessments at receiving sites almost always involves the teaching partner, at least for monitoring the activity.

What follows is a discussion of assessment tools, the roles played by the lead teacher and teaching partners, and issues related to the uses of tools in a videoconference class. A sample rubric and tools used by the North Borough School District can be found in [Sample Assignment for "An Arctic Year" Web Site](#).

Assessing Activities and Daily Work

Teaching partners, guided by an outline of expectations provided by the lead teacher, assess students' daily work and performance in activities. Teaching partners' enthusiasm and involvement in class activities directly affect their students' attitudes and energy; therefore, he or she should hold students to high standards and take an active role in activities. The lead teacher generally provides plans for activities to teaching partners before the videoconference and allows adequate time for their completion during class.

Lead teachers are responsible for:

- Clarifying expectations for student performance and participation
- Providing activities and related materials to partners in a timely manner
- Providing ample time for students to complete activities during class

Teaching partners are responsible for:

- Reiterating expectations for student performance and participation
- Implementing activities as the lead teacher has planned
- Taking an active, enthusiastic role in activities
- Assessing students' performance in class daily work and activities

Classroom Participation

Teaching partners assess classroom participation because only they see and work closely with all students at their sites.

Lead teachers are responsible for:

- Providing guidelines and expectations for student participation
- Providing students with opportunities to participate

Teaching partners are responsible for:

- Reiterating guidelines and expectations for participation
- Facilitating student participation
- Assessing students' participation

Tests

Written tests evaluate students' factual recall and record their problem-solving strategies. Generally, a lead teacher writes tests for all sites, and teaching partners administer them to students. Teaching partners can grade these tests, but it is incumbent on the lead teacher to provide an accurate, clear key. In turn, teaching partners must communicate to the lead teacher any areas of weakness in student performance so they can be addressed in a subsequent videoconference.

After the test, the lead teacher should review the answers during a videoconference and provide an opportunity for students to ask questions. However, it is important to avoid taking video time with extended conversations over particular questions or issues, when teaching partners can address individual students' detail concerns.

Lead teachers are responsible for:

- Writing tests
- Writing keys
- Providing teaching partners with tests and keys in a timely manner
- Reviewing answers and providing feedback to all students

Teaching partners are responsible for:

- Communicating to the lead teacher any problems with student performance
- Administering tests
- Grading tests
- Addressing individual students' questions and concerns

Other Student Assessment Areas

For assessing each of the following student activity types -- **Experiment Write-ups, Portfolios, Presentations, Projects, Visual Arts, and Writing** -- the lead teacher's and the teaching partner's responsibilities are the same:

Lead teachers are responsible for:

- Providing guidelines for assignment and criteria for assessment
- Providing feedback and/or working with teaching partner to assess students' activity and product

Teaching partners are responsible for:

- Communicating guidelines for assignment and criteria for assessment
- Assessing students' product, either independently or in conjunction with lead teacher

Below are suggested strategies for assessing in each of these six areas.

Experiment Write-ups - Teaching partners should be the primary assessor of writing assignments about science or other experiments. Lead teachers may choose to have students present their results digitally with presentation software so that they can also provide feedback on students' work. This has several advantages. First, digital presentations of experiments, whether in a word processing application or in presentation software, can be shared easily with the lead teacher for evaluation and comment. Second, students can present their work and results to the entire videoconference class either during a videoconference, posted to the class Web site, or as an e-mail attachment. Third, the linear nature of presentation software works well with traditional scientific method investigations, which helps students write out procedures. Fourth, students can use digital images of the experiments' stages and results to jog the their memory when they write their final report.

Portfolios - Teaching partners should be primarily responsible for assessing portfolios. However, digital portfolios can be shared conveniently with the lead teacher for comment and evaluation. Portfolios can be created and shared with presentation or word processing software.

Presentations - The teaching partner should be primarily responsible for assessing presentations. Presentations provide students an opportunity to demonstrate how they use and understand the concepts that have been presented. Presentation software allows students to share images and audio as well as writing.

Projects - The teaching partner should be primarily responsible for assessing projects but should also have input from the lead teacher. The lead teacher must develop a rubric with clear and thorough criteria for the teaching partner to accurately assess student projects.

Visual Arts - Teaching partners should be closely involved in assessing students' artwork. The visual nature of videoconferencing facilitates the assessment of art because a camera can relay an image of the piece to the lead teacher, zooming in for detail, or a picture of the piece can be digitized and sent via e-mail attachment. The logistics of this process make it nearly impossible for lead teachers alone to provide timely feedback, and as with other graded assignments, the number of pieces a lead teacher would have to evaluate could be overwhelming.

Writing - In many cases, the teaching partner can evaluate written work. In a large class, the lead teacher might lack time to assess the written work of all students and is unlikely to have the time to give individual feedback. Although such feedback can be provided to receiving-site students by e-mail or fax, this process can be difficult and time consuming.

Guidelines for Assessing Teaching Partners

This section is designed to give lead teachers and administrators guidance in assessing teaching partners' performance. Lead teachers have a unique role: they supervise teaching partners by directing class content and activities, but they do not have supervisory authority over partners. Therefore, lead teachers must work closely with their own and teaching partners' building administrators to resolve problems that arise. As discussed in the Planning chapter, including receiving site administrators in the planning process helps them understand the goals of the videoconference program and the day-to-day issues teachers and partners face; this, in turn, paves the way for effective communication and the quick resolution of problems.

The following are important questions to ask when assessing teaching partners.

- How well does the teaching partner follow the lead teacher's direction?
- How well does the teaching partner maintain classroom discipline and motivation?
- Is the teaching partner prepared for the videoconference:
 - Does he or she read lesson plans in advance and have supplies and ready for the videoconference?
 - Does he or she have the hardware and software ready prior to connecting?
 - Does he or she immediately communicate technical problems or lack of materials?
- Is the teaching partner an active participant in the class?
- How well does the teaching partner work with students to make the classroom an inviting learning environment?
- How well does the teaching partner assess students?
- How well does the teaching partner maintain direct contact with parents?

Guidelines for Assessing Lead Teachers

The following are questions that can assist an administrator in assessing the performance of a videoconference lead teacher. In most cases, the quality of a lead teacher's performance can be seen in the overall performance, enthusiasm, and effectiveness of teaching partners and students.

- How effectively does the lead teacher align course goals and videoconference program goals with district goals?
- How well does the lead teacher define goals and objectives for teaching partners and students?
- How knowledgeable and enthusiastic is the lead teacher about the course content?
- How well has the lead teacher trained teaching partners and students to use the hardware and software to facilitate interaction?
- How well does the lead teacher communicate with teaching partners?
- How well has the lead teacher prepared staff and students at all sites for each videoconference class?
- Does the lead teacher make lesson plans, activity sheets, and other support material, and provide them in a timely manner?
- How well does the lead teacher involve students in meaningful interaction, projects, and learning opportunities?
- How effective is the lead teacher's on-air delivery and demeanor?
- How well does the lead teacher use graphics to enhance lessons?
- How smoothly are demonstrations and examples integrated into the overall videoconference presentation?
- How well does the lead teacher take advantage of the capabilities of the videoconferencing hardware and software?
- How does the lead teacher address equipment failures, changes in schedules, and other problems associated with videoconferencing?
- How clearly do rubrics created by the lead teacher guide teaching partners in assessing student performance?

Glossary

Connectivity

Connectivity is the way in which videoconferencing stations share audio, video, and file data. (Is this really the definition? Are the references throughout text correct, then? Connectivity vs. connection--terms must be consistently and clearly used.) An overview of connectivity can be broken down into the signal and the components that carry and manipulate it, how the whole videoconferencing system functions, how the videoconferencing system is controlled, and the basic setup of the videoconferencing system.

Signal

The signal is either an electric current or an electromagnetic field, whose fluctuations can be used to encode information. The carrier signal for a videoconference contains the encoded information used to produce audio, video, and data displays in the videoconference classroom. The example of the telegraph, in the sidebar, exemplifies an extremely simple use of a carrier signal. The need to send complex information has led to innovations that allow more than the simple "on" or "off" information sent on the carrier signal described in the telegraph example. However, the principles of sending information over long distances, and of coding and decoding, remain the same as for the simple telegraph example.

Telegraph

The telegraph uses DC current as a carrier signal. The sender presses a key to turn on the current, and releases the key to turn off the current; information is encoded in terms of whether the current is on or off at a given time. Decoding is accomplished by a device that responds to whether the current is on or off. Thus, when the sending key is depressed, the circuit is completed and an electromagnet causes the "clicker" to make a sound; when the send key is released, the electromagnet is turned off and the "clicker" is reset. The decoding device interprets the on/off signal as sound or no sound, and the tele-graph operator decodes the series of sounds--dots and dashes--as alphanumeric characters.

Analog Signal

An analog signal is generated as an electronic response to something in the real world. For example, a microphone in a telephone converts sound waves from the human voice to an electrical analog signal. This analog signal is then carried over telephone lines to the receiving telephone where it is converted back into sound waves. Transmitting an analog signal to the receiving site allows more chance for "noise" (error) to get into the signal than transmitting a digital signal.

Digital Signal

A digital signal is created by converting analog information into a binary format--into a series of ones and zeroes which describe the analog signal. Computers and compact disk players process digital signals. Digital signals are less susceptible to "noise" than analog signals. Digital signals may be "compressed" (see "Codec" below), thus reducing the amount of information that must be sent to have a usable signal at the other end.

Codec (coder/decoder or compression/decompression)

The codec converts analog data to digital form, and digital data to analog form. A codec that converts analog data to digital form may also "compress" data, by eliminating redundant information, which reduces the amount of data that needs to be sent for the videoconference; another codec that converts digital data to analog form may "decompress" such data. This reduces the bandwidth needs of a videoconferencing system (see "bandwidth" below) and thereby speeds up transmission.

Digital Decompression

Decompression is the process by which compressed information is reconstructed to share the information that was sent. The point of digital decompression is to reproduce an analog signal that will, in turn, produce sound that sounds like what went into the microphone, or video on the monitor that fairly represents the video collected by the camera at the other end.

Bandwidth

Bandwidth is a measure of the range of frequency that a signal occupies. It is directly proportional to the amount of data that can be transmitted. A larger bandwidth means that more data can be sent. Bandwidth is important in videoconferencing for determining the quality of the video that can be sent and displayed reasonably--inadequate bandwidth means unsatisfactory video transmission. Because bandwidth costs money, schools and institutions try not to buy more than they anticipate needing. This consideration has been a major factor in the development of technologies for digitizing and compressing signals.

Modulation

Modulation technology is used to take advantage of the characteristics of carrier signals (optical or electronic) to send additional information. It uses markers that recognize changes in things like voltage, waveform phase, frequency, and binary encoding (digitizing). Better modulation technology results in more efficient use of the carrier signal and ultimately provides better quality video and audio production. As modulation technology becomes more complex, it becomes more difficult for different systems to communicate because of the different ways of coding and then decoding the carrier signals. That is a reason why there is a movement to establish standards that will allow communication between different brands of telecommunication systems.

Multiplexing

Multiplexing is technology that permits better use of the carrier signal bandwidth by sending more than one modulated signal within a bandwidth. This means that more than one simple signal can be transmitted as part of a single complex signal, and that these simple signals can be separated at the receiving end.

Transmission Medium

The transmission medium is the means by which carrier signals are moved between end points e.g., videoconferencing stations. This includes a particular technology (which can include hardware and/or software) and a physical medium to transmit the signals. A brief comparison of some better-known ones is shown below (adapted from Whatis.com <http://www.whatis.com/thespeed.htm>). This is a simplified display of a few common transmission media. Fully interactive videoconferencing requires at least 384 Kbps of bandwidth.

Carrier Technology	Speed	Physical Medium	Application
ISDN	1.544 Mbps	T-1	Medium and large enterprise access
Satellite	400 Kbps	Air	Faster home and small enterprise access
Cable modem	512 Kbps to 52 Mbps	Coaxial Cable	Home, business, school access
Ethernet	10 Mbps	10-base-T	Most popular for local area networks (LAN)

Carrier Technology	Speed	Physical Medium	Application
ISDN	1.544 Mbps	T-1	Medium and large enterprise access
Satellite	400 Kbps	Air	Faster home and small enterprise access
Cable modem	512 Kbps to 52 Mbps	Coaxial Cable	Home, business, school access
Ethernet	10 Mbps	10-base-T	Most popular for local area networks (LAN)

Bridge

Bridges and routers connect the participants in a videoconference to one another. The distinction between a bridge and a router has to do with whether or not addresses and the physical path to that address is set or not. A more detailed account of bridges and routers can be found at Connected: An Internet Encyclopedia, at <http://www.freesoft.org/CIE/index.htm>. The System A videoconferencing system is a group of components that work together to support communication by sharing video, audio, and data files with distant sites. The diagram below identifies some of those components and how they interrelate. The different color lines show where the signals are generated and the arrows show the direction that information flows. The components can be grouped into viewers (monitors and speakers), senders (cameras,

microphones, whiteboards, computers), controllers (key-board, tablet, or remote), processors (codec and bridge/router), and carriers (wires, microwave in air, satellite signals, fiberoptic cable).

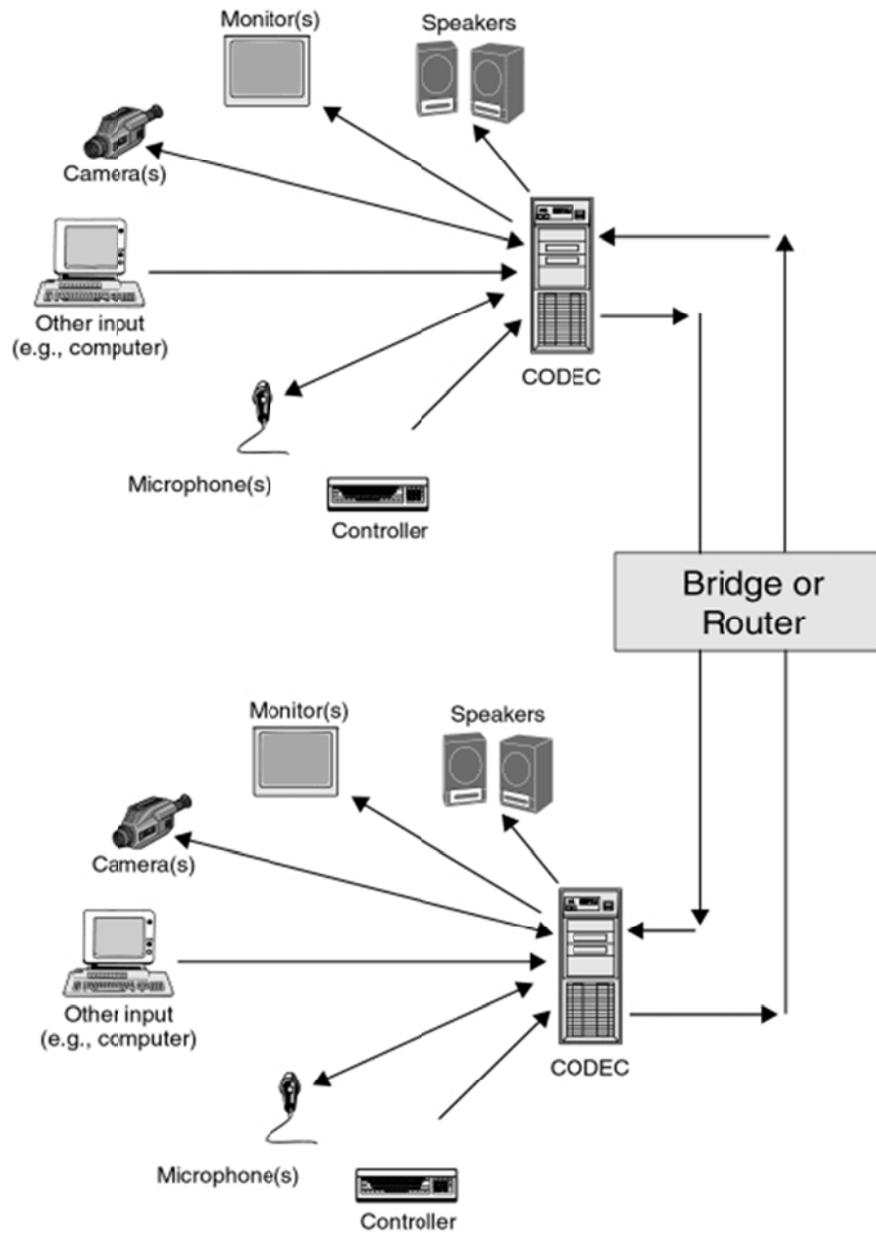
Router (see Bridge)

System

A videoconferencing system is a group of components that work together to support communication by sharing video, audio, and data files with distant sites. The diagram below identifies some of those components and how they interrelate. The different color lines show where the signals are generated and the arrows show the direction that information flows. The components can be grouped into viewers (monitors and speakers), senders (cameras, microphones, whiteboards, computers), controllers (keyboard, tablet, or remote), processors (codec and bridge/router), and carriers (wires, microwave in air, satellite signals, fiberoptic cable).

A Troubleshooting Scenario: We had a problem with the microwave system connecting our satellite earth station with the routers at the school district office. Our technician decided to go up in a "cherry picker" to work on the microwave can. The catch was that it was around -40° F with wind chills in the -70s. It wasn't that unusual to be out in cold weather working in the Arctic, but ending up stuck in a dysfunctional cherry picker for three additional hours was, and we were all relieved when he got down, cold but without much frostbite.

Interrelationships of videoconferencing components



Senders

Senders generate analog signals that are digitized, compressed, and sent to distant videoconferencing sites. These might include any or all of the following.

Cameras. Cameras capture pictures at the originating site. They may be set cameras that are not moved around the room, mobile cameras, or document cameras that work like overhead projectors.

Microphones. Microphones capture sound. There are a variety of microphone designs that work best under specific conditions. A microphone should be chosen with the conditions of a specific site in mind.

Whiteboards. Whiteboards allow teachers to write like a chalkboard, but do not generate chalk dust that can impair videoconferencing equipment. The whiteboard may be a small tablet or large and upright similar to ones in a classroom.

Computers. Screens and data from computers can be exchanged between sites. Computers used for presentation should have lots of RAM and processing power because of the number and type of applications that may be open at the same time, in order to make transitions between applications as seamless as possible. It is best to use a computer dedicated to the videoconferencing system that is separate from the codec. The advantage to having a dedicated computer is that if an application crashes the computer, it does not crash the codec. A codec crash will result in the loss of communication, and may necessitate rebuilding the codec in order to re-establish communication.

VCRs or other video players. Video output from peripherals can be used with videoconferencing systems. It is better to use a system that allows for easy search and playing; e.g. laser disks, DVD, or CD-ROM. On the other hand, a class that plays an entire video without discussion is better off sending copies of the video to each site.

Viewers

When the compressed and digitized sender signals are received at the receiving site, they are decoded and displayed through the receiving site viewers--usually monitors and speakers. Lead teachers should use a monitor to observe what the lead site is sending to receiving sites. This is particularly important while presenting. Lead teachers should also have a screen, separate from the videoconferencing monitors, for any computer they use, in order to get computer displays ready without having to manipulate the views.

Controllers

Controllers are essentially interface devices that interact with software and allow lead teachers to control the videoconference. The keyboard, tablet and pen, and remote control are the most common interfaces. See the section below on controllers for a more detailed discussion.

Our personal preference is to use a tablet because it is so intuitive that anyone can easily make choices while presenting. The pen touch makes selections easier than having to use a mouse or keystrokes. We would recommend purchasing a tablet and pen with the system for anyone planning to control most of her own presentations.

Processors

Codec. The codec is loaded on the computer associated with the videoconferencing system at the lead site. Its job is to convert analog to digital signals and to compress the digital signals so that they can be sent efficiently. It also decompresses and decodes incoming signals so that they can be viewed. A videoconference is impossible if the codec is unable to decode signals from another system. This is why it is important to make sure that all codecs used for a given videoconference are compatible.

Bridge or router. The bridge or router is normally located away from the lead site and is operated by a separate entity. The lead teacher must make sure that the people who are responsible for bridging or routing sites into the conference have been notified and that they make the connections.

Physical Signal Carriers

Physical signal carriers are the wires, fiberoptic cable, and air that carry satellite and microwave signals. If physical signal carriers fail, lead and receiving sites cannot communicate.

Troubleshooting

Problems with connectivity generally relate to a broken link between controllers, senders, or viewers. Troubleshooting should begin with the simple things. Is the device plugged in? Has the connection come loose? If it appears that these are not the problem or it is obvious that the problem lies with the communication between codecs, then the system should be rebooted by shutting it down and starting it again. If this does not reestablish connectivity, technicians should be called.

Control

Control consists of interface devices, called controllers, and how they are deployed to facilitate presentation, called the basic setup. Controllers are interface devices that interact with software and allow you to control the videoconference. The keyboard, tablet and pen, and remote control are the most common interfaces. They all allow lead teachers to control such things as camera angle and zoom, microphone volume, putting a picture in a picture, which video feed will be sent to receiving sites, which receiving sites will be connected through a bridge or router, and transfer of files.

Controllers

Controllers are interface devices that interact with software and allow you to control the videoconference. The keyboard, tablet and pen, and remote control are the most common interfaces. They all allow lead teachers to control such things as camera angle and zoom, microphone volume, putting a picture in a picture, which video feed will be sent to receiving sites, which receiving sites will be connected through a bridge or router, and transfer of files.

Interface	Advantages	Disadvantages
-----------	------------	---------------

Keyboard	<p>Lead teacher has access to all that can be controlled</p> <p>Lead teacher has access and can control any software installed on the codec computer</p>	<p>It is not intuitive to use keystrokes and the mouse to make selections, so it is difficult to use "on the fly" while presenting.</p> <p>It takes up space on the table.</p>
Remote	<p>Lead teacher is highly mobile and can operate the basic controls while moving around.</p>	<p>It gives limited control choices.</p> <p>Lead teacher may move around too much and disrupt students' focus.</p> <p>Lead teacher is dependent upon battery power which can go out at unfortunate times.</p> <p>Cannot operate software installed on the codec computer.</p>
Tablet and Pen	<p>These are very intuitive to use because of their graphic nature.</p> <p>They give access to most of the controls.</p>	<p>They cannot control applications on the codec computer during presentation.</p> <p>They take up space on the table.</p>

Basic Setup

The basic setup of equipment and the layout of the lead site is an important part of the control that lead teachers have over their presentations. These are some issues that lead teachers should consider.

- Computer applications in addition to software that comes with the video conferencing should include at least a good presentation program, such as Microsoft PowerPoint. Other applications should be chosen as needed for a given presentation topic. They should, however, be capable of displaying with good resolution at the receiving sites: lead teachers should consider their software's ability to change font size and type.
- Lead sites should use a different computer for presentation than the one the codec is installed on, and the presentation computer should be located to give the lead teacher easy access for presentation. The presentation computer should be loaded with RAM and

have a fast processor: a fast computer with plenty of RAM makes transitions between applications smooth, and will not detract from the presentation as much as a slow computer.

- The document camera needs to be easily accessible. Also, lead teachers should mark the effective presentation area in order to quickly and easily put down display material.
- The workspace should be designed so that it can be shown on camera easily from a variety of angles. It may be advantageous to have a camera directly above the workspace as well as to the sides, depending on what is to be displayed.
- Cameras should be set up so that lead teachers may see students and presenters. Preset camera positions should be used, and, if appropriate, a voice tracking system should also be used.
- Microphones should be positioned to make interaction easy and natural.
- Rooms should be arranged so that lead teachers can see most of the students.
- Options for viewing receiving sites should be set up so that both the lead site and the receiving sites are comfortable. Voice activated viewing, rotating receiving site picture, voice activated with rotating receiving site picture, or cameras locked on to the presenter are viable options.
- The lead site should have one monitor to see what is being sent to receiving sites, one monitor to see the receiving sites, and one monitor to see the computer screen that the lead site is using.
- Is the setup for the presenter going to be different than for the receiving sites? Will the receiving sites be presenting?