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Frequently Asked Questions for Schools

Status of This Memo

This memo provides information for the Internet community. This memo does not specify an Internet standard of any kind. Distribution of this memo is unlimited.

Abstract

The goal of this FYI document, produced by the Internet School Networking (ISN) group in the User Services Area of the Internet Engineering Task Force (IETF), is to act as an introduction to the Internet for faculty, administration, and other school personnel in primary and secondary schools. The intended audience is educators who are recently connected to the Internet, who are accessing the Internet by some means other than a direct connection, or who are just beginning to consider Internet access as a resource for their schools. Although the Internet Engineering Task Force is an international organization and this paper will be valuable to educators in many countries, it is limited in focus to internetworking in the United States.

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1. Introduction

As more and more schools begin using technology to achieve educational goals, access to the worldwide network of computer networks known as the Internet is expanding. Help for schools in the form of printed materials, electronic resources, and people is also expanding. The Internet School Networking (ISN) group of the Internet Engineering Task Force (IETF) remains committed to articulating the advantages of Internet connections for schools and providing solutions to the challenges schools face in getting connected. The FYI (For Your Information) series, which is a subset of the IETF-produced RFCs (Requests for Comments) is one way to achieve these goals. (See Appendix A, "Glossary of Terms Used in This Document" for further explanation of "FYI" and "RFC.")

While the IETF and ISN are international groups, the authors of this document are experienced only in bringing the Internet to schools in the United States. We are aware that culture and the national economy effect how one views the issues surrounding school networking. (To give just one example, in the United States, educational reform is an important reason for schools to get connected to the Internet. Other countries may not have the same incentive to transform the teacher's role to more of a guide toward knowledge and less of a sole provider of information.) So, while this document may have a U.S. flavor, we feel that the focus will not prevent it from being useful to those in other countries!

Some of the questions educators have about the Internet are of a more general nature, and for those we recommend reading FYI 4, "Answers to Commonly Asked 'New Internet User' Questions." (For information on how to get this and other IETF documents of interest to the general Internet user, See Appendix B, "Ways to Get RFCs.")

Remember that the Internet is a changing environment. Although we have tried to include only the most stable of network services and contacts, you may still find that something listed is unavailable or has changed. The positive side of this constant change is that you will discover much on your own, and some of what you discover will be new since the writing of this document.

This is an update of an earlier document (FYI 22/RFC 1578, "Answers to Commonly Asked 'Primary and Secondary School Internet User' Questions"), and renders that document obsolete. If future updates are produced, the RFC number will change again, and the FYI number (22) will remain the same.

2. Acknowledgments

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3. Questions About the Internet in an Educational Setting

3.1 What is the Internet?

The Internet is a large and rapidly growing worldwide network comprised of smaller computer networks, all linked by a common protocol, that enables computers of different types to exchange information. The networks are owned by countless commercial, research, government, and education organizations and individuals. The Internet allows the almost 5 million computers [1] and countless users of the system to collaborate easily and quickly either in pairs or in groups. Users are able to discover and access people and information, distribute information, and experiment with new technologies and services. The Internet has become a major global infrastructure used for education, research, professional learning, public service, and business.

There is a confusing variety of types of Internet access. These types of access are distinguished either by the services one can use (telnet, Gopher, FTP or File Transfer Protocol, World Wide Web) or by the technology underlying the access (the protocol, or rules the computers must follow in order to communicate with one another). The Internet is most clearly defined by its technology, but other technologies now offer access to many of the same Internet services, most notably electronic mail and the World Wide Web. The most important question for a user today is probably not "Am I on the Internet?" but "Do I have access to the Internet services I want?" See Section 5, "Questions About Using Internet Services," for further discussion of telnet, Gopher, FTP, the World Wide Web, and electronic mail.

While there is no official governing body of the Internet, the Internet Society serves as the international organization for Internet cooperation and coordination. See Section 9, "Resources and Contacts" for Internet Society contact information.

For a more complete basic introduction to the Internet, see FYI 20, "What is the Internet?" cited in Section 8, "Suggested Reading." For information on how to retrieve FYI documents produced by the Internet Engineering Task Force, see Appendix B, "Ways to Get RFCs."

3.2 What are the benefits of using the Internet in the classroom?

The Internet is an exciting classroom resource. It expands the classroom dramatically by delivering information, data, images, and even computer software from places otherwise impossible to reach, and it does this almost instantly. This access to up-to-the-minute information can make a student's education more relevant. Some of these materials are original sources which are too expensive or in other ways difficult for schools to own. Some information is news unfiltered by mass media, requiring students to critically assess its content and value.

But the Internet is not strictly a place from which to gather something. It is also a place to communicate, to make contact with people all over the world. The Internet brings into the classroom experts in every content area, new and old friends, and colleagues in education. And it allows students and teachers to leave the classroom by sharing ideas with people far away. The isolation inherent in the teaching profession is well-known among educators. By having Internet access to colleagues in other parts of the world, as well as to those who work outside of classrooms, educators are not as isolated.

Your site can become a valuable source of information as well. Consider the expertise in your school which could be shared with others around the world. For guidance in finding schools with a presence on the Internet, see Section 9, "Resources and Contacts."

Use of the Internet shifts focus away from a teacher-as-expert model and toward one of shared responsibility for learning, making it a vital part of school reform. Many reform efforts attempt to move away from teacher isolation and toward teacher collaboration, away from learning in a school-only context and toward learning in a life context, away from an emphasis on knowing and toward an emphasis on learning, away from a focus on content and toward a focus on concepts [2]. The Internet can play an integral part in helping to achieve these shifts, since it is well-suited for use as a project resource. Information on the Internet, as in the rest of the world outside the classroom, is not divided into separate disciplines such as geometry, writing, geography, or painting.

As a hands-on classroom tool, the use of the Internet encourages the kind of independence and autonomy that many educators agree is important to the learning process. Internet use itself can also be a

motivator for students. Additionally, because class, race, ability, and disability are removed as factors in communication while using the Internet, it is a natural tool for addressing the needs of all students.

There are a number of resources you can use to convince others of the benefits of the Internet in the classroom. The NASA IITA (National Aeronautics and Space Administration Information Infrastructure Technology and Applications) K-12 Internet Initiative has produced an 11-minute video describing the benefits to schools in using the Internet. Its title is "Global Quest: The Internet in the Classroom." Another video appropriate for a mixed audience of stakeholders is "Experience the Power: Network Technology for Education," produced by the National Center for Education Statistics in the U.S. Department of Education. Several articles appearing in various periodicals make a strong case for using the Internet in the classroom. A particularly good one by Al Rogers of the Global SchoolNet Foundation is called, "Global Literacy in a Gutenberg Culture." Student essays can also give compelling testimony. For information on the Rogers article, see Section 8, "Suggested Reading." Some student essays can be found on NASA's Quest server listed in Section 9, "Resources and Contacts," as can information on the videos.

3.3 Will using the Internet replace teachers?

Just as textbooks, periodicals, videos, guest speakers, and field trips are often used to support a curriculum, the Internet can be used as a tool for teaching and learning. This does not mean that it must be the sole instructional method in a classroom. Teachers will remain responsible for making educated and informed decisions about the best way to use the Internet as a tool, just as they do with other materials used in the classroom. They can also use the Internet to individualize student learning, making a student's classroom experiences more relevant.

3.4 Will this technology replace books?

There is room in any school for all kinds of materials and resources. Books and other print materials will certainly continue to be important. Internet resources have the advantage of tying together information from all over the globe, making them useful research tools. As mentioned before, they can also provide up-to-the-minute information and are therefore particularly relevant. In addition, you may be able to engage an expert in a dialog that clarifies or updates what you find in published materials.

One factor to consider is that much of the material published on the Internet lacks the authority imputed by an established publishing house or a reputable author, and may therefore be viewed as less reliable than books. For example, an encyclopedia or almanac found in a school library might reasonably be accepted as valid without question, while a source found on the Internet may require a more critical look. However, lack of authority is not always a negative. Reading an account of the fall of the Berlin Wall by a student in the local region the day it happened can be valuable even if the student is not a reputable author. Moreover, while it's true that with Internet materials it becomes increasingly important to evaluate where they came from, one of the hallmarks of a good education is the ability to assess information critically, whether the source be print, television, or some other media.

3.5 How can use of the Internet be integrated into the existing curriculum?

This is a key question. In order for the Internet to be used successfully in schools, it must be employed as a tool to teach content and to reach educational goals that have already been established. It cannot be seen as an end in itself.

Individual teachers will first need to become familiar enough with the Internet to know how to do at least two things: find information on topics they consider important and locate people with like educational goals. Sections 5 and 6, "Questions About Using Internet Services" and "Questions About Classroom Resources, Projects, and Collaboration" will give you some ideas about how to begin.

Once they are familiar with how to find content on the Internet, most teachers can decide how to use Internet resources to help their students meet goals. For example, science teachers often teach about hurricanes and other weather phenomena in the normal course of instruction. With Internet access they can use information and satellite data pertaining to the most recent storm to make their points, rather than outdated examples from textbooks.

When teachers become familiar with finding other people on the Internet, some of them already grouped into network "communities" of interest, they can gain experience in using the Internet from educators who have been using it longer; they can join existing projects, contribute to the evolution of proposed projects, and propose their own projects; and they can ask for and give help to solve problems in the classroom ranging from the content they teach, to addressing students as individuals, to mastering effective discipline.

Internet access supports project-based learning. A teacher in an individual classroom can use the data and information available on the Internet as a resource for classroom projects, and there are also a variety of projects which take place over the Internet in more than one classroom at a time. A project may be initiated by any educator with an idea. A popular example of an educator-initiated project is one which requires data to be collected from diverse sites around the world or at least around the country. For example, together students in various locations have tracked butterfly and bird migrations, compared bodies of water, and measured the north-south circumference of the Earth. Various organizations also run projects in which schools can participate. Among the many groups which have invited schools to participate in projects with a focus on a specific topic are the Global SchoolNet Foundation, The European Schools Project, the International Educational and Research Network (I*EARN), and groups associated with such federal agencies as the Department of Energy, the United States Geological Survey, and the National Aeronautics and Space Administration.

The Internet can also be used for peer review of student materials; as a medium for publishing student newspapers, art exhibits, and science fairs; and in a global email pen-pal program for the discussion of classroom topics.

It cannot be stressed enough that the key factor these Internet uses have in common is that they are supporting classroom curriculum, not defining it.

Learning about the Internet and how to use it is an important goal for any school's Internet program, but in the classroom, the message needs to be emphasized over the medium.

There are several sources of material for discussing curriculum infusion, including mailing lists, World Wide Web sites, and archives of sample lesson plans. Most of the mail lists, Internet computers, and organizations in Section 9, "Resources and Contacts," address infusion of technology into the curriculum. See also Appendix C, "Examples of Educational Projects Using the Internet."

4. Questions About Getting the Internet into the School

4.1 How much does it cost to connect to the Internet, and what kind of equipment does my school need to support the Internet connection?

The cost of an Internet connection varies tremendously with the location of your site and the kind of connection that is appropriate to your needs. In order to determine the cost to your school, you will need to answer a number of questions. For help in learning what

the questions are and getting answers to them, begin asking at local colleges, universities, technology companies, government agencies, community networks (often called "FreeNets"), local electronic bulletin board systems (BBS), Internet access providers, or technology consultants. See also Question 4.6.

To give you an idea of possible cost and equipment needs, think of four groups of Internet users. We will call them basic individual users, advanced individual users, school networks, and school district networks.

How you approach acquiring service depends on which category you feel best describes your needs. This discussion is based on experiences in the United States. (For more information on the Internet services you'll be reading about in this section, see Section 5, "Questions About Using Internet Services.")

Basic users are individuals who want to access common Internet services such as the World Wide Web, Gopher, and email. There are two types of basic users: those who plan to be online for a few hours per week, and those who plan to be online for many hours per day.

Basic individual users who require access to common Internet services such as Web pages, FTP sites, and email for only a few hours per week may be best served by one of the nationwide online services such as America Online, CompuServe, or Prodigy. These services have the advantage of providing the user with a simple setup and easy, graphics-based access screens which hide the complex commands required by some Internet services. They also provide value-added services not available via the general Internet, such as access to news magazines and encyclopedias. Hardware required is generally a standard Windows-based PC or Macintosh and a 14.4 kilobits per second (Kbs) or higher modem. At the time of this writing, prices typically run around \$10 per month for the first 5 hours of connect time, and \$2-4 per hour thereafter.

Basic individual users who access common Internet services for many hours per day should consider a "shell" account from a local Internet Service Provider (ISP). Shell accounts generally provide access to a Unix computer which is connected to the Internet, so those choosing this option should be prepared to learn a few Unix commands. Shell account users will get all the standard Internet services but at a cheaper rate, generally in the \$30 per month range for 6 hours per day access plus \$1-2 per hour for extra hours. Most shell account vendors do not provide nationwide access, and shell accounts do not have graphical user interfaces, so you cannot use Web browsers such as Netscape and Mosaic. While you may be able to use Lynx, a text-based browser, some ISPs do not install it on their computer servers.

Many FreeNets also offer shell account access gratis, but they may not be able to offer much support.

In the United States, there are a number of statewide educational networks, most of them with access to the Internet. To find out if there is a state education network in your area which gives basic user accounts to educators and/or students, contact the Consortium for School Networking (CoSN) or consult the document "Getting US Educators Online" by Linda Conrad, listed in Section 8, "Suggested Reading."

Advanced individual users are those who want graphical user interfaces to Internet services and who may want to use their computers to offer services to other Internet users. For example, they may want to create Web pages for others to access or put files online for others to retrieve. If you are an advanced user, you might consider getting a Serial Line Internet Protocol (SLIP) or Point to Point Protocol (PPP) account from an Internet Service Provider. The interface is similar to that of nationwide online services available to basic users, but the performance is better and the cost is less for someone who wants to use the service for more than just a few hours per week.

Setting up a SLIP or PPP account requires configuration and installation of Internet and SLIP/PPP software. Some ISPs only provide the software, some will install the software for you, and some preconfigure the software and send it on disk, with instructions to the user, via postal mail. Again, hardware required is generally a standard Windows-based PC or Macintosh and a 14.4 Kbs or higher modem. Costs are generally comparable to basic shell accounts, but for 24-hour connections expect to pay \$100 or more per month.

If in your school you plan to have more than a few individual Internet users, you will need to consider a network with a high-speed dedicated line connected to the Internet. This school network is probably a small- or medium-sized network in a single building or a very few geographically close buildings. It may include only one or several LANs.

Most high speed connectivity is provided through a dedicated leased line, which is a permanent connection between two points. This allows you to have a high quality permanent Internet connection at all times. Most leased lines are provided by a telephone company, a cable television company, or a private network provider and cost \$200 per month or more. Typically the connection from your LAN or LANs is a digital leased line with a Channel Service Unit/Data Service Unit (CSU/DSU) which costs between \$600 and \$1000. Less frequently, the connection is an analog leased line with a modem which costs between

\$200 and \$800. You will also need a router which costs roughly \$1500. This is a substantially more difficult setup to manage. After you have determined the ways in which you believe you will use Internet access, you should contact several ISPs in your area and compare prices and services.

School district networks are even more complex. If you have several locations which require connectivity, you should contact several ISPs and get bids for the service.

The ISP world is changing very rapidly, especially at the low end. At the time of the first edition of this document, local ISPs were rare, small, and fairly expensive. At the time of this writing ISPs abound, offering a wide variety of services at reasonable prices. Additionally, several groups are working on low-cost solutions to school networking. Subscribe to the mail lists in Section 9, "Resources and Contacts," to keep abreast of new developments.

"Getting US Educators Online" and "Connecting to the Internet: An O'Reilly Buyer's Guide" by Susan Estrada are both listed in Section 8, "Suggested Reading." Other books about the Internet and how to get connected to it are available and new ones are being published. Check libraries, bookstores, and booksellers' catalogs. Two lists of Internet providers available via the World Wide Web can be found in Section 9, "Resources and Contacts" along with the Consortium for School Networking. The global regional Network Information Centers (NICs) such as the Reseaux IP Europeens Network Coordination Centre (RIPE NCC) in Europe can also provide a list of service providers. The Asia Pacific Network Information Center (APNIC) in the Pacific Rim will have a similar list in the near future. These two NICs are listed in Section 9, "Resources and Contacts."

4.2 What are the other costs associated with having Internet access?

When budgeting for your school's Internet connection there are a number of factors to consider that might not seem immediately obvious. Technical support and training will incur additional ongoing costs, even if those costs show up only as someone's time. Equipment will need to be maintained and upgraded as time passes, and even when all teachers have received basic Internet training, they will most likely have questions as they explore and learn more on their own. A general rule for budget planning is this: for every dollar you spend on hardware and software, plan to spend three dollars to support the technology and those using it.

It will be necessary for your school to have some technical expertise on-site. (See also Question 4.4.) Your network access provider may offer training and support for technical issues, and other groups

also offer formal classes and seminars. If your school has designated technical personnel, they will be good candidates for such classes and seminars. If your school does not have designated technical personnel, a teacher or other staff member with a strong interest may take on the task of becoming the local expert, but a better solution is to have someone dedicated to this at least part time. Students can help local experts maintain equipment and do other tasks, which allows them to learn new skills at the same time.

Training is an equally significant component to deployment of the Internet in schools. Most teachers learn about the Internet during the time they use to learn about any new teaching tool, which often means they "steal" time at lunch, on weekends, and before and after school to explore resources and pursue relationships via the Internet. When a school is committed to providing the Internet as an educational resource, the administration will make in-service time available. It will also ensure that someone at the school is sufficiently knowledgeable to field questions and help people as they risk trying new ways of teaching using Internet resources. Again, some students make excellent tutors.

Some technical support and a variety of training materials can be found by using the Internet itself. You can send questions to people in the know and join discussion lists and news groups that discuss and answer questions about support and training. The Edtech mail list is one such list. Some World Wide Web sites offer technical support information. Videos also help bridge the information gap. See Section 9, "Resources and Contacts," for a preliminary listing of these resources. Your local community may also have resources. These include colleges and universities, businesses, computer clubs and user groups, technology consultants, and government agencies.

4.3 How can my school afford access to the Internet?

Although school budgets are impossibly tight in most cases, the cost of an Internet connection can be squeezed from the budget when its value becomes apparent. Costs for a low-end connection can be reasonable. (See the next question.) The challenge facing those advocating an Internet connection sometimes has less to do with the actual cost than it has with the difficulty of convincing administrators to spend money on an unfamiliar resource.

In order to move the Internet connection closer to the top of your school's priority list, consider at least two possibilities. First, your school may be in the process of reform, as are many schools. As mentioned earlier, use of the Internet supports reform efforts, so framing Internet access as a component to systemic reform may help to persuade some people. Second, to convince people of the value of a

connection, an actual Internet demonstration can be more useful than words. While this may sound like a chicken-and-egg situation (I need Internet access to get Internet access), some organizations will provide guest accounts on an Internet-connected computer for people in schools who are trying to convince others of the value of an Internet connection. Another way to begin using Internet services is to sign up for one of the popular online services such as America Online, CompuServe, or Prodigy. Once subscribed, you can use these services either from home or from school. This method is recommended only as way to introduce yourself and others in your school community to the value of the Internet. It is not a good long-term solution to providing Internet access for a lot of users at one site such as a school.

Contact local colleges, universities, technology companies, service providers, community networks, and government agencies for both guest accounts and funding ideas. For alternatives to your own school's budget or for supplements to it, look for funding in federal, state, and district budgets as well as from private grants. Work with equipment vendors to provide the hardware needed at low or no cost to your school, and consider forming a School/Community Technology Committee, or a joint School District/School/Community Technology Committee. Also investigate the possibility of a back-door connection to a local college or university. Service providers often allow schools to connect to higher education sites at a lower cost.

A number of sites on the Internet provide more information about grants and organizations that offer them. Two in particular that you may find useful are Grants Web, for grant information of all kinds, and the Foundation Center, for information on private and nonprofit organizations. For information on where to find these sites on the Internet, see Section 9, "Resources and Contacts."

4.4 What organizational structure needs to be in place in order for my school to have Internet access?

Schools and school districts have devised structures that vary widely, depending on a school's particular requirements. In many schools, the librarians/media specialists guide the development of the network and policies on its use and serve as the top of the structure within the school. In other schools, an interested teacher becomes the driving force behind getting the Internet into the school and may be the most appropriate person to see the project through. The school administration, if not the guiding force, needs to be behind the plan to bring the Internet into the school. And all other parties who might have a stake in the development should be brought in as early as possible, whether or not they are knowledgeable about the Internet. These might include area businesses, community leaders,

teachers with Internet access at home, the librarian or media specialist, parents, and anyone in the school who finds the idea of bringing the Internet into the school appealing. In short, any organizational structure will do as long as it is clear and simple and includes the people who might have a stake in the process of bringing the Internet into the school.

One way to ensure that an organizational structure develops and that the right people become involved is to invite a wide variety of people to create a technology plan for the school. The by-product of technology planning can be the development of an organizational structure, but of course the planning is useful in itself to help your school define and meet goals for Internet and other technology use. The National Center for Technology Planning hosts a collection of technology plans and planning aids for people who need help, new ideas, or solutions as they tackle technology planning in their schools or districts. Information on the National Center for Technology Planning can be found in Section 9, "Resources and Contacts."

No matter what the structure, there should be someone at the school who can take the lead in working with vendors and Internet Service Providers (ISPs). This person should be knowledgeable about - or willing to learn about - the technical aspects of connecting to the Internet, including knowledge about any networks the school already has in place. The lead person should have an alternate so that the school is not completely dependent on one person. If your school hires an independent consultant, someone at the school should be aware of everything the consultant does and should receive at least some training in the areas of the consultant's work.

Another role that must be filled is that of in-house network administrator. Having an already busy teacher take on this role as an extra duty is a bad idea; a greater time commitment is needed.

4.5 What questions do I need to ask people who are selling network services?

There are a number of questions you should ask. Anything you hear that you don't understand must be questioned. If a vendor knows the product and the process well, he or she should be able to explain in terms you can understand.

You should also ask any kind of vendor how available they are and at what point they either stop helping you or begin charging by the hour. Get references from other customers, preferably including at least one school which has requirements similar to yours.

Questions for LAN vendors:

If the school has not yet purchased a Local Area Network (LAN), ask the LAN vendor how the product will interact with TCP/IP. (TCP/IP stands for Transmission Control Protocol/Internet Protocol, the technology which forms the basis of the Internet.) If necessary, arrange a meeting with the LAN vendor, the ISP, and any consultants that may be involved.

Make a list of the school's requirements, including security, the number of computers on the LAN which will have Internet access, and the Internet services you want students and teachers to be able to use. (See Section 5, "Questions About Using Internet Services," for an introduction to the services.) Ask the vendors if they can provide services that will meet your requirements.

Questions for Internet Service Providers:

In general, ask the ISP what services are included with your purchase of Internet connectivity.

Will they terminate the circuit in a router and leave you to your own resources to take care of the "LAN side" of the connection?

Will they provide a primary domain name server for you?

Will they register your domain name with the InterNIC?

Are they providing you with all the IP addresses you need?

Will they help you with security issues?

Do they provide a newsfeed or a newsreading service? (Do you know the difference?)

If they agree to do some work on the LAN side, what is the extent of that work? (Configure individual computers? Handle subnetting and routing issues?)

Will they answer questions from your network administrator?

Will a dedicated computer be needed as an Internet server for such things as domain name service, the World Wide Web, Gopher, and FTP?

Do they provide any training sessions for your staff and are these sessions included in the connectivity price?

Do they offer any other classes or seminars and are these included in the connectivity price?

Does the ISP do their own training or do they contract to someone else, and if the latter, who is it? Check references on any contractors.

Questions for Internet Service Providers furnishing dial-in service:

There are some specific questions you should ask of an ISP who is providing dial-in connections. (See Question 4.7 for a further discussion on dialing in from home.)

What is the charge per minute for connectivity?

Is SLIP or PPP connectivity available?

Will the ISP be providing software which allows you to use Internet services such as email and the World Wide Web or will they help you obtain it?

Will they help you install it?

Ask for references of other clients using dial-in service and when you check them, one of the questions to ask other customers is if they encounter lots of busy signals. (You can also check this yourself by trying the access provider's dial-in number at various times during the day. Just dial it by phone and see how many busy signals you get.)

4.6 How many of our computers should have Internet access and where in the school should they be located?

You should make Internet access possible for as many of your school's computers as possible. Ideally, you have computers located throughout the school - in classrooms, the library, and laboratories - and they are all connected together with printers and other peripherals in one or more LANs. In that case, you acquire one dedicated Internet connection of 56 Kbs (Kilobits per second) or higher to serve the whole school.

If your budget and existing computer equipment are both limited, you can use a dial-up service and a modem to access the Internet, but in most cases that will only be viable for one computer at a time. As use of the Internet catches on in your school, it will eventually be more effective for you to create the LAN with Internet access mentioned above than to keep adding modems in classrooms.

If you must choose between Internet access in one lab in the school or Internet access for the same number of computers throughout the school, in order to get teachers to use the access you must make it available where they can most easily take advantage of it. This usually means that you make access available throughout the school. Although a computer lab is an easier maintenance set-up for the person in charge of keeping the equipment running and allows each individual (or pair) in an entire class to be using a computer at the same time, a computer located in the classroom is more convenient for both the teacher and the class. Internet resources can be more easily integrated into a classroom lesson, and the emphasis remains on using the Internet as an instructional tool. Since only one or two computers can usually be placed in each classroom, teachers will learn to allocate computer time creatively. And if you are able to provide only a few computers throughout the school, make sure that at least one of them is in the library where all students will have the chance to be exposed to the Internet as a resource.

Networking all computers campus-wide can be expensive. You may want to investigate initially giving one lab, the library, and a few classrooms dial-up access, assuming phone lines are available. Even a connection to only one classroom as a demonstration may help you to garner more support for creating a campus-wide local area network that is routed to the Internet through a dedicated line.

4.7 Can people get on the Internet from home?

This depends on your network access provider. It is certainly a possibility and is definitely desirable for the educators at your school. To make it possible for teachers and other staff to dial in to the school network (and then out to the Internet) from home, you will need to employ, at the least, multiple phone lines and modems. Talk to your service provider about other technical requirements.

Many teachers like to be able to learn at home as well as on school grounds, and having the ability to explore when they have the time is invaluable. One school district we know of made low-interest loans available to teachers so that they could buy home computers. When the technology was later made available in their classrooms, they already had some experience and were comfortable beginning to use it in day-to-day instruction.

The question of whether or not to make the option to dial in from home available to students is more difficult. On one hand, a school may not be able to escape the idea that it is responsible for how students use the Internet access it provides, even though the school has no control over the home environment. On the other hand, particularly in high school, much schoolwork is done at home. Since

most classrooms don't have enough computers for all students to access the Internet at once, it is even more likely that work will not be completed during class time. Having Internet access from home becomes more important.

Discussion of whether or not you want to make this option available to students - even if it is technically possible - should involve as many school partners as possible, including faculty, administration, parents, and other community members. It might take place in a public forum such as a school/community meeting.

5. Questions About Using Internet Services

The way to find people, information, software, and anything else on the Internet is generally to use either printed or electronic guides and Internet services. In this section we will concentrate on the services. (See Section 6, "Questions about Classroom Resources, Projects, and Collaboration," for information on guides.) We answer more questions about the World Wide Web than about other online services for three reasons. First, the World Wide Web is the Internet tool coming into most prominence at the time of this writing. Second, many (if not all) of the other services are included seamlessly in the Web; that is, they're there, but you may or may not realize you're using them. Third, making your way around the Internet using the World Wide Web is easy; for people not interested in computers, access to the Internet and has become less frustrating.

This is not to say that finding what you want is always simple. The Internet is like a vast library without a comprehensive card catalog. New ways to do indexing and searching are being devised and employed, and you'll need some time to learn how to use them.

5.1 What is the World Wide Web?

The World Wide Web (WWW) is a project initiated by the European Laboratory for Particle Physics (CERN) located in Geneva, Switzerland and currently driven by the World Wide Web Consortium. When exploring the World Wide Web, users navigate through documents by selecting highlighted text that leads to another document or location. The highlighted text can be called a "pointer," a "link," or an "anchor." This navigation results in a three-dimensional exploration of documents instead of a flat text document. The World Wide Web incorporates different media into its documents, including text, sound, graphics, and moving images.

The World Wide Web presents either a graphical or a text interface to numerous Internet resources. Not only can users access documents specifically designed for the Web, they can also view documents on

Gopher servers, use FTP to download files, and launch a telnet session. Some World Wide Web clients also allow for the use of email and Usenet news. This is an easy-to-use, nonthreatening way to approach the Internet, and does not require in-depth technical knowledge. (See Question 5.5 for a discussion of these other services.)

5.2 How do I connect to the World Wide Web?

First, you will need at least a SLIP or PPP connection. (See Question 4.1 for more information; SLIP or PPP is the "advanced individual user" solution described there.) Accessing the Web is like using any other service on the Internet: you run a client on your computer which accesses a server, in this case a Web server, running on another computer. In Web terms, the client is called a browser. The browser retrieves and reads documents from Web servers. Information providers establish Web servers for use by network users, and when you become proficient at using the Internet, you may want to become exactly that kind of information provider.

Most Web browsers share common features. One feature is the hotlist, or bookmark. This allows you to mark your favorite sites. Your browser will store these sites and their addresses and allow you to revisit them later by simply selecting the name of a site from a menu. Another feature common to most browsers allows you to save the current file to your local disk. Some browsers keep a tally of the sites you've visited recently and allow you to revisit them without typing in the location again. Every browser is different, so it pays to explore your own client software and learn its features through practice. Most people, even those with little computer experience, find that it's easy to learn to use a browser just by exploring on their own.

Each document contained on Web servers across the Internet has a unique address. This is called a URL, a uniform resource locator. Browsers negotiate URLs just like mail software negotiates email addresses. Users can type in the URL for the browser to access. URLs are also embedded in a Web document's text, providing a seamless link to another location or document.

5.3 How is the World Wide Web linked?

The Web functions as a distributed hypermedia system. The purpose of this system is to allow the exchange of information across the Internet in the form of hypertext documents called Web pages or home pages. Hypertext is text with pointers or links to further information in various formats (text, graphic, video), allowing you to branch off to another document for more information on a given

topic, and then return to the same location in the original document with ease. Pointers in a Web document are analogous to HyperCard stacks or Microsoft help files in which you click on an option (a pointer or a link) and the program moves you to another document, or location.

Documents published on the Web are constructed in hypertext markup language, or HTML. This is a simple language that allows you to format text, insert images and sound, and create links in a document. Tutorials on creating Web services are available at the NCSA Mosaic Home Page, the automatic starting place for Web exploration when using the Mosaic client. There are also Web page creation resources listed in Section 9, "Resources and Contacts."

5.4 Where do I get a World Wide Web browser?

The two most common graphical Web browsers at the time of this writing are Netscape and Mosaic. Netscape is a commercial product but is currently free for educational use. Mosaic is free. Both of these packages are available for Macintosh, PC, and Unix platforms through the Internet. See Section 9, "Resources and Contacts," for details.

For those users with lower-speed connections that cannot accommodate full graphical browsers, there is a text-based browser available for Unix systems called Lynx. A public-access Lynx client is accessible through telnet at the server of the World Wide Web Consortium, which is listed in Section 9, "Resources and Contacts."

Many commercial online services, such as CompuServe, Prodigy, and America Online, include a Web browser as part of their offerings. More and more often, Web browsers are being included as part of the standard connection software provided by the Internet Service Provider.

5.5 What are the other services on the Internet?

There are a number of other services to help you get around on the Internet. The most common ones are described here. For more information, see "EFF's (Extended) Guide to the Internet" by the Electronic Frontier Foundation, and "The Whole Internet User's Guide and Catalog" by Ed Krol, both of which are listed in Section 8, "Suggested Reading," in addition to the Glossary entries mentioned for each tool.

Email. Email is probably the most basic tool on the Internet. It is short for electronic mail and may be used in a couple of ways. You can send messages back and forth with just one person, or you can participate with a group of people who discuss topics of common

interest. These groups are called mail lists. You join and leave the lists by sending email to one address, and you post messages to all the people on the list by sending email to a slightly different address. Sometimes a human does the list registration and sometimes a software program does it. For more information see the entries for email and mailing lists in the Glossary. A list of mail lists related to primary and secondary education can be found in Section 9, "Resources and Contacts."

Network News. Also known as Usenet News or Net News. Reading news is similar to joining an email list, but instead of the messages coming to your mailbox, you use news reader software to read messages on a computer where they are accumulated. For more information see the entry for Usenet News in the Glossary.

FTP. FTP stands for File Transfer Protocol, and just as the name implies, it allows you to transfer files from one computer to another. It is the name for both the protocol and the program. A special kind of FTP, Anonymous FTP, allows you to access the many public archives on the Internet. FTP is not used by itself as much as it used to be, since people often use Web browsers and Gopher clients which incorporate FTP when they want to retrieve files. For more information see the entries for Anonymous FTP and FTP in the Glossary.

Telnet. Telnet allows you to log into a computer somewhere else on the Internet and use the services there. For example, if you don't have a Gopher client or a Web browser, there are some public access sites that you can telnet to in order to use a Gopher client or a text-based Web browser.

Gopher. Gopher is a tool that lets you browse for information on the Internet using menus. If you know what you're looking for and have an idea about where to find it, Gopher can make your search easier. And when you have located something of interest, whether it's a document, a data set, or a picture, Gopher will retrieve it for you. For more information see the entry for Gopher in the Glossary.

Searching and Indexing Tools. Archie is a tool for searching FTP sites; Veronica (Very Easy Rodent-Oriented Network Index to Computerized Archives, which works the same way Archie does) is a tool for searching Gopherspace; WAIS (Wide Area Information Service; pronounced "wayz") is a tool for searching indexed databases, whether the databases are full of numbers, text, or graphics files; and Yahoo, Lycos, and WebCrawler are some of the many searching and indexing tools available on and for the World Wide Web. For more information see the entries for Archie, Gopher, WAIS, WWW, and Veronica in the Glossary.

Videoconferencing. At the time of this writing, schools are beginning to participate in conferences, meetings, and collaborative activities via video. The two services or applications used are Multicast Backbone (MBONE) and CU-SeeMe, both of which allow for desktop videoconferencing, or videoconferencing via computer.

MBONE is an option for videoconferencing using several operating systems at the time of this writing: Unix, Windows NT, Windows 95, and Mac Operating System 7.5.2. It requires that your Internet service provider be a part of the MBONE, which depends on a specialized routing strategy. Ask your service provider if they are equipped to support MBONE traffic. If so, you will need to work fairly closely with your provider to establish working configurations for your network. More information on MBONE is available at the MBONE Information Web. (See Section 9, "Resources and Contacts.")

CU-SeeMe, developed by Cornell University, also presents conferencing capabilities over an IP network. You may participate in a CU-SeeMe videoconference as a sender, a recipient, or both. Through use of reflectors, multiple sites may participate in any given conference. For any of these activities, you'll need a PC or a Macintosh with a connection to the Internet and CU-SeeMe software. Additionally, if you'd like to send video and audio, you will need a video camera and a video board in your computer. Full information on the hardware requirements is available at the CU-SeeMe Web site; there is also a mailing list for CU-SeeMe information. For guidance and discussion about using CU-SeeMe as an instructional tool, the Global SchoolNet Foundation hosts a mail list called cu-seeme-schools which announces opportunities for participation in CU-SeeMe events. For information on the Web site and mailing lists, see Section 9, "Resources and Contacts."

6. Questions About Classroom Resources, Projects, and Collaboration

6.1 How can I find specific projects using the Internet that are already developed?

When you have learned to use some of the Internet services discussed in Section 5, "Questions About Using Internet Services," particularly the search tools, you will be able to answer that question more fully for yourself. In the meantime, since there are several resources on the Internet that are directed specifically at the primary and secondary school communities, here are some ideas to get you started.

Computer Information Servers:

Global SchoolNet. The Global SchoolNet Foundation's World Wide Web site contains a wealth of valuable information and materials, including help setting up projects by learning what has worked best based on others' experience. The GSN site also contains a landmark registry of projects in which schools can participate.

EdWeb. Andy Carvin's EdWeb is an excellent source of K-12 information.

CoSN. The Consortium for School Networking maintains an Internet server.

NASA. NASA's Spacelink and Quest are directed at primary and secondary school educators, and both house lesson plans, Internet-based curriculum units, and interactive projects and activities. Many NASA projects also maintain computer information servers.

Empire Internet Schoolhouse. The New York State Education and Research Network (NYSERNet) hosts the Empire Internet Schoolhouse, an extension of its Bridging the Gap program.

K-12 Schools on the Internet. Gleason Sackman of North Dakota's SENDIT network for K-12 educators maintains an active list of K-12 schools on the Internet.

National School Network Testbed. The Bolt Beranek and Newman (BBN) project called the National School Network Testbed provides links to numerous schools and projects.

Internet School Networking. The Web pages for the group which brings you this paper contain a collection of documents and case studies on projects.

Mail lists:

Many people on electronic mailing lists such as Ednet, Kidsphere, and the Consortium for School Networking Discussion List post their projects and ask for partners and collaborators.

News groups:

The K12 hierarchy of Usenet News has several groups where educators post these invitations as well. For subscription to these and other electronic lists and for names of news groups see Section 9, "Resources and Contacts."

Conferences:

There are also a number of conferences worth looking in to. The National Education Computing Conference (NECC) and Tel-Ed, both held annually, are conferences sponsored by the International Society for Technology in Education (ISTE). The Internet Society (INET) conference is the annual conference for the Internet Society. See Section 9, "Resources and Contacts" for contact information for these organizations.

Specific computer information servers, mail lists, news groups, and conference sponsors are listed in Section 9, "Resources and Contacts." A number of Web sites also provide favorite "bookmarks," or lists of sites for educators. Bookmarks are not included in Section 9, but you will quickly find them if you begin at any of the Web server entry points listed here.

6.2 What are some examples of how the Internet is being used in classrooms now?

Projects which use the Internet sometimes request sites from all over the world to contribute data from the local area then compile that data for use by all. Weather patterns, pollutants in water or air, and Monarch butterfly migration are some of the data that have been collected over the Internet. In Appendix C, "Examples of Educational Projects Using the Internet," you will find several examples collected from various online servers and electronic mailing lists pertaining to education, each from a different content area and representing different ways of using the Internet. Some of the projects require only that you be able to use email, some require that you have access to the most advanced Internet services, and some offer varying levels of participation.

There are a number of specific projects you may find interesting:

KIDS. KIDS is a project managed by the nonprofit KIDLINK Society. It includes discussion lists and services, some of them only for people who are ten through fifteen years old.

Academy One. Academy One is part of the National Public Telecomputing Network (NPTN) and usually has a number of projects running at a time.

I*EARN. The International Education and Research Network (I*EARN), a project of the nonprofit Copen Family Fund, facilitates telecommunications in schools around the world.

Chatback Trust. Initiated to provide email for schools in the United Kingdom and around the world with students who have mental or physical difficulty with communicating, Chatback Trust and Chatback International maintain a network server that you may want to investigate.

ESP. The European Schools Project (ESP) involves approximately 200 schools in 20 countries and has as its goal building a support system for secondary school educators.

Electronic Field Trips. The online interactive projects on NASA's Quest server and the JASON Project are designed especially to provide classroom contact with real science and scientists.

For contact information on these groups and computer information servers refer to Section 9, "Resources and Contacts."

6.3 Are there any guides to using the Internet in schools that list all these resources in one place?

Printed guides to using the Internet in education are appearing along with the new books on the Internet and you can expect to see more in the near future. The problem with paper resource guides is that the Internet is a changing environment so they become outdated quickly. Most (like this document) try to list only the most stable resource sites, and even if not everything you try is available, these guides can be particularly helpful if you are new to the Internet. Try the books entitled "Education on the Internet," "Teaching with the Internet: Putting Teachers Before Technology," and "Brave New Schools" listed in Section 8, "Suggested Reading," for a sampling of those available at the time of this writing. Check bookstores, libraries, and booksellers' catalogs for others.

One answer to the problem of printed Internet guides is the newsletter. Two we recommend are specifically for primary and secondary school educators interested in networking and contain information on new services on the Internet that are of interest to educators, projects for collaboration, conferences, new books and publications, essays, and practical tutorials on using network tools and services. NetTeach News is published ten times a year and is available both hardcopy and via email. Classroom Connect is published nine times a year. Information on subscribing and related online services for both newsletters can be found in Section 9, "Resources and Contacts."

Internet computers which act as guides to the Internet for educators are, among others, BBN's Copernicus server, the Global SchoolNet server, NASA's Quest server, the University of Illinois College of

Education's Learning Resource Server, and Web66. All are listed in Section 9, "Resources and Contacts."

6.4 How can I add my own contributions to the Internet?

In addition to sharing your knowledge and expertise on the electronic mail lists and news groups mentioned, as you gain experience you may find you have the knowledge and inclination to put up a Web page for your own site. Many K-12 schools are maintaining Web pages, either on Web servers they set up at the school or on a computer at another site, to publish student projects and information about their schools. Gleason Sackman's Hot List of K-12 Internet School Sites and Web66 offer a comprehensive listing of these schools and provide links to their home pages. These pages may give you ideas about ways your school can use the World Wide Web to contribute to the K-12 Internet community. There are also a number of sites which give instruction in how to publish on the Web and how to maintain Web sites, including Web66, the National Center for Supercomputing Applications (NCSA), and the Geometry Forum. For the Internet locations of these resources see Section 9, "Resources and Contacts."

7. Questions About Security and Ethics

7.1 I've heard that there is a lot of objectionable material on the Internet. How do I deal with that problem?

Because sensational media accounts tend to downplay the educational uses of the Internet in favor of the more controversial material available, this will almost certainly be an issue raised when you discuss getting an Internet connection in your school. Concerned educators should learn more about this issue and formulate a strategy for resolving problems before they arise. One important point to realize early is that students do not accidentally bump into objectionable material in the course of most educational explorations. Although we are not suggesting that people never run across objectionable material by chance, most find this material only because they're looking for it.

At the time of this writing the most important and effective action schools can take is to develop clear policies to guide students' use of the Internet and establish rules - and consequences for breaking them - that govern behavior on the Internet. These policies, called Acceptable Use Policies (AUPs), work best when they are in line with rules governing other behavior at school. Additionally, schools should integrate issues around technology and ethics into the curriculum [3]. Schools need to exercise reasonable oversight while realizing that it is almost impossible to absolutely guarantee that students will not be able to access objectionable material. It may be

wise to make this clear to parents and students before a student is given access to the Internet. To limit a school's liability, some systems obtain signed releases from students and parents stipulating that they have read the AUP and that the student agrees to abide by it.

Several commercial software products are available which attempt to address the problem of access to objectionable material. They block access to controversial sites, look for specific text in email messages, or do both. Some can be configured in the home or school and some block a preconfigured collection of sites which is maintained and configured by the company.

Some success has been achieved through the use of proxy servers. A school hooks up all its computers to a single computer that has full Internet access. This computer server then becomes the gateway to the Internet for all of the school computers. The server can be configured to mask away sites that have objectionable material, including Web pages, Gopher and FTP sites, and network news and WAIS servers. One further step can be taken by also installing a caching server on the gateway machine. A caching server can hold Web pages locally after they have been retrieved from other sites. Once a page has been loaded into the server it can thereafter be fetched from the cache, useful if a set of Web pages needs to be accessed frequently from a site that is usually busy.

Although proxy and caching servers are relatively easy to set up by a system administrator, entering all the sites that are objectionable and keeping the cache up to date can be time consuming. Also, this method does not stop teachers and students from receiving and sending objectionable material as email attachments.

The store-and-forward method is one way to filter information to which students are exposed. Usenet News and email (both described in Section 5, "Questions About Using Internet Services") are "stored" on a computer until the time appointed for that computer to contact the next one along the path to the final destination, at which time it is "forwarded" along its way. Most computers are set up to process outgoing requests at least every 30 minutes. This method requires quite a bit of management on the part of humans.

It is also possible to control the times and opportunities that students have to access the Internet and only allow access under supervision. Many teachers find that engaging their students in meaningful, supervised learning activities operates as an effective deterrent to unauthorized Internet exploration.

At the time of this writing none of the technical solutions discussed above has proven wholly successful in addressing the problem of student access to controversial material. However, this area is currently the focus of intense development efforts. In the mean time, these solutions may be used in combination with clear policies and consequences for breaking them to ensure the integrity of the school, its students, and its educators. No matter what option or combination of options you choose, teaching the ethics of Internet access as a matter of course is imperative.

There are resources for further exploration of the issue of students and objectionable material available on the Internet. The National Center for Missing and Exploited Children has produced a sensible and practical brochure entitled, "Child Safety on the Information Highway," written by Los Angeles Times columnist Lawrence J. Magid. It is available both online and hardcopy. Another good document, "Internet Parental Control Frequently Asked Questions," describes the tools available at the time of this writing to help with issues of children using the Internet, from guidance by parents to government restrictions to rating and filtering systems. It is produced by the Voters Telecommunications Watch and is available on the Internet. There is also at least one mailing list which you may want to join called Children Accessing Controversial Information (CACI). For information on all of these, please see Section 8, "Suggested Reading," and Section 9, "Resources and Contacts."

7.2 How do we keep our own and other people's computers safe from student "hackers"?

In the language of computer folks, a "hacker" is someone who is excellent at understanding and manipulating computer systems. A "cracker" is someone who maliciously and/or illegally enters or attempts to enter someone else's computer system.

Computer security is unquestionably important, both in maintaining the security of the school's computers and in ensuring the proper behavior of the school's students (and others who use the network). In this area, not only school policy, but also state and national laws may apply. One source of information which you can read to help you sort through security issues is the Site Security Handbook (FYI 8), which suggests to site computer administrators, Network Information Centers, Network Operation Centers, and others how to set up security policies and directs you to further information. A good book available commercially is "Computer Security Basics" by Russell and Gangemi. The full reference for these two sources of information can be found in Section 8, "Suggested Reading."

Your school's AUP (see Question 7.4) should specify the consequences for such activity, and it may also be prudent to require a signed release from each student stating that he understands these consequences and possible legal implications of intentional exploitation of computer networks.

In the unlikely event that someone from outside your school breaks in to a computer on your network, you should report the activity to the CERT Coordination Center. Contact information for the center can be found in Section 9, "Resources and Contacts."

7.3 How do we keep viruses from attacking all of our computers if we get connected to the Internet?

Even if you use the Internet to exchange only data (such as text or pictures), virus infection can be a problem. This is because many programs today allow data files to include commands which are run when the data is loaded. Certainly when you download software programs and run them on your own computer you should use caution. Anything you download over the Internet or an electronic bulletin board system could have a virus. For that matter, any program and even some documents, whether on tape or a disk, including commercial software still in its original packaging, might possibly have a virus. Therefore there are two precautions you should take. First, install virus protection software on all your computers. Second, use only trusted sources from which to download software and files. If you are uncertain about whether to download something, ask someone first.

Virus checking software is available free over the Internet via Anonymous FTP from the CERT Coordination Center. Your hardware or software vendor, your network access provider, your technical support resources, or your colleagues on network mailing lists should be able to provide more specific information applicable to your site. Contact information for the CERT Coordination Center can be found in Section 9, "Resources and Contacts."

7.4 What are the rules for using the Internet?

When your Internet connection is established, your access provider should acquaint you with their Acceptable Use Policy. This policy explains acceptable and unacceptable uses for your connection. For example, it is in all cases unacceptable to use the network for illegal purposes. It may, in some cases, be unacceptable to use the network for commercial purposes. If such a policy is not mentioned, ask for it. All users are expected to know what the acceptable and unacceptable uses of their network are.

Remember that it is essential to establish a school-wide policy in addition to the provider's AUP. A school's AUP is usually more restrictive and specific than the one used by the service provider. A repository of sample school AUPs can be found on the Armadillo Web server, listed in section 9, "Resources and Contacts." As mentioned earlier, some school systems have found it worthwhile to make Internet access contingent upon a student's signed agreement to abide by the school's AUP.

Beyond your service provider's AUP and the one you create for your school, there are no overreaching rules for Internet use. There are, however, community standards and conventions that should be observed. You can review some generally agreed-upon guidelines at Arlene Rinaldi's etiquette page and by reading FYI 28 (RFC 1855), "Netiquette Guidelines." See Section 9, "Resources and Contacts," for the location of the etiquette page, and Appendix B, "Ways to Get RFCs" for instructions on obtaining FYI 28.

8. Suggested Reading

Those items marked with an asterisk (*) are available free online. For information on retrieving RFCs and FYIs, see Appendix B, "Ways to Get RFCs."

* Connecting to the Future: A Guide For Building a Network Infrastructure for Education. NASA IITA, Department of Education NCES. 1995. Gopher: [quest.arc.nasa.gov/How to Get Connected to and How to Use the Internet](http://quest.arc.nasa.gov/How%20to%20Get%20Connected%20to%20and%20How%20to%20Use%20the%20Internet) (Also available from NASA CORE with accompanying video. See NASA Central Operation of Resources for Educators in Section 9, "Resources and Contacts.")

* Conrad, L. B. "Getting US Educators Online"
<http://quest.arc.nasa.gov/online/table.html> (State-by-state compilation of Internet service offerings especially for teachers.)

Cummins, J. and D. Sayers. Brave New Schools: Challenging Cultural Illiteracy Through Global Learning Networks. New York: St. Martin's Press, 1995.

Ellsworth, J. H. Education on the Internet: A Hands-on Book of Ideas, Resources, Projects, and Advice. Indianapolis, Indiana: Sams Publishing, 1994.

* Electronic Frontier Foundation. EFF's (Extended) Guide to the Internet.
http://www.eff.org/pub/Net_info/EFF_Net_Guide/netguide.eff
and from the EFF online archives at [ftp.eff.org](ftp://ftp.eff.org), gopher.eff.org, AOL keyword EFF, CIS EFFSIG forum.

Estrada, S. Connecting to the Internet: An O'Reilly Buyer's Guide. Sebastopol, California: O'Reilly and Associates, Inc., 1993.

- * FYI 4 "FYI on Questions and Answers: Answers to Commonly asked 'New Internet User' Questions," Marine, A., J. Reynolds, and G. Malkin. (fyi4.txt or rfc1594.txt)
- * FYI 5 "Choosing a Name for Your Computer," Libes, D. (fyi5.txt or rfc1178.txt)
- * FYI 8 "Site Security Handbook," Holbrook, J.P. and J.K. Reynolds. (fyi8.txt or rfc1244.txt)
- * FYI 18 "Internet Users' Glossary," Malkin, G. and T. LaQuey Parker. (fyi18.txt or rfc1392.txt)
- * FYI 20 "What is the Internet?" Krol, E. and E. Hoffman. (fyi20.txt or rfc1462.txt)
- * FYI 26 "K-12 Internetworking Guidelines," J. Gargano, D. Wasley. November 1994. (fyi26.txt or rfc1709.txt)
- * FYI 28 "Netiquette Guidelines," Hambridge, S. (fyi28.txt or rfc1855.txt)

Giagnocavo, G., et. al. Educator's Internet Companion (with diskette and video). Lancaster, Pennsylvania: Wentworth Worldwide Media, 1995.

Harris, J. Way of the Ferret: Finding and Using Educational Resources on the Internet. Eugene, Oregon: International Society for Technology in Education, 1995.

Krol, E. The Whole Internet User's Guide & Catalog, Second Edition. Sebastopol, CA: O'Reilly & Associates, Inc., 1994. (Also available in textbook version)

- * National Center for Missing and Exploited Children
http://www.missingkids.org/information_superhighway.html (Online brochure "Child Safety on the Information Highway")
Also available from
National Center for Missing and Exploited Children
2101 Wilson Boulevard
Suite 550
Arlington, VA 22201-3052
1-800-THE-LOST (1-800-843-5678)

Protheroe, N. and E. Wilson. The Internet Handbook for School Users.

Arlington, Virginia: Educational Research Service, 1994.

- * RFC 1480 "The US Domain," Cooper, A. and J. Postel. June 1993.
(rfc1480.txt)

[This document will also be useful to people not in the United States. See the sites listed under the FYI documents for the location nearest you from which to download the file.]

- * Rinaldi, A. "The Net: User Guidelines and Netiquette,"
<http://rs6000.adm.fau.edu/rinaldi/netiquette.html>

- * Rogers, A. "Global Literacy in a Gutenberg Culture,"
<http://gsn.org/gsn/article.gutenberg.html>

Russell, D., and G. T. Gangemi, Sr. Computer Security Basics.
Sebastopol, California: O'Reilly and Associates, 1991.

- * Safdar, S. J. "Internet Parental Control Frequently Asked Questions,"
Voters Telecommunications Watch, 1995.

<http://www.vtw.org/pubs/ipcfaq>, or email vtw@vtw.org and in the subject line type "send ipcfaq" without the quotes

Steen, D.R., M.R. Roddy, D. Sheffield, and M.B. Stout. Teaching with the Internet: Putting Teachers Before Technology. Bellevue, Washington: Resolution Business Press, Inc., 1995.

9. Resources and Contacts

----- CONFERENCES -----

A list of other conferences, primarily in the United States, can be found at <http://www.classroom.net/classroom/conf.htm>

NECC and Tel-Ed

International Society for Technology in Education
1787 Agate Street
Eugene, Oregon 97403-1923
USA
Phone: 503-346-4414 or 1-800-336-5191
Fax: 503-346-5890
Email: iste@oregon.uoregon.edu
(CompuServe: 70014,2117)
(AppleLink: ISTE)

See also "Internet Computers" in this section.

INET

Internet Society
12020 Sunrise Valley Dr.
Suite 210
Reston, Virginia 22091
USA
Phone: 703-648-9888
Fax: 703-620-0913
Email: isoc@isoc.org

ELECTRONIC MAIL LISTS

Lists of electronic mail lists which you can search by category can be found via the World Wide Web at <http://tile.net/listserv>, at <http://k12.cnidr.org:90/lists.html>, and at <http://catalog.com/vivian/interest-group-search.html>.

Classroom Connect mailing list

To subscribe, send a message to...
crc-request@wentworth.com
Leave the Subject field blank and in the first line of the body of the message enter...
subscribe

CACI (Children Accessing Controversial Information)

To subscribe, send a message to...
caci-request@cygnus.com

Leave the Subject field blank, and in the first line of the body of the message enter...
subscribe

To post, send a message to...
caci@cygnus.com

Cosndisc (Consortium for School Networking Discussion List)

To subscribe, send a message to...
listproc@list.cren.net

Leave the Subject field blank, and in the first line of the body of the message enter...
subscribe cosndisc YourFirstName YourLastName

To post, send a message to...
cosndisc@list.cren.net

Cu-seeme-l (General CU-SeeMe discussion list)

To subscribe, send a message to...
listproc@cornell.edu

Leave the Subject field blank, and in the first line of the body of the message enter...

subscribe cu-seeme-l YourFirstName YourLastName

To post, send a message to...
cu-seeme-l@cornell.edu

Cu-seeme-schools (Discussion about using CU-SeeMe as an instructional tool)

To subscribe, send a message to...
majordomo@gsn.org

Leave the Subject field blank, and in the first line of the body of the message enter...

subscribe cu-seeme-schools

To post, send a message to...
cu-seeme-schools@gsn.org

Ednet

To subscribe, send a message to...
listproc@lists.umass.edu

Leave the Subject field blank, and in the first line of the body of the message enter...

subscribe ednet YourFirstName YourLastName

To post, send a message to...
ednet@lists.umass.edu

Edtech (Educational Technology list)

To subscribe, send a message to...
listserv@msu.edu

Leave the Subject field blank, and in the first line of the body of the message enter...

subscribe edtech YourFirstName YourLastName

To post, send a message to...
edtech@msu.edu

European Schools Project (ESP)

To subscribe, send a message to...
listproc@educ.uva.nl

Leave the Subject field blank, and in the first line of the body of the message enter...

subscribe bbs YourFirstName YourLastName

To post, send a message to...

bbs@educ.uva.nl

Internet School Networking (List for the working group which produced this document)

To subscribe, send a message to...

listmanager@nasa.gov

Leave the Subject field blank, and in the first line of the body of the message enter...

subscribe isn-wg (NOTE: Do not add your name)

To post, send a message to...

isn-wg@nasa.gov

Kidsphere

To subscribe, send a message to...

kidsphere-request@vms.cis.pitt.edu

Type any message asking to subscribe.

To post, send a message to...

kidsphere@vms.cis.pitt.edu

KIDLINK (Also KIDS-96, KIDS-97, etc.)

KIDLINK operates 24 public mailing lists in English, Spanish, Portuguese, Japanese, Hebrew, and Scandinavian languages, and a private "chat" network for members.

To learn about KIDLINK projects, subscribe to the news service by sending a message to...

listserv@vml.nodak.edu

Leave the Subject field blank, and in the first line of the body of the message enter...

subscribe KIDLINK YourFirstName YourLastName

To receive a file of general information on KIDLINK, send email to the same listserv address, leave the Subject field blank, and in the first line of the body of the message enter...

get kidlink general

K12admin (A list for K-12 educators interested in educational administration)

To subscribe, send a message to...
listserv@listserv.syr.edu

Leave the Subject field blank, and in the first line of the body of the message enter...

subscribe k12admin YourFirstName YourLastName

To post, send a message to...
k12admin@listserv.syr.edu

LM_NET (A list for school library media specialists worldwide)

To subscribe, send a message to...
listserv@listserv.syr.edu

Leave the Subject field blank, and in the first line of the body of the message enter...

subscribe LM_NET YourFirstName YourLastName

To post, send a message to...
LM_NET@listserv.syr.edu

NOVAE Group: Teachers Networking for the Future (Distribution list -- not discussion list -- of projects and happenings of interest to educators)

To subscribe, send a message to...
listserv@idbsu.idbsu.edu

Leave the Subject field blank, and in the first line of the body of the message, enter...

subscribe novae YourFirstName YourLastName

UK-schools (for teachers and others interested in the use of the Internet in UK schools and for general discussion about anything concerning international classroom connections)

To subscribe, send a message to...
mailbase@mailbase.ac.uk

Leave the Subject field blank, and in the first line of the body of the message enter...

join uk-schools YourFirstName YourLastName

To post, send a message to...
uk-schools@mailbase.ac.uk

WWWedu (the World Wide Web in Education list; pronounced "we do")
To subscribe, send a message to...
listproc@educom.unc.edu

Leave the Subject field blank, and in the first line of
the body of the message, enter...
subscribe wwwedu YourFirstName YourLastName

To post, send a message to...
wwwedu@educom.unc.edu

INTERNET COMPUTERS

Academy One (National Public Telecomputing Network)
via WWW:
<http://www.nptn.org/cyber.serv/AOneP/index.html>

Armadillo's WWW Server
via WWW:
<http://riceinfo.rice.edu:80/armadillo/>

BBN National School Network Testbed
via Gopher:
copernicus.bbn.com

via WWW:
<http://copernicus.bbn.com:70/testbed/>

Censorship/Freedom of Speech/Child Safety on the Internet Web page
via WWW:
<http://www.voicenet.com/~cranmer/censorship.html>

Classroom Connect on the Net
via WWW:
<http://www.classroom.net/>

via FTP:
[ftp.classroom.net/wentworth/Classroom-Connect/aup-faq.txt](ftp://classroom.net/wentworth/Classroom-Connect/aup-faq.txt) (for an
FAQ document on Acceptable Use Policies)

Chatback Trust and Chatback International network server
via WWW:
<http://www.tcns.co.uk/chatback/welcome.html>

CERT Coordination Center

via WWW:

<http://www.sei.cmu.edu/SEI/programs/cert/CERT.info.html><http://www.sei.cmu.edu/technology/trustworthy.html>

via email:

cert@cert.orgvia FTP: [info.cert.org](ftp://info.cert.org)

cd pub/

Consortium for School Networking

via Gopher:

cosn.org

via WWW:

<http://cosn.org/>

CU-SeeMe

via WWW:

<http://cu-seeme.cornell.edu/>

Educational Resources Information Center (ERIC)

via WWW:

<http://ericir.syr.edu/>

via Gopher:

ericir.syr.edu

via telnet:

telnet [bbs.oit.unc.edu](telnet://bbs.oit.unc.edu)

login: launch

(Follow directions on screen for registration. At the main menu, choose number 4, "Topical Document Search (WAIS)", and move to eric-digests. For help in WAIS, type a question mark.)

via email:

askeric@ericir.syr.edu

(In your message ask for the topic you're interested in. A human will answer you.)

Empire Internet Schoolhouse

via Gopher:

nysernet.org (port 3000)

Electronic Frontier Foundation ("A non-profit civil liberties

organization working in the public interest to protect privacy, free expression, and access to online resources and information.")

via WWW:
<http://www.eff.org/>

via email:
ask@eff.org

via snailmail, telephone, and fax:
The Electronic Frontier Foundation
1550 Bryant Street
San Francisco CA 94103 USA
+1 415 668 7171 (voice)
+1 415 668 7007 (fax)

EdWeb
via WWW:
<http://edweb.cnidr.org:90/>

European Schools Project
via WWW:
<http://www.educ.uva.nl/ESP/>

Foundation Center
via WWW:
<http://fdncenter.org/>

Geometry Forum
via WWW:
<http://forum.swarthmore.edu/>
<http://forum.swarthmore.edu/~steve/steve/wwwhtml.html> ("Learning
to Use the Web and Create Web Pages")

Global SchoolNet Foundation
via WWW:
<http://gsn.org/>
<http://gsn.org/gsn/article.connect.levels.html> ("Internet
Connectivity Levels")
<http://gsn.org/gsn/article.design.project.html> ("How to Design a
Successful Project")
<http://gsn.org/gsn/article.gutenberg.html> ("Global Literacy in
a Gutenberg Culture")

Grants Web
via WWW:
<http://infoserv.rttonet.psu.edu/gweb.htm>

Hot List of K-12 Internet School Sites (Gleason Sackman, SENDIT)
via WWW:
<http://www.sendit.nodak.edu/k12/>

International Education and Research Network (I*EARN)

via WWW:
[http:// www.iearn.org/iearn/](http://www.iearn.org/iearn/)

via Gopher:
gopher.iearn.org (port 7008)

via email:
iearn@iearn.org

Internet School Networking (ISN) working group home page (publishers of this document)

via WWW:
<http://spider.lloyd.com/isn/index.html>

International Society for Technology in Education (ISTE)

via WWW:
<http://isteonline.uoregon.edu/>

via Gopher:
isteonline.uoregon.edu

KIDLINK

via WWW:
<http://www.kidlink.org/>

via Gopher:
gopher.kidlink.org

Learning Resource Server, University of Illinois College of Education

via WWW:
<http://www.ed.uiuc.edu/>
<http://www.ed.uiuc.edu/Activity-Structures/> (Judi Harris' Network-Based Educational Activity Collection)

via Gopher:
gopher.ed.uiuc.edu

MBONE (Multicast Backbone)

via WWW:
<http://www.mbone.com/techinfo/>

NASA Jason Project

via WWW:
http://seawifs.gsfc.nasa.gov/JASON/JASON_HOME.html

NASA Online Educational Resources

via WWW:

<http://quest.arc.nasa.gov/OER/>

NASA Quest

via WWW:

<http://quest.arc.nasa.gov/><http://quest.arc.nasa.gov/essay/essay-index.html> ("Networks, Where Have You Been All My Life" student essay contest winners)

via Gopher:

quest.arc.nasa.gov (port 70)

via FTP:

[ftp quest.arc.nasa.gov](ftp://quest.arc.nasa.gov)

NASA Spacelink

via WWW:

<http://spacelink.msfc.nasa.gov/>

via Gopher:

spacelink.msfc.nasa.gov

via telnet:

[telnet spacelink.msfc.nasa.gov](telnet://spacelink.msfc.nasa.gov)

login: guest

via FTP:

[ftp spacelink.msfc.nasa.gov](ftp://spacelink.msfc.nasa.gov)

To find information on the NASA Teacher Resource Center Network, choose "Educational Services," then "Teacher Resource Center Network." For television schedules, follow the menu for "Educational Service" to the menu option, "Technology."

National Center for Missing and Exploited Children

via WWW:

<http://www.missingkids.org/>http://www.missingkids.org/information_superhighway.html (Online brochure "Child Safety on the Information Highway")

National Center for Supercomputing Applications (NCSA)

via WWW:

<http://www.ncsa.uiuc.edu/SDG/Software/Mosaic/NCSAMosaicHome.html>
(Mosaic Home Page)<http://www.ncsa.uiuc.edu/General/Internet/WWW/HTMLPrimer.html>
(A Beginner's Guide to HTML)

via FTP:
ftp ftp.ncsa.uiuc.edu (to download the Mosaic WWW browser)

National Center for Technology Planning
via Gopher:
gopher.msstate.edu

Choose "Resources Maintained at MS State University," then select
"National Center for Technology Planning."

National Science Foundation's (United States) Science and Technology
Information System (STIS)

via WWW:
<http://stis.nsf.gov/>

via Gopher:
stis.nsf.gov

via telnet:
telnet stis.nsf.gov
login: public
Follow instructions on screen.

Netscape Communications
via WWW:
<http://www.netscape.com/>

via FTP:
ftp ftp.netscape.com

Netscape's WWW browser can be downloaded from Netscape's FTP sites at
ftp.netscape.com, ftp2.netscape.com, ftp3.netscape.com...through
ftp7.netscape.com.

Office of Educational Research and Improvement (U.S. Department of
Education)

via WWW:
<http://oeri.ed.gov/>

via Gopher:
gopher.ed.gov

Providers of Commercial Internet Access (for a list of Internet Service Providers)

via WWW:
<http://www.celestin.com/pocia/>

THE LIST (for a list of Internet Service Providers)

via WWW:
<http://thelist.com>

Voters Telecommunications Watch

via WWW:
<http://www.vtw.org/>
<http://www.vtw.org/pubs/ipcfaq> [Internet Parental Control
Frequently Asked Questions (FAQ) by Shabbir J. Safdar]

World Wide Web Consortium

via WWW:
<http://www.w3.org/pub/WWW/>

via telnet:
telnet telnet.w3.org (public access Lynx client. Use "lynx"
without the quotes if a login is requested.)

Web66

via WWW:
<http://web66.coled.umn.edu/>
<http://web66.coled.umn.edu/schools.html> (International WWW Schools
Registry)
<http://web66.coled.umn.edu/Cookbook/contents.html> (Classroom
Internet Server Cookbook)

NEWS GROUPS

alt.algebra.help
alt.comp.shareware.for-kids
alt.education.distance
alt.kids-talk
bit.listserv.edtech
comp.security.announce
k12.chat.elementary
k12.chat.junior
k12.chat.senior
k12.chat.teacher
k12.ed.art
k12.ed.business

k12.ed.comp.literacy
k12.ed.health-pe
k12.ed.life-skills
k12.ed.math
k12.ed.music
k12.ed.science
k12.ed.soc-studies
k12.ed.special
k12.ed.tag
k12.ed.tech
k12.edu.life-skills (especially for school counselors)
k12.euro.teachers (in Europe)
k12.lang.art
k12.lang.deutsch-eng
k12.lang.esp-eng
k12.lang.francais
k12.lang.russian
k12.library
k12.news
k12.sys.projects
misc.education
misc.education.language.english
misc.education.multimedia
misc.kids
misc.kids.computer
news.announce.newusers
uk.education.misc
uk.education.teachers

NEWSLETTERS and JOURNALS

Classroom Connect

Published monthly during the school year, a subscription currently costs U.S. \$39.00.

Wentworth Worldwide Media
1866 Colonial Village Lane
P.O. Box 10488
Lancaster, PA 17605-0488
USA
Phone: 1-717-393-1000
1-800-638-1639
Fax: 1-717-390-4378
Email: connect@wentworth.com

via WWW:

<http://www.wentworth.com/classroom/crcpub.htm> (Classroom Connect home page)

<http://www.wentworth.com/classroom/orderform.htm> (order form for Classroom Connect Newsletter, books, software, and videos about the Internet for educators)

Electronic Learning

Published eight times per year, a current subscription to this magazine for technology and school change costs \$23.95.

Scholastic, Inc.
2931 East McCarty Street
P.O. Box 3710
Jefferson City, MO 65102-3710

Learning and Leading with Technology (Formerly "The Computing Teacher")

Published monthly, the current U.S. \$61.00 ISTE membership fee includes \$36.00 for this journal.

ISTE (International Society for Technology in Education)
1787 Agate Street
Eugene, OR 97403
Phone: 1-503-346-4414

MultiMedia Schools

Published five times a year, a subscription currently costs U.S. \$38.00.

Online, Inc.
462 Danbury Road
Wilton, CT 06897-2126
USA
Phone: 1-800-222-3766

NetTeach News

Published ten times a year, subscription prices are as follows.

Annual hardcopy subscription cost:

U.S. \$38.00 for individual subscriptions in the U.S.

U.S. \$45.00 for individual subscriptions in Canada and Mexico

U.S. \$60.00 for individual subscriptions outside North America

Annual ASCII electronic copy cost:
U.S. \$22.00 for individual subscriptions worldwide

Site licenses are available for the electronic version.
Discounts are available for ten or more orders of the printed
version for educational institutions.

For subscription questions and submissions contact:

Kathleen M. Rutkowski, Editor
Chaos Publications
13102 Weather Vane Way
Herndon, VA 22071
USA
Phone: 1-703-471-0593
Fax: 1-703-471-0596
Email: netteach@chaos.com

via WWW:
<http://www.chaos.com/netteach>

ORGANIZATIONS

Asia Pacific Network Information Center
c/o The United Nations University
53-70 Jingumae 5-Chome
Shibuya-ku, Tokyo 150
Japan
Phone: +81-3-5467-7014
Fax: +81-3-5467-7015
Email: hostmaster@apnic.net
WWW: <http://www.apnic.net>

AskERIC Project
ERIC Clearinghouse on Information Resources
Syracuse University
4-194 Center for Science & Technology
Syracuse, New York 13244-4100
Phone: 315-443-3640
Fax: 315-443-5448
Email: AskERIC@ericir.syr.edu

See also "Internet Computers" above.

CERT Coordination Center (Formerly CERT, Computer Emergency Response Team)

Software Engineering Institute
Carnegie Mellon University
Pittsburgh, PA 15313-3890
USA
Phone: 412-268-7090
Fax: 412-268-6989
Email: cert@cert.org

See also "Internet Computers" above.

Chatback International

Dr. R. Zenhausern, Executive Director
Psychology Department
St. Johns University
SB 15, Marillac
Jamaica, NY 11439
USA
Phone: 718-990-6447
Fax: 718-990-6705
Email: drz@sjvm.stjohns.edu

The Chatback Trust

Tom Holloway, UK Director
6 St. Mary's Crescent
Royal Leamington Spa
Warwickshire, 1JL
Phone: +44-926-888333
Fax: +44-926-420204
Email: t.holloway@warwick.ac.uk

See also "Internet Computers" above.

Consortium for School Networking

P.O. Box 65193
Washington, DC 20035-5193
USA
Phone: 202-466-6296
Fax: 202-872-4318
Email: info@cosn.org

See also "Internet Computers" above.

European Schools Project ("...a support system for secondary schools
to explore applications of educational telematics.")

University of Amsterdam
Centre for Tele-Learning
Wibautstraat 4
1091 GM Amsterdam
The Netherlands
Contact: Dr. Pauline Meijer or Dr. Henk Sligte
Phone: +31-20-5251248
Fax: +31-20-5251211
Email: risc@esp.educ.uva.nl
WWW: <http://www.educ.uva.nl/ESP>

FidoNet

1151 SW Vermont Street
Portland, OR 97219
USA
Contact: Janet Murray
Phone: 1-503-280-5280
Email: jmurray@psg.com
WWW: <http://bbs.owls.com/~jerrys/fidonet.html> (A Fidonet Primer)

Global SchoolNet Foundation (formerly FrEdMail)

P.O. Box 243,
Bonita, CA 91908
USA
Phone: (619) 475-4852
Fax: (619) 472-0735
Email: info@gsn.org

See also "Internet Computers" above.

International Education and Research Network (I*EARN)

c/o Copen Family Fund
345 Kear Street
Yorktown Heights, NY 10598
USA
Contact: Dr. Edwin H. Gragert
Phone: 914-962-5864
Fax: 914-962-6472
Email: iearn@iearn.org

See also "Internet Computers" above.

Internet Society

12020 Sunrise Valley Dr.
Suite 210
Reston, Virginia 22091
USA
Phone: 703-648-9888
Fax: 703-620-0913
Email: isoc@isoc.org
WWW: <http://www.isoc.org/home.html>

KIDLINK Society

4815 Saltrod
Norway
Phone: +47-370-31204
Fax: +47-370-27111
Email: kidlink-info@kidlink.org

See also "Internet Computers" and "Electronic Mail Lists" above.

K12Net

1151 SW Vermont Street
Portland, OR 97219
USA
Phone: 503-280-5280
Contact: Janet Murray
Email: jmurray@psg.com
Gopher: <gopher.psg.com>
WWW: <http://arlo.wilsonhs.pps.k12.or.us/k12.html>

Reseaux IP Europeens Network Coordination Centre (RIPE NCC)

Kruislaan 409
NL-1098 SJ Amsterdam
The Netherlands
Phone: +31 20 592 5065
Fax: +31 20 592 5090
Email: ncc@ripe.net
WWW: <http://www.ripe.net/ripe/default.html>

VIDEOS

Master Communications Group
7322 Ohms Lane
Minneapolis, MN 55439
Phone: 1-800-862-6164
Fax: 1-612-835-9573

Titles:

Experience the Power: Network Technology for Education (produced
by the National Center for Education Statistics)
Future Schools: Connected to the World (produced by MIT)

NASA Central Operation of Resources for Educators (CORE)

Lorain County Joint Vocational School
15181 Route 58 South
Oberlin, OH 44074
USA
Phone: 1-216-774-1051, x293/294
Fax: 1-216-774-2144
Email: video-info@quest.arc.nasa.gov

Titles:

Global Quest: The Internet in the Classroom
Connecting to the Future: A Guide for Building a Network
Infrastructure for Education
Global Quest II: The Internet in the Curriculum
Others

The fee for the videos is cost plus shipping and handling. You may also make a copy yourself by taking a blank copy to the nearest NASA Teacher Resource Center. For information on the NASA Teacher Resource Center Network or on NASA Select, contact your nearest NASA facility or consult NASA Spacelink, listed above in "Internet Computers."

Wentworth Worldwide Media
1866 Colonial Village Lane
P.O. Box 10488
Lancaster, PA 17605-0488
USA
Phone: 1-717-393-1000
1-800-638-1639
Fax: 1-717-390-4378

Titles:

The Amazing Internet
Internet Email
Searching the Internet
Discovering the World Wide Web
Others

10. References

- [1] "Internet Domain Survey, January 1995," Network Wizards
<http://www.nw.com/zone/WWW/report.html>
- [2] "Restructuring Schools: A Systematic View," Action Line, the
newsletter of the Maryland State Teachers Association, a National
Education Association Affiliate. R. Kuhn, Editor. No. 93-6. June,
1993.
- [3] Sivin, J. P. and E. R. Bialo, "Ethical Uses of Information
Technologies in Education." Washington, D.C.: U.S. Department of
Justice, Office of Justice Programs, National Institute of
Justice. 1992.

11. Security Considerations

General security considerations are discussed in Section 7 of this document.

12. Authors' Addresses

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505 Huntmar Park Dr.
Herndon, VA 22070
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EMail: julier@internic.net

Jennifer Sellers
Sterling Software/NASA IITA
700 13th Street, NW
Suite 950
Washington, DC 20005
Phone: 202-434-8954
EMail: sellers@quest.arc.nasa.gov

APPENDIX A: GLOSSARY OF TERMS USED IN THIS DOCUMENT

The following is a short glossary of terms used in this document. For a more complete glossary of Internet terms, refer to FYI 18, "Internet Users' Glossary." These definitions are largely excerpted from that glossary. (See Section 8, "Suggested Reading," above for complete reference information.)

Acceptable Use Policy (AUP)

The policy which defines the uses of the network that the network's administrators consider appropriate. Enforcement of AUPs varies with the network.

Anonymous FTP

Accessing data via the File Transfer Protocol using the special username "anonymous." This was devised as a method to provide a relatively secure way of providing restricted access to public data. Users who wish to acquire data from a public source may use FTP to connect to the source, then use the special username "anonymous" and their email address as the password to log into a public data area.

Archie

A system to automatically gather, index and serve information on the Internet. The initial implementation of Archie provided an indexed directory of filenames from all anonymous FTP archives on the Internet. Later versions provide other collections of information.

Client

An application which requests information from, or requests a service of, a shared resource (a computer or "server"). See also Server.

Cracker

A person who uses computer knowledge to attempt to gain access to computer systems and/or maliciously damage those systems or data.

Dial-in (also dial-up)

A connection, usually made via modems, between two computers (or servers) over standard voice grade telephone lines.

Download

To copy data from a remote computer to a local computer. The opposite of upload.

DSU/CSU (Data Service Unit/Channel Service Unit)

The digital equivalent of a modem. A Channel Service Unit connects to a telephone company-provided digital data circuit, and a Data Service Unit provides the electronics required to connect digital equipment to the CSU. Paired together a DSU/CSU allows computer equipment to be connected into the telephone digital service for highly conditioned, high speed data communications.

Electronic Bulletin Board System (BBS)

A computer, and associated software, which typically provides electronic messaging services, archives of files, and any other services or activities of interest to the bulletin board system's operator. Although BBSs have traditionally been the domain of hobbyists, an increasing number of BBSs are connected directly to the Internet, and many BBSs are currently operated by government, educational, and research institutions.

Email (Electronic Mail)

A system whereby a computer user can exchange messages with other computer users (or groups of users) via a communications network.

FidoNet

A network of computers interconnected using the FIDO dial-up protocols. The FIDO protocol provides a means of "store and forward" file transfer similar to UUCP.

FTP (File Transfer Protocol)

A protocol which allows a user on one host to access, and transfer files to and from, another host over a network. Also, FTP is usually the name of the program the user invokes to execute the protocol.

FYI (For Your Information)

A subseries of RFCs that are not technical standards or descriptions of protocols. FYIs convey general information about topics related to TCP/IP or the Internet. See also RFC (Request for Comments).

Gopher

A distributed information service that makes available hierarchical collections of information across the Internet. Gopher uses a simple protocol that allows a single Gopher client to access information from any accessible Gopher server, providing the user with a single "Gopher space" of information. Public domain versions of the client and server are available

Hacker

A person who delights in having an intimate understanding of the internal workings of a system, computers and computer networks in particular. The popular media has corrupted this term to give it the pejorative connotation of a person who maliciously uses computer knowledge to cause damage to computers and data. The proper term for this type of person is "cracker."

Home page

A form of Web page that serves as the introductory or main page for a subject. The home page generally contains basic information about a subject and hypertext links to other pages which contain more detailed information. See also WWW and Web page.

Internet Engineering Task Force (IETF)

The IETF is a large, open community of network designers, operators, vendors, and researchers whose purpose is to coordinate the operation, management and evolution of the Internet, and to resolve short-range and mid-range protocol and architectural issues. It is a major source of protocol proposals and standards.

Internet Service Provider (ISP)

See Network Access Provider.

InterNIC

A Network Information Center (NIC), funded by the National Science foundation, that provides information about the Internet. The InterNIC offers support in the areas of Information Services (the task most often cited in this document), Registration Services, and Directory and Database Services.

Kbs (Kilo-Bits per Second)

A data transmission rate expressed in 1000 bit per second units. For example, 56 Kbs is $56 \times 1000 = 56,000$ bits per second.

LAN (Local Area Network)

A data network intended to serve an area of only a few square kilometers or less. Since such networks are relatively small, they can usually be directly controlled by the users and operate at relatively high speeds (up to 100 Mbs [10 million bits per second]) over inexpensive wiring.

Leased line

A leased line is a special phone company permanent connection between two locations. Leased lines are generally used where high-speed data (usually 960 characters per second and higher) is continually exchanged between two computers (in the Internet, generally between routers). A leased line is billed at the same rate per month independent of how much the line is used and can be cheaper than using dial modems depending on the usage. Leased lines may also be used where higher data rates are needed beyond what a dial modem can provide.

Listserv (mailing list server)

An automated program that accepts mail messages from users and performs basic operations on mailing lists for those users. In the Internet, listservs are usually accessed as "listname@host." For example, the list server for the hypothetical list "newsreports@acme.org" would be called "listserv@acme.org." Sending email to "newsreports@acme.org" causes the message to be sent to all the list subscribers, while sending a message (to subscribe or unsubscribe, for example) to "listserv@acme.org" sends the message only to the list server program. Not all mailing lists use list servers to handle list administration duties. More than one automated mailing program exists on the Internet, although the term "listserv" is sometimes confusingly used to refer to any such program.

Mailing Lists

A list of email addresses. Generally, a mailing list is used to discuss a certain set of topics, and different mailing lists discuss different topics. A mailing list may be moderated. That is, messages sent to the list are actually sent to a moderator who determines whether or not to send the messages on to everyone else. Many mailing lists are maintained by mail handling software such as

listserv, majordomo, or listproc, which are programs that automatically handle operations such as adding new people to the list. (See above.) In the Internet, for those mailing lists maintained by a human, rather than by a program, you can generally subscribe to a list by sending a mail message to: "listname-REQUEST@host" and in the body of the message enter a request to subscribe. To send messages to other subscribers, you will then use the address "listname@host."

Modem (MODulator/DEModulator)

A device that converts the digital signals used by computers into analog signals needed by voice telephone systems.

Network Access Provider (Network Service Provider, Internet Service Provider)

Any organization that provides network connectivity or dial-up access. Service providers may be corporations, government agencies, universities, or other organizations.

Network News

Another name for "Usenet News."

NIC (Network Information Center)

A central place where information about a network within the Internet is maintained. Usually NICs are staffed by personnel who answer user telephone calls and electronic mail, and provide general network usage information and referrals, among other possible tasks. Most network service providers also provide a NIC for their users.

Port

A specific access point on an Internet computer, designated by a number. Most common Internet services, such as the World Wide Web, have specific port numbers associated with them, which makes it easier for applications on the Internet to interact. Human users of the Internet normally do not need to worry about port numbers.

PPP (Point to Point Protocol)

A protocol used to establish TCP/IP connections using serial lines such as dial-up telephone lines. Similar to SLIP (see below), PPP is a later standard that includes features such as demand dial-up, compression, and better flow control.

Protocol

A formal description of message formats and the rules two computers must follow to exchange those messages. Protocols can describe low-level details of machine-to-machine interfaces (e.g., the order in which bits and bytes are sent across a wire) or high-level exchanges between allocation programs (e.g., the way in which two programs transfer a file across the Internet).

Protocol Stack

A series of protocols linked together to provide an end-to-end service. For example, the File Transfer Protocol uses the Transmission Control Protocol, which uses the Internet Protocol, which may use the Point to Point protocol, to transfer a file from one computer to another. The series FTP->TCP->IP->PPP is called a protocol stack.

RFC (Request for Comments)

The document series, begun in 1969, which describes the Internet suite of protocols and related experiments. Not all (in fact very few) RFCs describe Internet standards, but all Internet standards are written up as RFCs. The RFCs include the documentary record of the Internet standards process.

Router

A computer which forwards traffic between networks. The forwarding decision is based on network layer information and routing tables, often constructed by routing protocols.

Server

A shared resource which provides information or services to user applications or clients. See also Client.

SLIP (Serial Line Internet Protocol)

A protocol used to establish TCP/IP connections using serial lines such as dial-up telephone lines. Small computers, such as PCs and Macintoshes, can use SLIP to dial up to servers, which then allow the computer to act as a full Internet node. SLIP is generally used at sites with a few users as a cheaper alternative than a full Internet connection. SLIP is being replaced by PPP at many sites.

TCP/IP (Transmission Control Protocol/Internet Protocol)

TCP/IP is named for two of the major communications protocols used within the Internet (TCP and IP). These protocols (along with several others) provide the basic foundation for communications between hosts in the Internet. All of the service protocols, such as FTP, Telnet, and Gopher, use TCP/IP to transfer information.

Telnet

Telnet is the Internet standard protocol for remote terminal connection service. The name "telnet" also is used to refer to programs that allow interactive access to remote computers, as well as the action of using said programs. For example, the phrase "Telnet to host xyzzy" means to interactively log into host "xyzzy" from some other host in the Internet.

Upload

To copy data from a local computer to a remote computer. The opposite of download.

Usenet News

An electronic bulletin board system created originally by the Unix community and which is accessible via the Internet. Usenet News forms a discussion forum accessible by millions of users in almost every country in the world. Usenet News consists of thousands of topics arranged in a hierarchical form. Major topics include "comp" for computer topics, "rec" for recreational topics, "soc" for social topics, "sci" for science topics, etc. Within the major topics are subtopics, such as "rec.music.classical" for classical music, or "sci.med.physics" for discussions relating to the physics of medical science.

UUCP (Unix-to-Unix CoPy)

This was initially a program run under the Unix operating system that allowed one Unix system to send files to another Unix system via dial-up phone lines. Today, the term is more commonly used to describe the large international network which uses the UUCP protocol to pass news and electronic mail.

Veronica (Very Easy Rodent-Oriented Network Index to Computerized Archives)

A utility which searches Gopher servers based on a user's list of keywords.

Virus

A program which replicates itself on computer systems by incorporating itself into other programs which are shared among computer systems. The term virus is also often used more generally to refer to any unauthorized software intrusion into a computer, no matter the type or behavior of the program.

Web

See WWW.

Web page

A document, usually containing hypertext links, which is available through the World Wide Web. Web pages are composed in a special language called Hypertext Markup Language (HTML), which allows basic formatting such as font sizes, bold, underline, blinking text, and inclusion of graphics images. Web pages usually contain hypertext links to other Web pages. See also WWW and Home page.

WAIS (Wide Area Information Server)

A distributed information service which offers simple natural language input, indexed searching for fast retrieval, and a "relevance feedback" mechanism which allows the results of initial searches to influence future searches. Public domain implementations are available.

WWW (World Wide Web)

A hypertext-based, distributed information system created by researchers at the European Laboratory for Particle Physics (CERN) in Switzerland. The Web information system may be used to create, edit, or browse hypertext documents. The Web protocol interlinks information in such a way that a user can traverse the Web from any starting point. The protocol also interacts with many other Internet services, such as Gopher, to provide one consistent, transparent user interface to the Internet. Client and server software is widely available via a number of methods: as free software, as client software often included as part of an Internet connection package, or as a commercial product.

APPENDIX B: WAYS TO GET RFCs

FYI documents such as the one your are reading are a subset of the Internet Engineering Task Force's RFC documents.

Note that the latest version of the following file may be found on the World Wide Web at <http://www.isi.edu/in-notes/rfc-editor/rfc-info>

For more information on Internet Engineering Task Force publications, visit the RFC Editor's home page on the World Wide Web at <http://www.isi.edu:80/rfc-editor/rfc-sources.html>

RFC-Info Simplified Help

Use RFC-Info by sending email messages to RFC-INFO@ISI.EDU.

1. To get a specific RFC send a message with text as follows:

```
Retrieve: RFC
Doc-ID: RFC1500
```

This gets RFC 1500. All RFC numbers in the Doc-Id are 4 digits (RFC 791 would be Doc-ID: RFC0791).

2. To get a specific FYI send a message with text as follows:

```
Retrieve: FYI
Doc-ID: FYI0004
```

3. To get a list of available RFCs that match a certain criteria:

```
LIST: RFC
Keywords: Gateway
```

Returns a list of RFCs with the word Gateway in the title or specified as a keyword.

4. To get the Index of all RFCs published:

```
HELP: rfc_index
```

5. To get information about other ways to get RFCs, FYIs, STDs, or IMRs.

```
HELP: ways_to_get_rfcs
HELP: ways_to_get_fyis
HELP: ways_to_get_stds
```

HELP: ways_to_get_imrs

6. To get help about using RFC-Info:

HELP: help

or

HELP: topics

APPENDIX C: EXAMPLES OF EDUCATIONAL PROJECTS USING THE INTERNET

The following examples of projects using the Internet appeared on various online computers and electronic mailing lists pertaining to education during the 1995-96 school year. The messages have been edited in the interest of space and because many of the details about how to participate will become dated, but the information presented can give you a feel for the types and range of projects that are happening at the time of this writing.

A good source for project examples is "Judi Harris' Network-Based Educational Activity Collection" and other World Wide Web sites listed above in Section 9, "Resources and Contacts."

Example One: Interdisciplinary, Grades 2-4

From> KIDSPHERE Mailing List <kidsphere@vms.cis.pitt.edu>
Subject> interdisciplinary project - grades 2-4

Project description: This interdisciplinary data collection activity will enable students to answer the question: Does our community size and location affect the types and numbers of pets we own?

For grades 2,3,4

Timeline: January 29-March 4

Our classes will collect and share information about our communities and will then collect and share data about the types and numbers of pets we own. Students will be able to use the collected information to draw conclusions.

To participate, please send me your:

Name and grade level

School address

community size generalization: rural, urban or suburban

Example Two: Science, Engineering, and Careers, Levels K-12

NASA is pleased to announce another exciting opportunity for K-12 classrooms to interact with our scientists, engineers and support staff.

This time, the men and women of the Galileo project will provide a behind-the-scenes look at what it's like to be part of the flight team on a pioneering interplanetary expedition through the ONLINE FROM JUPITER project.

Galileo scientists and mission engineers are opening their notebooks to classrooms, museums and the public via the Internet to share their observations and experiences working on the NASA spacecraft mission to Jupiter.

From now through January 1996, members of the flight team will write brief field journal entries describing the scientific puzzles, engineering challenges and excitement of discovery as the Galileo orbiter and atmospheric entry probe begin their scientific investigation of Jupiter. The atmospheric probe is set to descend into Jupiter's atmosphere on Dec. 7, the same day the Galileo orbiter begins circling the giant planet for a two-year mission.

"For the first time, we're providing a window on the inner workings and interactions of a scientific deep space mission," said Dr. Jo Pitesky, member of the Galileo Mission Planning Office. "In sharing the journal entries, we hope to give readers, particularly students, an idea of the tremendous efforts that go into controlling and collecting data from a robot spacecraft a half-billion miles away."

After reading background material and the journals, kindergarten through 12th grade students and their teachers can ask project members questions -- via E-mail -- starting in late November and running through January 1996. They will receive personal responses, corresponding with experts on subjects ranging from atmospheric science to spacecraft systems. An archive of all questions and answers will be available online.

In addition, students will be able to take part in online experiments that will use actual probe data. Another activity will challenge students to predict the exact timing of the Galileo probe's first-ever plunge into the Jovian atmosphere. Additionally, students will be invited to create Stumpers (riddles and puzzles) to share with one another. Other curriculum resources will help teachers integrate the Galileo project into their classrooms. As well, mechanisms will be

provided to help like-minded teachers connect with each another to pursue collaborative projects of their own.

Other than your own time, there is no cost to get involved. Please consider joining us on this learning adventure. To participate, you must sign up for the ONLINE FROM JUPITER maillist. To do this, send an email message to listmanager@quest.arc.nasa.gov. In the message body, write only these words: subscribe updates-jup

For more information, make a webstop at our "continuous construction" site: <http://quest.arc.nasa.gov/jupiter.html>

These projects are part of the "Sharing NASA with the Classroom" series. They are made possible by funding from the NASA Information Infrastructure Technology and Applications (IITA) program. IITA is part of the High Performance Computing and Communications program authorized by Federal legislation passed in December 1991.

Example Three: MathMagic; Math at Various Grade Levels

[Note: The MathMagic World Wide Web home page is located at <http://forum.swarthmore.edu/mathmagic/>]

What is MathMagic?

MathMagic is a K-12 telecommunications project developed in El Paso, Texas. It provides strong motivation for students to use computer technology while increasing problem-solving strategies and communications skills. MathMagic posts challenges in each of four categories (k-3, 4-6, 7-9 and 10-12) to trigger each registered team to pair up with another team and engage in a problem-solving dialog. When an agreement has been reached, one solution is posted for every pair.

MathMagic has received wide ideological acceptance by hundreds of past FidoNet users because it addresses most of the National Council of Teachers of Mathematics standards. A modified format has now expanded into the Internet and is available via regular e-mail or via the World Wide Web (WWW).

Who can participate?

K-12 teachers and students, but higher education teachers, librarians, technology coordinators, computer teachers, and even home-schoolers are joining to act as facilitators.

What is needed?

Any teacher with access to electronic mail via the Internet can participate. Several net service providers and most of the commercial boards (America Online, Genie, CompuServe, Delphi, The Well, etc.) now offer e-mail gateways and other Internet services. MathMagic is best suited to schools that use computers with modems and have direct Internet access.

In some areas, a local Bulletin Board System (BBS) or a Net user (such as a parent with net access) may have to act as a go-between. Please ask about special arrangements.

[Example challenge for grades 10-12:]

MathMagic Cycle 18: Level 10-12 Regular

Using the numbers 1 9 9 2 in a "locked" position, can you develop a 31 day calendar for the month of October? You can use addition (+), subtraction (-), multiplication (*), division (/) exponents (^) factorial (!) square root (sqrt) and, naturally, parenthesis ().

Example: Friday the 13th could be: $(1+\sqrt{9})!-9-2$ (Scary, isn't it?) (Notice that the numbers appear in the "locked" sequence)

MathMagic Cycle 18: Level 10-12 Advanced

What 6 digit number, with 6 different digits, when multiplied by all integers up to 6, circulates its digits through all 6 possible positions, as follows:

```

ABCDEF * 1 - ABCDEF
ABCDEF * 3 - BCDEFA
ABCDEF * 2 - CDEFAB
ABCDEF * 6 - DEFABC
ABCDEF * 4 - EFABCD
ABCDEF * 5 - FABCDE

```

Good luck
MrH

[Example challenges for grades K-3:]

MathMagic Cycle 16: Level K-3 Regular

When two straight lines meet, they form an angle. Some angles are easy to recognize. For instance, a RIGHT ANGLE is any of the four angles formed by a piece of paper (like typing or computer paper) that has sharp corners.

Using a clock and "talking" with your partners, try to figure out how many times in a day (24 hours) the hour hand and the minute hand form a right angle. You may want to do a chart and watch the hour hand move between the numbers, as you move the minute hand...

MathMagic Cycle 16: Level K-3 Advanced

One of the better known works of architecture of the Roman Empire was the Coliseum. For a few months, at its maximum splendor (before the senate began cutting its funding... yes, old problem) there stood an Imperial Roman Guard in each of its 1000 arches. Imagine the splendor! (Not too cool if you were the entertainment.)

The first budget conscious cut called for the removal of every other Imperial Guard. Imagine, one stayed, the next went. The second senate cut called for the removal of every third guard (from the original count). So, the order went out that guards of gate 1 and gate 2 (if there was one) could stay, while guard of gate 3 (and every other third one) had to go... Naturally, what the senate was doing was getting rid of some guards, but also getting the credit for a lot of "cuts" of gates that had no guard.

The "cuts" continued number after number, until a diligent member of the opposition party cried foul. He said, "Only some of the cuts are actually getting rid of guards. A lot of them are not!" Can you build an argument for this senator?

Also, if you were a Roman Imperial Guard that every week had to choose a different gate you had to look after (and run the risk of losing your job), which gates would be your choice?

Good luck MrH

Example Four: Various Projects Announced by Global SchoolNet

Hi,

Our teachers have been doing K12 projects over the Internet for the past 12 years.

There is NO CHARGE for schools to participate in the projects. Global SchoolNet organizes, manages, and facilitates collaborative learning projects for schools with any level of connectivity . . . from email only . . . to desktop videoconferencing.

To access these projects go to:
<http://gsn.org/gsn/gsn.projects.html>

Sample of Projects you will find

The Global Schoolhouse (Featuring Desktop Video-Conferencing)

Today's "school of the future" uses the most powerful Internet tools, including live video, to link K12 classrooms to their communities and to other children around the world.

CALREN: Building the California Global Schoolhouse

Education leader (Global SchoolNet) partners with business leader (Aldea Communications) to discover and document how schools, businesses, and the community can network to share resources.

CyberStars: Number Ones of Tomorrow

For the first time ever, children around the globe can share their musical talents with the world via the Internet.

PAACE: Personal Achievement And Career Awareness

Students learn and practice important career skills, including those dealing with education, attitude, manners, grooming, and fashion.

Scientist-on-Tap

Scientists from the Jet Propulsion Laboratory demonstrate the power of distance learning, by interacting with students around world, from the comfort of their own offices!

Projects that Require Email Access Only

Ask a Geologist (AAG)

Have you ever wondered about why California has so many earthquakes and New York does not? Why is there so much oil in Texas but not in Wisconsin? What are the deepest canyons in the United States? (The answer might surprise you!) While the answers to many of these questions might be as close as an encyclopedia, some questions are difficult to answer without checking many sources. Beginning Monday, October 3, 1994, the USGS will offer a new, experimental Internet service - Ask-A-Geologist. General questions on earth sciences may be sent by electronic mail

Family Tree-Mail: Language Translation

In this pilot project, children use Globalink's language translation software to share family histories via email in their native languages of Spanish, French, German, and Italian.

Field Trips

Join other classes on their live field trips. In turn, you take other classes with you when you visit local places of interest. Our FIELDTRIPS-L mailing list manages this "exchange" of classroom field trips and excursions.

Geogame

This perennially favorite project will excite your students as they immerse themselves in atlases, maps, almanacs, and other references in order to solve a geography puzzle. Your students help create the puzzle by answering 8 questions about your community: latitude, typical weather, land formations, time zone, points of interest, etc. We combine their responses with other classes to create a geography puzzle your students will love to solve. A simple first project for beginning telecommunicators.

Global Grocery List

Your students visit their local grocery stores and record the prices of items on the grocery list, then share their prices with other participating classes all over the world. The result is a growing table of current, peer-collected data that can be used in math, social studies, science, and health classes (and others). This project is especially good for telecomputing beginners: it has very little structure and no timeline.

Jane Goodall Institute

Students learn about the interconnectedness of all life on earth as they observe the world around them and become involved in environmental and humanitarian issues. Explore Gombe and Kibira National Parks, ChimpanZoo, and the Roots & Shoots Program.

The Jason Project

The Jason Project brings the thrill of exploration and discovery live to students around the world as they participate in an amazing electronic field trip. In 1995 they trekked to Hawaii to study volcanoes. The Global SchoolNet Foundation manages the Jason Project Listservs and features them in our Global SCHLnet Newsgroup Service.

LOGO Foundation

The Logo Foundation, in cooperation with the Global SchoolNet Foundation, is now managing a Logo listserv discussion group available to anybody on the Internet.

Newsday

Your students write articles and post them on the Newsday Newswire for the whole world to see! Then they read and choose articles from other schools to download and include in their own newspaper! Finally... you share your newspaper with other classes... and they in turn share theirs with you. Your students' reading and writing skills will improve while they learn about current local, national, and global issues.

Where on the Globe is Roger?

Children are invited to learn about history, culture, geography, and the environment, while they electronically travel around the world with Roger Williams - in his quest to promote world peace!

Example Five: Professional Development

THE WEATHER UNDERGROUND ANNOUNCES "DISASTER IN THE CLASSROOM"
A *LIVE* TELEVISION PROGRAM TO ILLUSTRATE USES OF REAL-TIME
WEATHER AND ENVIRONMENTAL IMAGERY IN K-12 EDUCATION

Beginning in September 1995, Professor Perry Samson, University of Michigan professor and Director of the Weather Underground, will host an innovative, biweekly series of live, interactive, television shows aimed at teachers, administrators, and parents interested in K-12 education, Internet resources, and the use of real-time weather information in science. Aimed specifically at the professional development of teachers, the programs create a model for teachers to carry back into their classroom, a model that promotes project-based student centered learning environments using new technology and science ideas creatively.

The programs, interactive in design, allow participants to ask questions and respond to information through a simultaneous e-mail dialogue. A strength in the design of this series is its ability to allow an interactive discussion of environmental issues (severe weather, snowstorms, droughts, earthquakes, volcanic activity, El Nino, etc.) in a timely manner, matching current news items to science activities. The programs in the virtual classroom series are uplinked to a satellite from the University of Michigan. Teachers, administrators, parents or students can view the class either on their own or in groups. Participants will be encouraged to use their computer and modem to log into our server during the show. This interactive virtual classroom will allow participants to pose or answer questions live (or after the show).

Navigation on the Internet and pointers to information specific to the science curriculum ideas presented on the show are emphasized and made available to teachers for use in their classrooms. Participants are shown where on the Internet to find imagery and activities relevant to the topics discussed and are lead through a discussion of new methods to utilize these data in their classroom activities. Example activities utilizing current weather, climate and environmental conditions are demonstrated.

If you are interested in participating in this series from your home or school and would like to receive graduate credit for it, please contact:

The Weather Underground
URL: <http://groundhog.sprl.umich.edu>

[other contact information deleted]

First show is Sept. 18, contact us or look to URL above for more information soon!!!!!!

