

A DESCRIPTIVE STUDY OF TEACHERS' AND
EDUCATORS' PERCEPTIONS OF THE EDUCATIONAL
FEATURES OF STEM-Net AND THE EFFECT OF AN
ONLINE UNIT OF STUDY

CENTRE FOR NEWFOUNDLAND STUDIES

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EDITH M. LYNCH



A DESCRIPTIVE STUDY OF TEACHERS' AND EDUCATORS' PERCEPTIONS
OF THE EDUCATIONAL FEATURES OF STEM-Net AND THE EFFECT OF AN
ONLINE UNIT OF STUDY

BY

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ABSTRACT

This study was designed as a qualitative study to determine the educational expectations and experiences of K-12 teachers and educators in Newfoundland and Labrador as they become users of STEM-Net. More specifically, the study was intended to determine the perceptions of K-12 teachers and educators of various educational computer network activities; and, to investigate the effect of an online unit of study on teachers' and educators' understanding of these features.

The study consisted of several stages of data collection and analysis. In the first phase of the study data were collected through a survey questionnaire that was sent via electronic mail on STEM-Net to 200 teachers and educators. The data from the questionnaire provided the information for the implementation and development of a small group activity. The main purpose of the small group activity was to assess the impact of an online unit of study on teachers' and educators' understanding of the educational features of STEM-Net. The basis of the online unit was a series of six tutorials that were sent to the members of the small group. Through the tutorials members were encouraged to explore educational databases on the Internet through File Transfer Protocol, Gopher and the World Wide Web. Data from the survey questionnaire, the evaluations of the

small group activity and the online messages of participants were collected and analyzed to address the major research questions of the study.

The findings of the study suggest that teachers and educators perceive the educational features of STEM-Net to be useful and valuable to them in their teaching. The study also revealed factors that may influence teachers' and educators' understanding of the educational features of STEM-Net. Key issues that were identified include training materials, group and technical support as well as technical difficulties and time and access constraints. Finally, the design of the online unit of study seemed to be critical to the success of the group activity. The design of the unit incorporated group discussions and interactions, with the researcher as facilitator. The focus on a specific topic that addressed the needs of the group also contributed to the very positive participants' assessment of the effect of the group activity.

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CHAPTER I

OVERVIEW OF STUDY

In the late 1960's, the U.S. Department of Defense, through its Advanced Research Projects Agency (ARPA) designed a small network of four computers called ARPANET. ARPANET, designed to test the feasibility of creating a network that could survive a nuclear attack, linked computer scientists and researchers to distant computers allowing users to exchange ideas, discuss problems and share skills over the network. Today, Internet has grown into a worldwide network of networks that now connects an estimated 15 to 30 million users (Dern, 1994).

The technology of the Internet, once confined to universities and researchers is now being integrated into the K-12 educational community. In Newfoundland and Labrador, K-12 educators have access to the Internet through the recent development of STEM-Net. Introduced in 1993, STEM-Net provides K-12 educators in Newfoundland and Labrador with network connectivity and access to a wide range of educational resources throughout the world.

As teachers and students worldwide are tapping into networks to share experiences and to engage in a wide variety of learning experiences, educators are becoming increasingly aware of the potential of computer networks and telecommunications, as "a powerful new medium for education" (Cohen & Miyake, 1996, p. 257). Williams and Smith (1994) contended that to meet the

objectives of educators all classrooms should be connected to computer networks that are accessible to both students and teachers. Clement (1992) agreed that the full potential of wide-area computing lies in its ability to "create an environment of higher learning and creative teaching in all schools" (p. 18).

Despite the agreement that telecommunications can enhance teacher development and overcome professional isolation (Rubio, 1993; Weir, 1993) there is some question of how to create and sustain teacher involvement on computer networks (Rubio, 1993; Spitzer, 1993). Rubio (1993) cautioned: "Handing someone a computer and a modem, pointing to an electronic network and saying 'Go ahead and telecommunicate!' may be one thing but actually having them do so can be quite another" (p. 222).

Spitzer (1993) identified one barrier to widespread usage of educational networks as the "perceptions of whether telecommunications is worthwhile" (p. 47). As teachers work under time constraints, psychological and social barriers, and technical illiteracy the key issue becomes the usefulness of telecommunications. Ruopp (1993) agreed that while ease of use and access are important issues it is "the intellectual content on a network and its utility for the daily needs of the working teacher" (p. 53) that will determine the future of computer networks in schools. Therefore, as STEM-Net is being developed as a new resource for K-12 education in Newfoundland and Labrador, it is essential to define and then serve the needs of teachers and educators.

Purpose of the Study

It is the purpose of this study to determine the educational expectations and experiences of K-12 teachers and educators in Newfoundland and Labrador as they become users of STEM~Net. Specifically, it attempted to answer the following questions:

1. What are the perceptions of K-12 teachers and educators of various educational computer network activities that are available on STEM~Net?
2. How does an online unit of study affect teachers' and educators' understanding of the educational features of STEM~Net?

Significance of the Study

The role of the teacher in determining the direction of the educational network is critical to the success of the network (Lieberman & McLaughlin, 1992; Ruopp, Pfister, Drayton & Gal, 1993; Teles & Duxbury, 1991; Watts & Castle, 1992). Reports of the development of successful educational networks (Ruopp et al., 1993; Teles & Duxbury, 1991; Watts & Castle, 1992) revealed that

teachers played an active role in the networks at every stage from planning to implementation to evaluation. As well, the networks provided qualified facilitators to help teachers get started on the network and to guide them as they became more familiar with network resources. The design of the networks evolved to reflect the specific needs of the participants and the activities they undertook.

Successful networks promote a model of learning that relies on users, not experts, to design and implement network activities (Lieberman & McLaughlin, 1992; Ruopp et al., 1993 Teles & Duxbury, 1991; Watts & Castle, 1992). "Teachers are a critical element and an irreplaceable element in the learning equation" (Ruopp et al., 1993, p.4) and as such should be engaged in actively identifying and developing network projects and activities. In addition, teachers need to receive support, particularly with technical training, to implement their ideas and to integrate the new tool into their professional lives.

The mission of STEM-Net is to be a "high-quality computer network for educators in Newfoundland and Labrador and to support their teaching, curriculum and professional activities" (Weir, 1993, p. 1.3). It is clear from the literature that if this mandate is to be met, "policy makers and others approach the teacher networks not from the standpoint of management and control, but from that of norms and agreements of communal relations" (Lieberman & McLaughlin, 1992, p. 677). Given the opportunity, teachers are willing and eager

to take part in networks that focus on their educational goals and their work as teachers (Lieberman & McLaughlin, 1992; Watts & Castle, 1992).

This study is significant, then, in that it provides K-12 teachers and educators in Newfoundland and Labrador with the opportunity to become actively involved in the design and implementation of activities on STEM~Net. Furthermore, the study will serve to determine how the services and activities available on STEM~Net can effectively meet the needs of teachers and educators in Newfoundland and Labrador particularly in enhancing professional development and in overcoming professional isolation.

Definition of Terms

The following terms were used throughout the study and are clarified here.

Computer Network For the purpose of this study, a computer network is a group of computers that while not physically linked can communicate with each other through modems.

Account An "arrangement between a network and a network user that gives the user a unique name and password through which to access the network" (Eisenberg, 1992, p.10).

Online The services and resources available through a computer network.

Electronic Mail (Email) Electronic mail is a computer messaging system which allows users to send messages to individual users or to lists of users. Teachers use email to consult with colleagues or other professionals in the district and around the world. The "pine" utility is used by most STEM-Net users to handle their individual electronic mail.

Computer Conferencing Computer conferencing is similar in many ways to normal conferencing. Computer conferences can be public or private. A private conference is limited to a predefined list of teachers and a coordinator. A public conference is open to all teachers who wish to exchange experiences, opinions and advice on any topic of interest. On STEM-Net, the "pine" mail utility with a conference mailing name can be used for private conferences, and the "tin" newsgroup utility can be used for public conferences.

File Transfer File transfer is a function closely related to email. File transfer allows teachers to "download" and "upload" reports, papers or educational software. The "kermit" and "z-modem" tools are used by most STEM-Net users for this activity.

Access to educational databases Networks can provide teachers with access to educational databases that contain lesson plans and other curriculum materials. Gopher and FTP are two tools that allow teachers on STEM~Net to search and retrieve educational information from central stores of files located on the network.

Bulletin Boards Bulletin boards allow individuals to post notes and requests for general viewing. It is an effective way to receive feedback from a large group on a variety of educational issues. STEM~Net users can post notices using the "tin" newsgroup utility. Also, program and group leaders can use the STEM~Net "gopher" utility to post notices.

Newsgroups Newsgroups are public discussions on a wide variety of topics. Teachers may read newsgroups for general interest and information. On STEM~Net, teachers can use the "tin" utility to access newsgroups.

PINE PINE(tm) is the University of Washington's "Program for Internet News and Email". It is a program for sending, receiving, and filing Internet electronic mail messages and bulletin board (Netnews) messages.

Limitations of the Study

The activities chosen for this study are activities generally associated with successful networks, and are reported in the literature as being effective in reducing professional isolation and in enhancing professional development. However, the list of activities in the study is merely a sample of possible network activities. Other activities could be considered for inclusion, but may not be available on STEM-Net.

This study was limited to those teachers and educators who regularly use their STEM-Net accounts. This may restrict the interpretation of the results since this group may not be representative of all teachers and educators in Newfoundland and Labrador who are connected to the network.

The collection of the data through electronic mail may have also introduced a limitation. Some participants may have lacked skill in using the mail facilities of STEM-Net. If so, this could affect the validity of some of the information received.

Conclusion

STEM-Net is a recent educational innovation that will provide network connectivity to K-12 teachers and educators in Newfoundland and Labrador.

While much of the focus of computer networks has been technological, K-12 networks are more interested in using the technologies to provide learning opportunities for both teachers and students. As STEM~Net is developed attention must be paid to defining and then serving the needs of students and teachers.

This study was designed to investigate teachers' and educators' perceptions of the educational features of computer networks and to assess the impact of an online unit of study on teachers' and educators' understanding of the educational features of STEM~Net.

The study began with a review of related literature which outlined the benefits and uses of educational computer networks and provided a theoretical framework for the study. Chapter II contains a summary of the literature review. Chapter III is a description of the design of the study. Chapter IV provides a summary of the results of the survey questionnaire. Chapter V presents a summary of the data collected during the development and implementation of the online unit of study. Chapter VI presents a summary of the study and a discussion of the results in terms of the stated research questions. Chapter VI also discusses the implications of the study for the future development of STEM~Net and offers suggestions for future research.

CHAPTER II

REVIEW OF RELATED LITERATURE

Educational computer networks are rapidly emerging as an important tool in K-12 education (Clement, 1992; Cohen & Miyake, 1986). With just a modem, a phone line and a computer, students and teachers are accessing large amounts of information including educational databases, electronic publications and resource people. Through educational networks, similar to STEM~Net, they are also communicating with other people all over the world. This chapter, by reviewing recent literature on educational computer networks, explores the impact of this new medium on K-12 education. The review is divided into two parts: the educational benefits of computer networks for students and teachers; and, the educational functions of computer networks that offer the greatest opportunities to expand the learning environment of both learners and educators.

Educational Benefits of Computer Networks

Educational computer networks offer innovative potential to the field of education, both in its impact on teacher development and student learning (Harasim & Johnson, 1986; Harasim, 1990).

Teacher development

Unlike other technologies, educational computer networks affect what happens in the classroom by first influencing the teacher and the environment in which the teacher works (Ruopp, Pfister, Drayton, & Gal, 1993). Several studies and surveys have looked at the impact of computer networks on the professional development of teachers as a result of their use of telecommunications. A nationwide survey (Honey and Henriquez, 1992) profiling the range of activities being undertaken by K-12 educators in the United States, found that teachers used the networks for communicating with colleagues, posting questions and exchanging ideas on bulletin boards. Another common activity on the network was information retrieval from databases of educational research.

A study (Ruopp et al., 1993) of LabNet, a 4.7 million dollar project designed by an educational agency in Cambridge, Massachusetts, found that the network provided teachers with an open forum to exchange ideas and offer encouragement. Teachers took active roles on the network by solving technical problems, gathering curricular information and offering assistance to other teachers. The network supported teaching by acting as an effective medium for sharing teaching activities and "shoptalk" about teaching and research findings.

One of the most powerful effects of computer networking noted by the studies was its potential to overcome the isolation that is familiar to teaching

professionals (Ruopp et al., 1993; Watts & Castle, 1992). Teachers reported that they felt "more connected" to the teaching community. The community provided teachers with support from technical advice to opportunities to discuss educational issues with other professionals. Ruopp et al. (1993) assessed the impact of educational networks on isolation:

Isolation is a fact of life for many high school teachers, particularly those working in rural schools. They are often solo practitioners in their schools. Although contact with teachers of other subjects and trips to professional meetings may extend the benefits of affinity, they cannot substitute for daily intercourse with those practising the same craft (p.4).

Ruopp et al. (1993) compared computer networking to membership in a professional society. As teachers began to share their ideas and experiences on networks a new "sense of faculty-ness" emerged. Electronic networking enabled teachers to form working relationships with other teachers in distant locations, exposing them to new curriculum materials and instructional strategies. Teachers were more willing to ask for information from their network peers than from an administrator in their school (Riel, 1990). Furthermore, networks provided support and encouragement as teachers conceived and implemented innovative ideas.

By establishing a broad base of teachers that worked together to solve problems and learn from each other, electronic communities changed the professional lives of teachers (Riel, 1990; Ruopp et al., 1993). "Explorations of research, reflective dialogues on professional issues and the sharing of

experiences" (Watts & Castle, 1992, p. 687) were everyday events on the networks. Furthermore, the practices and perspectives of teachers within educational networks influenced the learning environment of their classrooms.

Lieberman and McLaughlin (1992) argued that networks, by engaging teachers in a constructivist experience of learning, stimulated them to engage students differently in the classroom. Networks challenged teachers to create learning environments which emphasized inquiry and discovery learning. Network evaluations (Ruopp et al., 1993) revealed that teachers who regularly used networks assigned their students more project work in the classroom and used the network to exchange project ideas with other teachers. The enthusiasm teachers felt for networking was also reflected in student projects carried out on the networks. The dramatic success of some of these projects suggest that telecommunications can affect the development of student skills and attitudes.

Student Learning

Computer networks allowed teachers and students to go beyond the four walls of the classroom and the restrictions of a textbook driven curriculum (Eisenberg, 1992; Ruopp et al. 1993). The learning environment of the network encouraged student exploration, experimentation, and collaboration (Harris, 1994; Riel, 1991-92). Working in an environment that encouraged "learning by doing"

provided many benefits for students (Buchanan, Rush, Krockover, & Lehman, 1993).

Some researchers suggested that student network interaction often accomplished cognitive objectives similar to those found in the classroom. Riel (1990) discussed electronic Learning Circles on the AT&T Learning Network in light of the co-operative learning theory. A Learning Circle is a small group of classrooms that interacted electronically to develop a shared task. Over a four month period teachers and students worked together on the network to plan and carry out various learning activities.

While the Learning Circles were comparable to the classroom model of cooperative learning, they differed in several ways. Because the classrooms were the "teams" or groups, the teachers worked closely with their students to plan and accomplish the learning tasks. The result was a shift in the power structure in the classroom. Since no one classroom teacher controlled the project, students and teachers were learning together. Learning Circles also encouraged more cooperation across the teams. In carrying out their projects, classrooms contributed to other classrooms in the Circle. The framework provided by the Learning Circles "creates cooperative work within a team in a way that is similar to the cooperative learning framework but, also constructs cooperative working patterns between the teams" (Riel, 1990, p.451).

Levin, Rogers, Waugh and Smith (1989) observed that the network created a functional learning environment for the study of social sciences and intercultural problem solving.

The idea of the functional learning environment is based on the assumption that the most powerful learning occurs in a situation where the learners are aware of what should be learned, how and for what purpose (Cohen & Miyake, 1986, p. 258).

Several classes of students took part in the Noon Observation Project, a network activity based on the findings of the geographer Eratosthenes. As students collected and shared data to measure the circumference of the earth they "learned first hand the importance of careful measurement, participated directly in dealing with the issues of data analysis and reduction, and learned some of the values of working jointly with others" (Levin et al., 1989, p. 19). Moreover, students' data collections, analysis and project write-ups were aimed at a wider and more diverse audience on the network than in the classroom. By writing for their peers students shared observations and information and clarified their understanding.

Computer networking also increased students global awareness (Honey & Henriquez, 1992; Teles & Duxbury, 1991). Cohen and Miyake (1986) found that the Intercultural Learning Network by linking students from different cultures in various educational activities, fostered the study of others and one's own culture. Teachers also reported that students viewed the world as a classroom. They

"visualize the children of other nations as students just like themselves" (Honey & Henriquez, 1992, p. 7).

Students used computer networks to access information not available in school libraries (Crane, 1993; Honey & Henriquez, 1992). For example, they searched:

databases containing news stories from regional and international newspapers ...Newswires updated continuously, enable students to access the latest-breaking events, such as information on Hurricane Andrew or the presidential election returns. Magazine databases provide access to complete articles from over 150 magazines for up to 10 years (Crane, 1993, p. 47).

Furthermore, as students planned and refined their search to retrieve information they gained familiarity with basic computer applications and improved their data analysis, problem solving and critical thinking skills (Crane, 1993; Honey & Henriquez, 1992).

Electronic networks linked students and teachers across classrooms, working together to solve real world problems and to learn from each other. This type of learning "can change the life of teachers and with it their methods for educating students" (Riel, 1990, p.465). Computer networking transformed students' common classroom experiences such as discussions and paper writing into unique projects that involve the interaction of students around the world. Teachers on the network access lesson plans, curriculum guides, summaries of educational research and other class materials.

The greatest potential for computer networks in teaching and learning, however, lies in the opportunity to develop communities of learners without regard for physical location. Ruopp et al. (1993) compared networks to a city "piazza" that allow teachers to talk to each other, ask questions and give assistance to fellow teachers. This contact with other adults is in direct contrast to the isolation of teaching in the traditional classroom.

Riel (1991-2) cautioned , however, that "telecommunications will not by itself change classrooms, teachers or schools" (p. 52). Without careful planning and consideration of the needs of its users, educational networks can fall silent as "electronic ghost towns" (Riel & Levin, 1990, p. 145). Studies (Riel & Levin, 1990; Watts & Castle, 1992) found that while technical connections are a necessary consideration, the success of educational networks was contingent on the "presence of an important function that the network serves for the participants" (Riel & Levin, 1990, p. 168). Weir (1993) observed that the most successful educational networks grew in response to the needs and participation of teachers. Furthermore, the successful incorporation of computer networks into the curriculum helped to create an environment that supported and stimulated professional growth. More importantly, it positively affected student learning - the ultimate goal of any educational innovation.

Educational Functions of Computer Networks

Networks serve two primary functions for people in education. Most networks provide teachers and students with access to large amounts of electronic information. This includes libraries, databases, software and instructional materials. Networks also provide opportunities for professional collaboration and communication among educators.

To facilitate communication and access to professional information there are a number of basic services provided by educational computer networks. This section of the literature review will discuss six services that are rated as being effective in overcoming professional isolation and in enhancing professional development of teachers. These are electronic mail, computer conferencing, file transfer, access to educational databases, bulletin boards and newsgroups.

Electronic mail

One of the most used services offered on educational computer networks is transmission of electronic mail (email). Email is a computer messaging system which allows users to send messages to individual users or to lists of users. Eisenberg (1992) compared email to an answering machine that uses text:

a sender composes a message for another individual on the network; the message is stored on the network; and the receiver can pull the message

up onto the screen when he or she wants to read it. A paper copy can be made if necessary (p. 8).

Electronic mail is not "intrusive." Recipients answer email at their own convenience. Teachers with limited time can communicate with others without playing "telephone tag." Messages are sent and received in minutes. Messages can also be sent to entire groups at once by the use of distribution lists (Bull, Harris, Lloyd & Short, 1989).

Teachers use electronic mail to consult with colleagues or other professionals in the district or around the world (Eisenberg, 1992). Teles and Duxbury (1991) found that teachers in the Southern Interior Telecommunications Project (SITP) used electronic mail to exchange teaching strategies and projects, to ask for technical help and to share general educational issues of concern. A group of teachers in British Columbia used electronic mail to share cooperative lesson plans. This project evolved from a mailing of a paper version of a newsletter to the distribution of an electronic publication to teachers involved in cooperative learning throughout the province (Maschak, 1989). Another telecommunications project (Hoffman, 1989) in British Columbia linked five schools. Electronic mail allowed the teachers and administrators in these schools to communicate and exchange information with each other.

Electronic mail systems have also been used to support beginning teachers (Bull et al., 1986). A school-university collaboration involving Curry School and the University of Virginia used computer networks to link university

faculty, student teachers and supervising teachers. Student teachers used the electronic mail feature to share lesson plans with an advisor, or to obtain support from peers. The director of the program observed:

Because I have different students, in different schools, teaching at different times, it is not easy to set up an efficient observation schedule by using the telephone. The electronic mail system has made the task of scheduling very easy. I can coordinate all my observations and also schedule around tests and quizzes, school assemblies and other noninstructional sessions (cited in Bull et al., 1989, p. 28).

Merseth (1991) researched the nature of the support delivered to 39 beginning teachers who participated on the Beginning Teachers Network (BTCN) at Harvard University. The study revealed that use of the network to send messages was fairly constant throughout the year. The beginning teachers reported that while electronic mail allowed them to share teaching techniques and get help with lesson planning, the network was significantly more effective in providing moral support and in reducing feelings of isolation. The respondents noted that the privacy and confidentiality of electronic mail allowed them to feel comfortable asking for help or support. Furthermore, the atmosphere on the network was nonevaluative and provided contact with a "sympathetic group of people" (p.145).

Computer Conferencing

Computer conferencing is similar in many ways to normal conferencing, but is held electronically. "The effect of this facility is to allow discussions similar to that which might follow the presentation of a paper or a lecture, except that participants might not be assembled at the same time and place" (Harasim & Johnson, 1986, p.6).

In a computer conferencing system messages are sent to a central location where they become available to all participants. The conference is usually moderated and may be available to a predefined list of participants or to all users on the system. Educators can also participate in discussions on topics of professional or personal interest through local newsgroups or discussion groups available through the Internet.

The School Renewal Network (Watts & Castle, 1992) used computer conferencing to support its school renewal program. The conference structure included topics deemed important to school restructuring such as instructional strategies, positive school climate, at risk students and student assessment. As well, prominent researchers took part in the network conferences.

The dialogue and the interactions among the participants in the School Renewal Network conferences influenced the environment of many of the participating schools and supported school renewal. Teachers reported that the

conferences fostered personal renewal and encouraged self-evaluation. Furthermore, the conference provided a way for teachers to participate in discussions with others who shared their interests and concerns.

Teles and Duxbury (1991) reported that computer conferencing allowed participants in the SITP to take part in 19 ongoing conferences. Topics varied from current political issues to how to establish contact with users in other cities and countries. Teachers taking part in conferences found that they provided opportunities to exchange information and to share ideas. "Both students and teachers benefitted from this exchange and were positive about the experience" (p. 35).

File Transfer

Harasim and Johnson (1986) defined file transfer as the transfer of information from one computer to another. File transfer can occur between two individuals on a network or can involve a user accessing a central store of files. "Downloading" and "uploading" refers to the sending or receiving of files.

Eisenberg (1992) cited some of the uses of file transfer for educators. Teachers send curriculum guides and instructional material to other teachers. Librarians locate relevant research summaries such as those produced by the

ERIC Clearinghouse and make them available to teachers and administrators. As well, file transfer allows for electronic distribution of educational software (Harasim & Johnson, 1986).

Access to Educational Databases

Educational computer networks are characterized by increased access to databases (Eisenberg, 1992). Through networks educators have the opportunity to search and retrieve information from a large variety of educational databases such as the ERIC databases containing full text ERIC Digests and reports of educational research. Participants in the SITP had access to three educational electronic databases including Grolier Encyclopedia, SFU Library Online and ERIC (Teles & Duxbury, 1991). Teachers in this project also had access to commercial databases such as NewsSource that contained Canadian newspapers. NewsSource updated information regularly to reflect changing world conditions.

Some educational databases are designed for a specific network. Adam and Mackie (1989) described a project to link the Okanagan Landing Elementary school library to a district resource center. As a result, the school had access to almost 18,000 media titles and teachers were able to search and book items in the resource center directly from the school library.

Access to databases has provided teachers with many sources of information. The information of the world is made available in the local school and even in the individual classroom (Eisenberg, 1992). In addition to providing information, database access can change the relationship of the teacher and learners to information. "When information comes from a variety of sources and teachers have less control over the information received, the critical evaluation of information and information sources becomes a key skill" (Teles & Duxbury, 1991, p. 39).

Bulletin Boards

Bulletin boards allow individuals to post notices and requests that can be viewed by an entire community of users. While some bulletin boards provide conferencing and messaging components (Swanson, 1985), bulletin boards are not usually structured according to topic or theme and have no assigned moderator.

An example of an effective bulletin board is the Forum (Ruopp et al., 1993). The Forum is the "public domain" of the Lab Network. LabNet teachers with diverse interests used the Forum to "post messages, read and respond to the messages of others, ask questions, receive answers and provide assistance to fellow teachers" (p. 12).

Teachers used the Forum to discuss activities directly related to classroom work. Teachers also spent time on the Forum merely gathering information about learning activities and educational aids. These kinds of network dialogues supported teachers in their day-to-day concerns. The Forum provided quick suggestions in response to specific requests. Thus, the professional discourse on the Forum connected teachers to one another as a "community of practitioners" that supported each other in the art of teaching (Ruopp et al., 1993).

Newsgroups

Some educational networks offer their users access to newsgroups. Newsgroups are unmoderated public discussions that are shared freely among network participants. Harris (1993) estimated that there are over 2000 different newsgroups available through the Internet. The conferencing capability of newsgroups allows educators from all over the world to discuss educational issues and concerns. Newsgroups are also a valuable source of general information. Newsgroups have been used to send and receive information about recent world events, such as the Tiananmen Square Massacre, long before news cameras. Newsgroups allow teachers and students to experience the world as

one interdependent global village where they directly interact with people and information (Harris, 1993).

Summary

There is often overlap in the function of these six services. For example, teachers can communicate with other teachers through electronic mail or computer conferencing. Teachers can access information through file transfer or through searching of databases.

"The central idea in each instance is that individuals do not have to be in the same place as other individuals or groups or sources of information in order to make educationally oriented contact through electronic means" (Collis, 1992, p. 25).

Conclusion

The literature reviewed in this chapter is about a relatively new media - educational computer networks. Proponents of computer networks appeared enthusiastic and convinced of the educational benefits afforded to both teachers and students.

Networks offered a valuable resource to teachers in providing them with access to educational research and discussions of educational and pedagogical

issues. More importantly, networks have the potential to overcome the professional isolation so common in traditional classrooms. Computer networks, through discussion groups, computer conferencing, electronic mail etc., give teachers a chance to talk about their work with other teachers. This building of a "community of practice" can change the work environment of the classroom teacher.

The literature also revealed that while this building of a community of "practitioners" is not easily realized (Ruopp et al., 1993) educational computer networks such as STEM-Net can enrich the working environment of the classroom teacher both in enhancing professional development and in overcoming professional isolation. The literature also suggests that as costs decline and use of computer networks become more commonplace the key issue for teachers and educators remains the utility of the network in providing services and programs that can best meet their professional needs. It is the intention of this study to determine the perceptions of teachers and educators in Newfoundland and Labrador of various educational features of STEM-Net; and, to investigate the effect of an online unit of study on the understanding of these features. This study will provide teachers and educators in Newfoundland and Labrador with the opportunity to become involved in the design and implementation of programs and services on STEM-Net. Furthermore, the study may help to determine how the educational features of STEM-Net can effectively

meet the needs of teachers and educators in Newfoundland and Labrador, particularly, in enhancing professional development and in overcoming professional isolation.

CHAPTER III

DESIGN OF THE STUDY

This study was designed as a qualitative study to determine the educational expectations and experiences of K-12 teachers and educators in Newfoundland and Labrador as they become users of STEM~Net. More specifically, the study was intended to determine the perceptions of K-12 teachers and educators of various educational computer network activities; and, to investigate the effect of an online unit of study on their understanding of these features.

The design of this study was based on the assumption that the nature of network use is determined by the users and the context in which they work. For that reason, the study consisted of several stages of data collection and analysis:

1. Data collection to identify teachers' and educators' perceptions of various educational network activities. For this phase of the study data were collected through a survey questionnaire and a recording of the online messages of the participants.
2. Data analysis to summarize the findings of the questionnaire and to identify the members and the focus topic of a small group that was set up to participate in an online unit of study.

3. The development and monitoring of an online unit of study designed to promote an improved understanding of one of the educational features of STEM~Net.
4. Data collection and analysis to evaluate the small group activity. For this stage of the study data were collected through three evaluation forms and the online messages of the members of the small group.
5. Final summary of all the data collected to develop a set of recommendations as to how the features of STEM~Net can best support the educational activities of teachers and educators in Newfoundland and Labrador.

This chapter describes how the study was conducted and includes a description of the development of the survey questionnaire, the selection of the sample, the development and evaluation of the online unit of study, and the analysis of the data.

Development of the Questionnaire

The questionnaire used in this study contained a short description of six computer educational networking activities. The network activities that were described in the questionnaire included: (a) electronic mail; (b) computer conferencing; (c) file transfer; (d) access to educational databases; (e) bulletin boards; and (f) newsgroups. As well, respondents could indicate any other activity or feature of computer networks that they viewed as effective in meeting their educational goals.

The respondents were asked: (a) to indicate their relative knowledge of the network activity; (b) to indicate their relative skill in using the network activity; (c) to rank the network activities in perceived order of importance; (d) to indicate if they would like to be part of a group to learn more about one of the network activities; and (e) to indicate their present level of participation in STEM~Net activities.

An initial version of the questionnaire used in this study was devised as a result of a review of recent literature pertaining to user experiences with educational computer networks. The list of network activities was compiled from reports of educators and researchers who have expressed strong enthusiasm for computer networking projects and the educational features of computer networks. Members of the Education Faculty of Memorial University and members of the

STEM~Net support staff reviewed the questionnaire and made suggestions for necessary changes. The questionnaire was then field tested with a select group of teachers and educators.

Pilot Study of the Questionnaire

The pilot study of the questionnaire was conducted in July, 1994. The questionnaire was sent via electronic mail on STEM~Net to a group of 50 teachers. The major aims of the pilot study were:

1. To determine if the instructions clearly indicated to the respondents how the questionnaire was to be completed and returned to the researcher.
2. To determine if the wording of specific items clearly requested the information that was being sought.
3. To determine if the network activities listed on the questionnaire were representative of the respondents' uses of networks.

Following completion of the pilot study minor changes were made to the method for distribution of the questionnaire. The final form of the questionnaire and the instructions for completing it (Appendix A) were sent to the members of the sample on October 5, 1994.

Population and Sample

The population for this study consisted of K-12 teachers and educators in Newfoundland and Labrador that held STEM~Net accounts. A list of 1000 frequent users of STEM~Net was obtained from the STEM~Net support staff. From that list, a random sample of 200 STEM~Net users was chosen using a computer program designed to generate random numbers.

The electronic mail addresses of the 200 members of the sample were added to a distribution list on STEM~Net. Using an electronic mail application on STEM~Net called "PINE," the questionnaire, along with directions for completing and returning it, were sent to the teachers and educators on October 5, 1994.

On October 20, a follow-up letter providing more detailed information on how to complete and return the questionnaire was sent to members of the sample who had not replied. After sending several more follow-up letters, the collection of data through the questionnaire was completed on Wednesday, November 9, 1994. These data and the online messages of the participants provided the information to address the first research question and to implement the second phase of the study, the development and evaluation of a small group activity. Copies of the follow-up letters are found in Appendix B.

Development and Evaluation of Small Group Activity

The main purpose of the small group activity was to assess the impact of an online unit on teachers' and educators' understanding of the educational features of STEM~Net. It was organized around the following sequence of steps:

1. Formation of the group. A group of 32 teachers and educators chose to be involved in a small group activity to learn more about one of the educational features of STEM~Net.
2. Selection of the goals of the group activity. A tentative schedule for the small group activity and an outline of the content of an online unit of study was evaluated and accepted by the members of the group.
3. Development of the content of the online unit. A series of six tutorials was written and developed in close collaboration with the STEM~Net support staff and incorporated material from STEM~Net training manuals (Shapleigh, 1994).
4. Implementation of the unit. Members of the group read and analyzed the content of the tutorials. They exchanged ideas with other members

of the group, and were encouraged to ask questions and make suggestions as to how the activity could be modified or improved. Group members also received continuous technical and curricular support from the STEM~Net support staff.

5. Evaluation of the group activity. Three evaluation forms consisting of a series of open ended questions were completed by the members of the group. As well, the online messages of the participants were recorded and analyzed. In evaluating the group activity several key issues were considered; the clarity of the tutorials, the instructional value of the online unit, and the effect of the online unit of study on teachers' and educators' knowledge of the educational features of STEM~Net. A copy of the evaluations can be found in Appendix D.

The small group activity took place over a period of two months from November, 1994 to January, 1995. After providing group members with the opportunity to make final comments and suggestions, the study was ended on January 30, 1995. The data from the survey questionnaire, the evaluations of the small group activity and the online messages of participants were analyzed to address the major research questions of the study.

Data Analysis

Data analysis for this study focused on the major research questions:

1. What are the perceptions of K-12 teachers and educators of various educational computer network activities that are available on STEM~Net?
2. How does an online unit of study affect teachers' and educators' understanding of the educational features of STEM~Net?

To address the research questions data were collected through a survey questionnaire, the recording of the online messages of participants and three evaluations of the small group activity.

Statistics were calculated and analyzed to summarize the data obtained through the questionnaire survey. Frequencies, means and totals were computed separately for knowledge of network activities, skill in using the activity and the ranking of the network activities.

The responses to the evaluation forms and the online messages of the small group members were analyzed to highlight important features of the process of implementing and developing the online unit of study. Finally, the collected data were summarized and analyzed to identify issues and factors that may affect teachers' and educators' perceptions and understanding of the educational features of STEM~Net.

A summary of the statistics collected through the survey questionnaire are presented in Chapter IV. Chapter V contains a summary of the data collected during the small group activity. Chapter VI presents a summary of the study and a discussion of the results in terms of the stated research questions. Chapter VI also discusses the implications of the study for the future development of STEM~Net and offers suggestions for future research.

CHAPTER IV

ANALYSIS OF THE QUESTIONNAIRE DATA

One of the purposes of this study was to determine the perceptions of K-12 teachers and educators regarding the rank of six educational features of STEM~Net; electronic mail, computer conferencing, file transfer, access to educational databases, bulletin boards, and newsgroups. This chapter presents the statistics collected through the questionnaire in seven sections: a profile of the respondents; teachers' and educators' perceptions of their knowledge of the educational features of STEM~Net; teachers' and educators' perceptions of their skill in using the educational features of STEM~Net; the ranking of the selected educational features of STEM~Net; STEM~Net activities identified for further study; and, the present level of the respondents' participation in STEM~Net.

Response to the Survey

The survey questionnaire was sent on October 5, 1994 to 200 teachers or educators using an electronic mailing application on STEM~Net called PINE.

While a large majority of respondents experienced no difficulty in completing and returning the questionnaire, several recipients raised a number of concerns about the distribution of the questionnaire through STEM~Net. Some concerns that were identified included technical and software problems in actually

filling out the questionnaire. The following comments from one teacher as she answered the questionnaire serve to highlight these problems:

I have been trying to answer your questionnaire but I haven't quite figured out where to put the answers. When I press "R" and then "y" I can't get to the questions to answer them. Tell me how and I will try again to help you in your research.

...I am still trying but having no luck using the arrow keys or any others for that matter! Nothing seems to work to get my cursor to allow me to answer. Any other suggestions? I'll keep plugging.

I seem unable to figure out how to reply to these questions. How do I get my answers to go inside your brackets? The arrow keys are not working to scroll the text. I would like to help just to figure out how to do it if nothing else.

Several recipients objected to the distribution of the survey questionnaire through the electronic mail facilities of STEM~Net and offered suggestions for conducting future research through STEM~Net. They indicated that questionnaires should not be sent through electronic mail, but could perhaps be posted to a discussion group or a STEM~Net newsgroup:

I very much object to receiving surveys by Stem-net. I consider this valuable educational time, and even the gift of an extra hour does not make reading a survey on screen an enjoyable experience. Should you wish to send a hard copy please feel free to do so.

While I feel sure you will benefit from this research, I consider it an invasion of my privacy to receive these surveys without having given permission. This is my third such survey, and today nine of my thirteen messages relate to your research. I simply do not have time to filter through your mail. Please discontinue correspondence.

Maybe the best place to post future questionnaires would be in a STEM~Net newsgroup... then people could respond via email. That way it would be completely voluntary. As for the hard copy I think people are

starting to rely more and more on electronic communication. Personally I hate 'paper' work, being on line is much more enjoyable :-)

Another concern expressed by several recipients in completing the questionnaire resulted from the "incorrect mailing" of the completed questionnaire. The questionnaire was distributed using a "distribution list" that contained the electronic addresses of the 200 members of the sample. While this provided for efficiency in mailing the questionnaire, it did create some problems for members of the sample as noted in these comments:

I've been getting mail over the past few days from other people who are completing your questionnaire, and also missives from some individuals asking that completed questionnaires not be sent to their mail boxes. I think the problem for all concerned is the old story of not having read the instructions. My guess is that some folks press 'r' for reply and then do not answer 'no' to the query re sending the reply to all individuals on the list, thereby causing their own form to be sent to the whole group.

I have spent so much time this past two weeks deleting e-mail that was meant for you that I did not have time to answer your request. I ask that if you are intending to send this questionnaire again, please make sure the recipients understand the consequences of replying to all recipients. This morning alone there were nine messages related to this questionnaire, some of them complaining about the responses they were getting because they were receiving everyone else's answers; yet they too were replying to all recipients. This problem is not restricted to this questionnaire alone but is common to all multiple recipient mail messages and can be quite a nuisance if there are a lot of people involved. Perhaps a general statement on the consequences of such replies could be included with the general sign on information immediately after you log-on until people are more aware of the problems it creates particularly through the loss of network time.

It looks as if we have to figure out a better way to complete questionnaires and surveys online. Make sure Harvey is aware of this drawback!

To address some of the concerns raised by the recipients a second copy of the questionnaire was mailed on October 20, 1994 to members of the sample who had not replied. This time the questionnaire was sent with a cover letter that provided more detailed information on how to complete and return the questionnaire. For a copy of this letter see Appendix B. After several more follow-up letters the collection of data through the questionnaire was completed on November 9, 1994. One hundred questionnaires were returned and utilized in compiling the following statistics. A copy of the questionnaire can be found in Appendix A.

Information on the Sample

Respondents to the questionnaire were asked to supply information concerning the grade(s) which they were presently teaching, the number of mathematics methods or computer courses they had completed, and the number of STEM-Net training sessions or workshops in which they had participated.

Twenty-seven percent of the respondents were coordinators and administrators at either the school board or Department of Education level. Forty-six percent were high school teachers (Grades 9-12) and 27% were primary, elementary or junior high school teachers (Grades K-8). Nineteen percent of the respondents reported they had completed more than 2 courses in

Mathematics methods while the remainder reported that they had completed 2 courses or less in Mathematics methods. Similarly, 22% reported they had completed more than 2 Computer Courses. The data also revealed that a majority (77%) of respondents had participated in 2 or fewer STEM~Net training sessions/workshops. (See Table 1)

Table 1

Profile of Respondents (N = 100)

Variable	Sub-Group	Number of Respondents
Grades Taught	Coordinators	27 (27%)
	Grades 9-12	46 (46%)
	Grades K-8	27 (27%)
Number of Courses in Math Education	0 Courses	43 (43%)
	1 or 2 Courses	38 (38%)
	More than 2 Courses	19 (19%)
Number of Computer Courses	0 Courses	39 (39%)
	1 or 2 Courses	38 (38%)
	More than 2 Courses	23 (23%)
Number of STEM~Net Training Courses	0 Courses	34 (34%)
	1 or 2 Courses	43 (43%)
	More than 2 Courses	23 (23%)

Knowledge of Network Activities

Respondents were asked to rank on a five point scale their knowledge of each of the six network activities. A rank of "1" indicated a very good knowledge of the network activity, a rank of "2" indicated good knowledge, a rank of "3" - poor knowledge, a rank of "4" - very poor knowledge while a rank of "5" indicated no knowledge of the activity.

A mean ranking for the level of knowledge of each activity was calculated. Table 2 contains the mean rank of the respondents' knowledge of each network activity. An examination of this table reveals that respondents ranked their knowledge of electronic mail, file transfer, access to databases, and newsgroups as very good or good while knowledge of bulletin boards and computer conferencing was ranked as poor or very poor.

Table 2

Mean Rank of Knowledge of each Network Activity		
Network Activity	Number of Responses	Mean Rank
Electronic Mail	98	1.58
Computer Conferencing	97	3.26
File Transfer	97	2.37
Access to Databases	97	2.38
Bulletin Boards	96	2.66
Newsgroups	97	2.15

Table 3 shows the frequency distribution for respondents' ranking of their knowledge of the activities. An examination of this table reveals that a majority of respondents (54%) ranked highest their knowledge of electronic mail.

Table 3

Frequency Table for the Ranking of Knowledge of each Network Activity
(Percentage distributions)

Network Activity	VGK	GK	PK	VPK	NK	n
Electronic Mail	53	40	5	0	2	98
Computer Conferencing	10	21	26	19	25	97
File Transfer	22	39	25	9	5	97
Access to Databases	14	49	24	8	4	97
Bulletin Boards	16	36	26	17	5	96
Newsgroups	25	49	14	8	3	97

* VGK=Very Good Knowledge; GK=Good Knowledge; PK=Poor Knowledge; VPK=Very Poor Knowledge; NK=No Knowledge;

*Totals not 100% due to rounding

Level of Skill in Using Network Activities

Respondents were asked to rank on a five point scale their level of skill in using each of the six network activities. A rank of "1" indicated a very good skill in using the network activity, a rank of "2" indicated good skill, a rank of "3" - poor skill, a rank of "4" - very poor skill while a rank of "5" indicated no skill in using the activity.

A mean ranking for the level of skill in using each activity was calculated.

Table 4 contains the mean rank of the respondents level of skill in using each network activity. An examination of this table reveals that respondents ranked their skill in using electronic mail, file transfer, access to databases, and newsgroups as very good or good while skill in using bulletin boards and computer conferencing was ranked as poor or very poor.

Table 4

Mean Rank of Level of Skill in Using Each Network Activity		
Network Activity	Number of Responses	Mean Rank
Electronic Mail	92	1.54
Computer Conferencing	91	3.47
File Transfer	92	2.42
Access to Databases	92	2.43
Bulletin Boards	91	2.73
Newsgroups	90	2.21

Table 5 shows the frequency distribution for respondents' ranking of their knowledge of the activities. An examination of this table reveals that a majority of respondents (61%) ranked highest their level of skill in using electronic mail. In contrast, very few respondents ranked their knowledge of any of the other activities as very good.

Table 5

Frequency Table for the Ranking of Level of Skill in Using Each Network Activity
(*Percentage distributions*)

Network Activity	VGS	GS	PS	VPS	NS	n
Electronic Mail	57	35	7	1	1	92
Computer Conferencing	10	14	26	18	32	91
File Transfer	20	40	25	9	7	92
Access to Databases	17	40	29	8	5	92
Bulletin Boards	15	36	27	9	12	91
Newsgroups	26	41	23	7	3	90

* VGS=Very Good Skill; GS=Good Skill; PS=Poor Skill; VPS=Very Poor Skill; NS=No Skill;

* Totals not 100% due to rounding

Ranking of Network Activities

Respondents were asked to rank on a six (or seven, if respondents added their own network activity to the listed activities) point scale their perceptions of the importance of the network activities for their teaching. A rank of "1" indicated they gave the activity top priority for their teaching; "2" - second priority; "3" - third priority; "4" - fourth priority; "5" - fifth priority; and, a rank of 6 or 7 indicated last position in importance for their teaching. Each number was used only once.

A sum and a mean for each network activity was calculated and the activities were then ranked with the first item being the one with the lowest mean and the last item being the one with the highest mean. Two respondents

included student projects and World Wide Web in their ranking of the STEM~Net activities. These responses were not included in the analysis. Table 6 contains the sum, mean and rank of each activity. A study of this table would reveal that the network activities can be ranked, in terms of their priority for the respondents, as follows:

First Priority	Electronic Mail
Second Priority	Access to Databases
Third Priority	File Transfer
Fourth Priority	Newsgroups
Fifth Priority	Computer Conferencing
Sixth Priority	Bulletin Boards

Table 6

Sum of Ratings, Means and Rank of Network Activities				
Network Activity	Sum	Mean	Rank	n
Electronic Mail	191	2.05	1	93
Computer Conferencing	414	4.45	5	93
File Transfer	294	3.16	3	93
Access to Databases	198	2.11	2	94
Bulletin Boards	438	4.71	6	93
Newsgroups	368	3.91	4	94

Table 7 shows the frequency distribution for respondents' ranking of the network activities. An examination of this table shows that almost all respondents ranked either electronic mail or access to databases as having first priority for them in their teaching.

Table 7

Frequency Table for Ratings of Network Activities
(Percentage distributions)

Network Activity	1	2	3	4	5	6	n
Electronic Mail	46	18	23	11	1	1	93
Computer Conferencing	1	12	12	23	25	28	93
File Transfer	5	37	23	13	17	5	93
Access to Databases	48	19	16	12	2	3	94
Bulletin Boards	2	5	12	18	27	35	93
Newsgroups	5	15	20	21	20	18	94

*1= top priority for teaching; 2 = second priority; 3 = third priority; 4 = fourth priority; 5 = fifth priority; 6 or 7 = last priority for teaching *Totals not 100% due to rounding

Activities for Further Study

Respondents were asked to indicate if they would like to become part of a small group activity to learn more about one of the listed network features. They were also asked to indicate which of the network features they would like to learn more about.

Sixty-four percent of the 100 respondents indicated they would like to be part of a small group activity to learn more about network features. Table 8 contains a summary of the respondents' choices of network activities for further study. From Table 8 it can be observed that 58% indicated they would like to be part of a small group to learn more about "Accessing Databases." Consequently, this topic was selected to be the focus of the small group activity.

Table 8

Network Activity for Small Group Course	
Network Activity	Number of Responses
Electronic Mail	9 (14%)
Computer Conferencing	21 (33%)
File Transfer Protocol	18 (28%)
Access to Databases	37 (58%)
Bulletin Boards	12 (19%)
Newsgroups	11 (17%)
Other (Lynx, Mosaic, WWW)	3 (5%)

*Percentages total more than 100 since some respondents indicated more than one activity

Level of Participation of Respondents in STEM~Net Activities

Respondents were asked to indicate their level of participation in STEM~Net activities. Table 9 shows the features of STEM~Net that were listed and the level of participation of the respondents in each activity. Ninety-seven

percent of the respondents indicated that they used the electronic mail feature of STEM~Net, and approximately 75% used the file transfer, access to educational databases, and newsgroup features of STEM~Net. Fifty-one percent of the respondents used the bulletin board feature of STEM~Net, while only 19% of respondents used the computer conferencing feature of STEM~Net.

Table 9

Level of Participation of Respondents in STEM~Net Activities (N = 100)	
STEM~Net Activity	Number of Responses
Lead Teacher	33 (33%)
School Board Coordinator	11 (11%)
Development of a Gopher	11 (11%)
Use of Electronic Mail	97 (97%)
Computer Conferencing	19 (19%)
File Transfer	75 (75%)
Access of Educational Databases	74 (74%)
Use of Bulletin Boards	51 (51%)
Use of Newsgroups	79 (79%)

*Percentages total more than 100 since some respondents indicated they participated in more than one STEM~Net activity

Conclusion

This chapter has provided some basic information on teachers' and educators' uses and perceptions of the educational features of STEM~Net. The analysis of the data revealed that despite little or no computer or STEM~Net

training respondents generally rated their knowledge of and skill in using most of the listed educational features of STEM~Net as good or very good. The "electronic mail" feature was ranked as having the top priority for most respondents in their teaching.

The data also revealed that a large majority (64%) of the respondents were interested in learning more about network features through a small group activity. The next chapter "Analysis of the Data from the Small Group Activity" will discuss the development and evaluation of a small group activity which designed and implemented an online unit of study to learn more about "accessing educational databases" through STEM~Net.

CHAPTER V

ANALYSIS OF THE DATA FROM THE SMALL GROUP ACTIVITY

The purpose of this study was to determine the educational expectations and experiences of K-12 teachers and educators in Newfoundland and Labrador as they become users of STEM~Net. As part of this study, a group of thirty-two teachers and educators chose to be involved in a small group activity. The purpose of the small group activity was to determine the effect of an online unit of study on teachers' and educators' understanding of the educational features of STEM~Net. The small group activity took place over a two month period from November, 1994 to January, 1995. For this phase of the study, data were collected through the online messages and written evaluations of participants.

This chapter presents a summary of the data collected during the development and evaluation of the small group activity. Specifically, the chapter describes the formation of the small group, a profile of the group members, the method followed and the results of the evaluations of the group activity.

Formation of the Small Group

In an early stage of this study a survey questionnaire was sent via electronic mail to a sample of 200 teachers or educators who regularly used their STEM~Net accounts (Chapter IV). On this questionnaire, respondents were

asked to indicate if they would like to be part of a small group activity to learn more about one of the listed network features. They were also asked to indicate which of the features they would like to learn more about.

Sixty-four of the respondents indicated they would like to be part of the small group. A majority of these respondents indicated they would like to be part of a small group to learn more about "access to educational databases." In early November, 1994 a letter was sent via electronic mail to the sixty four respondents inviting them to be part of a small group to explore the topic "Accessing Educational Databases." Thirty-two teachers or educators agreed to be members of the group.

Profile of the Group Members

In order to profile the voluntary group sample, statistics (Appendix E) were compiled from the responses of the group members to the survey questionnaire and compared to statistics recorded for the original sample (Chapter IV).

An examination of the data reveals that the grades taught and the numbers of Mathematics methods courses completed by members of the small group were comparable to those of the original sample. Similarly, the percentage of the group members who had completed more than 2 Computer Courses or

STEM~Net training sessions was comparable to that of the members of the original sample.

The group members' ranking of their knowledge of and skill in using the network activities and their ranking of the network activities in terms of their priority for teaching was also comparable to the rankings of the original sample. Although there is a slight increase (from 78% to 84%) in the percentages of members of the small group who used file transfer and the newsgroups, the data would suggest the same overall level of participation of group members in STEM~Net activities as that found in the original sample.

Method

The small group activity was developed and implemented through the use of electronic mail and electronic conferencing on STEM~Net. Messages were exchanged among group members as well as between the researcher and the group members and the researcher and the STEM~Net support staff.

As part of the small group activity, group members were sent a series of six tutorials. (The final form of the tutorials can be found in Appendix C). These tutorials were written by the researcher in close collaboration with the STEM~Net support staff and incorporated material from the training manual Getting Started on STEM~Net (Shapleigh, 1994). The tutorials contained basic commands and

information about STEM-Net "tools" that permitted network users to explore and access educational databases on the Internet. Through the tutorials, members of the group were encouraged to try various network activities and to share their comments or suggestions of how the activity worked for them.

The six tutorials were divided into three sections. Part 1 discussed File Transfer Protocol (FTP), a program that allows users to access remote ftp sites and transfer files to a personal computer. Part 2 presented Gopher, a menu based system that allows users to search and retrieve educational material anywhere on the Internet. Part 3 outlined the features of the World Wide Web (WWW) and Lynx, a program that can browse the services and information available through the Web. Each tutorial contained a suggested follow-up activity and the addresses of Internet sites that contained educational materials. Data were collected throughout the group activity by means of three evaluations completed by group members as well as the online messages of participants. Data analysis and interpretation were also ongoing during the activity. This provided information that helped to shape the activity according to the emerging needs and questions of the group members. The final form of the tutorials and the evaluations can be found in Appendices C and D respectively.

Results of the Group Activity

The main purpose of the group activity was to determine if an online unit of study would affect teachers' and educators' understanding of the educational features of STEM~Net. The findings related to this research question are presented in the next two sections. Specifically, they present data on the effect of the group activity as perceived by the group members, and on key issues associated with the development and implementation of the activity as identified by the participants.

Effect of the Group Activity

Group members were very positive in their evaluations of the group activity, with 80 to 90% of respondents to the three evaluations reporting an increase in their knowledge and understanding of File Transfer Protocol, Gopher and the World Wide Web.

Participants consistently rated their involvement in the online unit of study as a valuable learning experience and recommended that it be made available to other teachers and educators "especially those just learning about STEM~Net."

Key Issues in the Development and Implementation of the Group Activity

Analysis of the responses to the evaluations as well as the online messages of participants led to the identification of five key issues in the development and implementation of the group activity. These are: (a) the instructional value of the tutorials; (b) group support; (c) access to technical support; (d) technical difficulties; and, (e) time and access constraints. This section discusses the findings related to these issues.

Tutorials

Group members were very positive in their assessment of the instructional value of the tutorials. In their evaluation of the tutorials, group members considered several points, including the clarity of the instructions, the time needed to read and carry out the directions and the effectiveness of the tutorials in increasing their knowledge of a particular network feature.

Clarity of instructions.

Eighty to ninety percent of respondents to the three evaluations agreed that the tutorials were clearly written and that they had little difficulty in following the directions to locate and retrieve information from educational databases on the Internet. Respondents also identified some of the features of the tutorials that they found to be particularly useful:

I was glad that you captured the screen so we could actually see what would be written there. Explaining what some of the commands are was good too. I never understood how to get back up a directory until I read about the "cdup" command.

The information about the types of files and the extensions and the meaning of same was of much interest to me. I also was delighted to find out that you could print directly from pine and how to save mail to your home directory. The info about binary files and the programs to use to unzip them was extremely helpful.

Time.

Seventy-five percent of respondents reported that they read the tutorials in an average time of 15 to 20 minutes. However, the time needed to carry out the instructions contained in the tutorials varied. All of the respondents carried out the instructions in Tutorials 1, 2, 3, 4, and 5 in an average time of 45 minutes to 1 hour. In contrast, the time needed to carry out the directions in Tutorial 6 ranged from 15 minutes to 4 hours.

Tutorial 6 discussed the World Wide Web, a relatively new feature of STEM~Net and unfamiliar to some group members. (Tutorial 6 is also discussed on p. 61) Three respondents to Evaluation 3 indicated that this was an area that presented some difficulty:

This one was way over my head. I have no doubts that I will be able to figure it all out sooner or later, since that is how I became familiar with most of the other things in Stem-Net. But I have a long way to go on this one. I have scratched the surface on most of the possibilities of StemNet, but I am only now finding out how much I *don't* know! WWW is one of the hard ones.

To read the tutorial only about five minutes, but I spent a good hour trying to navigate my way through even the smallest thing.

I managed very well with all the other tutorials and got everything done. This one was a total disaster for me. I guess I probably need someone standing over my shoulder telling me what to do. I will give it a few tries again during the holidays, but it's not looking good

Increase in Knowledge

Perhaps the most important benefit of the tutorials that was reported by the respondents was the increase in their knowledge and understanding of File Transfer Protocol, Gopher, and the World Wide Web. Since the effect of the tutorials varied with each activity, they will be discussed separately.

File Transfer Protocol

Tutorials 1, 2, and 3 discussed the process of locating and transferring information from a remote FTP site on the Internet to a personal computer at home or school. A majority (80%) of the respondents to Evaluation 1 reported that they successfully used the directions contained in the tutorials to carry out a wide variety of activities that they had previously been unfamiliar with:

I have done a little cruising on the internet; I have used Archie at the Calvin prompt, have browsed ftp directories, I have downloaded files, and I have used successfully pkunzip.exe. Great for someone with little experience with downloading!

Gopher.

Tutorials 4 and 5 discussed the process of locating and retrieving information through Gopher, a menu based program on STEM~Net. While most participants indicated they had had a basic knowledge of Gopher prior to the study, all respondents to Evaluation 2 reported that the tutorials had helped "with examples and reinforcing ideas."

I never understood several things before, such as what you called the Boolean operators (and, or and not). That simplifies thing considerably. I never realized the difference between doing a word search and finding directories before, either.

...the tutorials have improved my understanding of Gopher. I now know about the bookmark feature, and a couple of easy commands that allow me to access sites quicker than I could previously.

I liked the bookmark part in this tutorial. Its a very useful tool that I've been looking for, for awhile. I thought there had to be a way to save time getting back to previous visited sites and the bookmark does give a good short cut.

World Wide Web.

Tutorial 6 discussed Lynx, a program that allows users to access the World Wide Web, an application that provides one access method to all Internet resources and services. Responses to Evaluation 3 indicated that the World Wide Web was a feature of STEM~Net that had been unfamiliar to many group members prior to the study. While almost half of the respondents indicated that more time was needed to fully explore and use the Web all group members

agreed that the tutorial had served as a good introduction to the World Wide Web and had increased their understanding of Lynx.

One teacher summarized these findings:

I USED LYNX FOR THE FIRST TIME AS A RESULT OF THE TUTORIAL. I CREATED BOOKMARKS AND DOWNLOAD FILES. I ALSO BROWSED A LITTLE BIT, EH! I HAVE TO READ MORE YET.

Group Support

An analysis of the messages recorded throughout the online unit of study revealed that the sharing of ideas and information was also a key feature of the group activity. The following examples demonstrate that members used the group activity to pose questions, give and receive technical advice, improve their understanding of the tutorials and inquire about additional features of STEM~Net.

Example 1. In the following exchange of messages a teacher, Jane, receives information on how to "print the tutorials." This is the message that was posted to the group with her request.

Date: Sat, 3 Dec 1994 19:50:36 -0330 (NST)
 From: Jane Dough <jedough@calvin.stemnet.nf.ca>
 To: Edith Lynch <elynch@calvin.stemnet.nf.ca>
 cc: el-question2@calvin.stemnet.nf.ca
 edith

i think the first part of all this should have been to download the file you send to us and put it in word perfect or so we can print it in order to work from a hard copy. can you help me do either of these.

regards jane

A day later, the researcher provided Jane with two ways to print the files.

Date: Sun, 4 Dec 1994 14:19:26 -0330 (NST)
From: Edith Lynch <elynch@calvin.sternnet.nf.ca>
To: Jane Dough <jedough@calvin.sternnet.nf.ca>
cc: el-question2@calvin.sternnet.nf.ca
Subject: Re: Part 1 - Tutorial 2 - Downloading

Dear Jane,

There are two ways you can print the files I have sent you:

1. The easiest way is to simply print the file from PINE if you have a printer attached to your computer. To do this type "y" while you are reading the message or when the message is highlighted in the Index. Answer "y" when asked "print message using attached to ansi"-- The message will print.

2. You can export the message to your home directory and download the file from there. To export message highlight the message in Index or view the message, type "e" and enter a filename for your message when prompted "(copy message) to file in home directory.

To download using zmodem type (at the calvin prompt)
sz filename

The message should download to your computer.

The commands for downloading can also be accessed through the calvin menu once your message has been exported to your home directory.

To do so at the main menu select 6. Upload/Download files/

2.Download file and depending on your telecommunications software choose one of the options. Follow the directions, entering the filename of the exported message.

I hope this information is helpful. Do not hesitate to write again if you have any difficulty.

Edith Lynch

There is note from Dale reminding Jane and Edith that the files can be "downloaded" only after "exiting Pine first." (Note the > sign in the message indicates the original message of Edith to Jane.)

Date: Sun, 4 Dec 1994 14:19:26 -0330 (NST)
From: Dale Fraser <dale@calvin.stemnet.nf.ca>
To: Edith Lynch <elynch@calvin.stemnet.nf.ca>
Subject: Re: Part 1 - Tutorial 2 - Downloading
On Sun, 4 Dec 1994, Edith Lynch wrote:

> 2. You can export the message to your home directory and download the file
> from there. To export message highlight the message in Index or view the
> message, type "e" and enter a filename for your message when prompted
> "(copy message) to file in home directory. To download using zmodem type (at
> the calvin prompt)
> sz filename
> The message should download to your computer.

You should mention that to download files, you must exit Pine first! Dale

The following message is an indication that other members of the group also found helpful the information on the printing of files from Pine.

Date: Thu, 15 Dec 1994 21:37:10 -0330 (NST)
From: "Jane Brown" <jbrown@calvin.stemnet.nf.ca>
To: Edith Lynch <elynch@calvin.stemnet.nf.ca>
Subject: Re: Part 1 - Tutorial 2 - Downloading

This is wonderful info regarding saving mail to your home directory or printing directly from Pine. It was only to-day that a fellow cohort and I were wondering/pondering how to do this very activity.

Many, many thanks.

Example 2. In this example John asks for and receives copies of a file he needs to complete Tutorial 3.

Date: Mon, 28 Nov 1994 23:50:08 -0330 (NST)
From: John Dough <jdough@calvin.stemnet.nf.ca>
To: Edith Lynch <elynch@calvin.stemnet.nf.ca>
cc: el-question2@calvin.stemnet.nf.ca
Subject: Re: Accessing Educational Databases- Part 1, Tutorial 1

Fellow Students

I downloaded the calculator file to my computer but my version of pkunzip will not unzip it. Could someone point me in the right direction to get a correct version or send me a version. Thank-you

Date: Tue, 29 Nov 1994 21:38:14 -0330 (NST)
From: John Dough <jdough@calvin.stemnet.nf.ca>
To: Edith Lynch <elynch@calvin.stemnet.nf.ca>
cc: el-question2@calvin.stemnet.nf.ca
Subject: Re: pkunzip

I've received new versions of pkunzip from some of you and I've been successful in unzipping my math programs.

Thanks very much.

Example 3. In this example, Ross requests information on a program that was not discussed in the tutorials. Information on this program was obtained from the STEM-Net Programmer Consultant and forwarded to Ross.

Date: Mon, 12 Dec 1994 19:13:30 -0330 (NST)
From: Ross Sand <rsand@calvin.stemnet.nf.ca>
To: Edith Lynch <elynch@calvin.stemnet.nf.ca>
cc: el-question2@calvin.stemnet.nf.ca
Subject: Mosaic

I'm seeking some help again. I'm trying to use Mosaic on my computer but I can't seem to initialize my winsock dll. I download win32s and installed that. I retrieved winsock from the calvin ftp site, but I can't seem to set it up right. Here is the information I need. I'm anxious to use mosaic.

Ip address

Netmask

Name server

Default Gateway

Packet Gateway

Packet vector

Domain Suffix

Ross Sand

Date: Mon, 12 Dec 1994 20:42:04 -0330 (NST)
From: Dale Fraser <dale@calvin.stemnet.nf.ca>
To: Edith Lynch <elynch@calvin.stemnet.nf.ca>
Subject: Re: Mosaic (fwd)

No. Mosaic is not available on STEM~Net yet. Individual users can get the required application software from the Internet and arrange from a company in the US to get the SLIP software but we will not be providing any support with this. We are getting our own copy of this SLIP software and will provide user's with the required manuals and software in the Spring - then we will be providing support.

Dale

The examples discussed above contain a wide array of topics that have one thing in common. They reflect the ability of the group to provide its members with technical and professional support as they explore the features of STEM~Net. Group members shared ideas, asked questions and gave assistance to fellow teachers and educators.

Access to technical support

A third issue in the development and implementation of the online unit of study was the technical and curricular support provided by the STEM-Net support staff, particularly the Director and the Programmer Consultant.

Both the STEM-Net Director and the Programmer Consultant played a vital role in the development of the tutorials, constantly providing the researcher with information and suggestions for improvements. The following message is an example of this input:

Date: Wed, 30 Nov 1994 07:51:15 -0330 (NST)
From: Harvey Weir <hweir@calvin.stemnet.nf.ca>
To: Edith Lynch <elynch@calvin.stemnet.nf.ca>
Subject: Re: Tutorial

Hi Edith,

I'm wondering if you need to stress that z-modem is the preferred method of transfer for ease of use.

Second, I'm wondering if you need to "append" a session in which you illustrate a download of the pkunzip software .

Third, perhaps they should be encouraged to set up a special directory on their local machine for storing these downloaded files. If it is brought down to their root or some "busy" directory, the downloaded files may get lost.

Regards, Harvey

Group members were also provided with technical support throughout the implementation of the online unit of study. Questions that were posed by group members were referred to the STEM-Net Programmer Consultant. The following are examples of questions that were raised throughout the small group activity.

(Note the > sign indicates the original message of Leo to Edith.)

Date: Thu, 15 Dec 1994 19:42:57 -0330 (NST)
 From: Edith Lynch <elynch@calvin.stemnet.nf.ca>
 To: Dale Fraser <dale@calvin.stemnet.nf.ca>
 Subject: Re: Downloading (fwd)

----- Forwarded message -----

Date: Thu, 8 Dec 1994 14:11:54 -0330 (NST)
 From: Leo White <lwhite@calvin.stemnet.nf.ca>
 To: Edith Lynch <elynch@calvin.stemnet.nf.ca>

>I was able to download the files to my personal computer but I was not able to
 >read the ext files because they were downloaded to a program called
 >"CSHOW". This program would not allow me to view the text files because the
 >only files that you can view are .GIF files.

>I would like to know how to set up a directory so any files that are downloaded
 >will be sent there. I have no problem creating a directory on my computer but
 >how do I instruct the computer to download the files to that directory.

>

> Thank you,

> Leo White

Technical Difficulties

A fourth issue identified by group members was the technical difficulty sometimes experienced in completing the tutorials. For example, one teacher

reported a possible problem with her phone line:

The tutorial itself was great but I did have problems on occasion with the file transfer (especially binary files). I later tried to save to my directory and download using "sz" and this worked. However, there were several interruptions during the download process. I think this was due to a problem with the system or with the phone lines.

Another teacher found a technical problem when "downloading" a file through

Lynx to his personal computer:

Everything that I tried to download came out as junk. I am using ProCommPlus for Windows as my communications software. It automatically downloads for me using the z modem. I tried to download a couple of GIFs and they ended up in my download file as .html files. I was unable to view them because I did not know how to convert them to GIF format. All other files that I have downloaded, especially GIF files, have been viewed as they have been downloading. That was not the case with the ones in the tutorial. I went back again and tried to get some clip art from the same area. They had hundreds of GIF files listed in Brad's Clip Art. I tried downloading them directly and then I tried mailing them to myself, exporting them to a file and downloading. All I got was that it was an unrecognizable format. I tried to download the help files to read, which according to the title page, was a WordPerfect 5.1/5.2 format. All that I got was the same page that you had already included in your tutorial. At least that's what I think I downloaded, because everything that downloads to my PC has a name that consists of only letters and numbers and tells you absolutely nothing about the content of the file. A little frustrating, to say the least.

Time and Access Constraints

Another concern raised by group members was the difficulty in completing some of the activities in the tutorials due to time and access constraints.

One participant commented on the difficulty of fitting the activity into his already busy schedule. Another teachers noted that he had some difficulty

completing the tutorials because he could not always connect to STEM-Net when he wanted to:

I have really enjoyed the tutorials, even though we are doing them during a busy time of the year. Time is at a premium right now and quite often we can't get online when we want to. A little more time for each tutorial would have been great

Another participant commented on the limitations imposed by the "10 hour per month time limit" of STEM-Net:

I work at the Provincial Department of Education where we connect to the internet via a router instead of a modem. I can download a 1 meg file from stemnet in about 10 seconds as opposed to about 15 minutes on a 14.4 modem. Thus, once people start fooling around with ftp their 10 hour time limit will be used up rather quickly in downloading time. Just my \$0.02 worth.

One respondent noted that extra online time was needed to connect to and fully explore interesting sites:

BUT EXTRA TIME (EVEN MORE THAN THE 5 HOURS) ARE NEEDED TO FULLY EXPLORE THE SITES WITHOUT WORRYING ABOUT THE TIME ALLOTMENTS. I GET LOST IN THE WORLD OF SITES AND HATE TO COME OUT. TIMES HAVE TO BE INCREASED!!

Summary

In summary, group members appeared enthusiastic and enjoyed taking part in the group activity. Data collected through online messages and evaluations indicated that despite some difficulties, group members benefitted from the online unit of study. The following comments from group members best summarize their evaluations of the group activity:

Thanks edith..the project was well worth it! The instructions were clear and accurate and i felt so good about them that i photocopied them and have it in the staff room by the computer and also several teachers are now using them to access the resources of Stem-net. You have done a fine job and i thank you for the honor of doing them under your guidance. I hope to see much more of the same in the near future. Hope we have been of some help to you too! you deserve it.

I thought this was a very useful activity and would suggest to others just learning about the network that they should take part in such an exercise

Conclusion

This chapter has presented a summary of the data collected during the development and evaluation of a small group activity. The purpose of the activity was to determine the effect of an online unit of study on teachers' and educators' understanding of various educational features of STEM-Net.

The data presented here would suggest that the online unit was effective in increasing teachers' and educators' understanding of the educational features of STEM-Net, in particular, File Transfer Protocol, Gopher and the World Wide Web. The data analysis also revealed features that were essential to the relative success of the group activity. The tutorials, and group and technical support were the basis of a learning environment that enabled group members to explore and discuss the various features of STEM-Net. However, it was also evident that time and access constraints and technical difficulties are factors that can affect teachers' and educators' understanding of the features of STEM-Net.

Chapter VI will present a summary of the study and a discussion of the results of the survey questionnaire and the small group activity in terms of the stated research questions. The chapter will also present the implications of the study for future development of STEM-Net and will offer recommendations for future research.

CHAPTER VI

SUMMARY, DISCUSSION, IMPLICATIONS AND RECOMMENDATIONS

STEM~Net is providing K-12 teachers and educators in Newfoundland and Labrador with network connectivity and access to a wide range of educational resources throughout the world. As STEM~Net is being developed as a learning resource for K-12 education in Newfoundland and Labrador, it is essential to define and then serve the needs of teachers and educators.

This study was designed to determine the educational expectations and experiences of K-12 teachers and educators in Newfoundland and Labrador as they become users of STEM~Net. Specifically, it attempted to answer the following questions:

1. What are the perceptions of K-12 teachers and educators of various educational computer network activities that are available on STEM~Net?
2. How does an online unit of study affect teachers' and educators' understanding of the educational features of STEM~Net?

In this chapter, a summary of the study and a discussion of the results in relation to the research questions are presented. This chapter will also present the implications of the study for the future development of STEM~Net and will offer recommendations for future research.

Summary of the Study

The study consisted of several stages of data collection and analysis. In the first phase of the study, a survey questionnaire was sent to a random sample of 200 regular users of STEM~Net. The questionnaire contained a summary of six educational computer networking activities. As well, respondents could indicate any other activity or feature of computer networks that they viewed as effective in meeting their educational goals.

The respondents were asked: (a) to indicate their relative knowledge of the network activity; (b) to indicate their relative skill in using the network activity; (c) to rank the network activities in perceived order of importance; (d) to indicate if they would like to be part of a group to learn more about one of the network activities; and (e) to indicate their present level of participation in STEM~Net activities. The data from the questionnaire provided the information for the implementation and development of a small group activity. The main purpose of the small group activity was to assess the impact of an online unit of study on teachers' and educators' understanding of the educational features of STEM~Net. The basis of the online unit was a series of six tutorials that were sent to the members of the small group. Through the tutorials members were encouraged to explore educational databases on the Internet through File Transfer Protocol, Gopher and the World Wide Web. As well, members were encouraged to

exchange ideas with other members of the group, to ask questions and to make suggestions of how the activity could be modified or improved. The members of the group also completed three evaluation forms consisting of a series of open-ended questions about the online unit of study

The data from the survey questionnaire, the evaluations of the small group activity and the online messages of participants were collected and analyzed to address the major research questions of the study.

Discussion of the Research Questions and Results

Question 1: What are the perceptions of K-12 teachers and educators of various educational computer network activities that are available on STEM~Net?

Six educational computer networking activities available on STEM~Net were included in this study. They were electronic mail, computer conferencing, file transfer, access to educational databases, bulletin boards and newsgroups.

Electronic mail and access to educational databases were reported as the two most used features of STEM~Net. A large majority of the teachers and educators surveyed in the study ranked these two activities as either having first or second priority for them in their teaching. Most respondents ranked their

knowledge of and skill in using electronic mail as very good and ranked their knowledge of and skill in accessing educational databases as good.

File transfer and newsgroups were also widely used features of STEM~Net, but they were ranked by a majority of respondents as having either third or fourth priority for them in their teaching. Most respondents ranked their knowledge of and skill in using these features as good or very good.

While fifty one percent of respondents reported that they used the bulletin board features of STEM~Net, a majority rated this feature as having either fifth or sixth priority for them in their teaching. Furthermore, teachers and educators ranked their knowledge of and skill in using this feature as poor or very poor.

The least used feature of STEM~Net as reported by participants was computer conferencing. Respondents to the survey ranked their knowledge of and skill in using the computer conferencing facilities of STEM~Net as poor or very poor. Teachers and educators ranked this feature as having only fifth or sixth priority for them in their teaching.

Question 2: How does an online unit of study affect teachers' and educators' understanding of the educational features of STEM~Net?

An analysis of the participants' evaluation of the small group activity and the online messages of participants indicate that the teachers' and educators' understanding of "accessing educational databases through STEM~Net" was increased as the result of an online unit of study. Teachers and educators consistently rated their involvement in the online unit of study as a valuable learning experience with a majority of participants reporting an increase in their knowledge and understanding of File Transfer Protocol, Gopher and the World Wide Web.

Discussion

As STEM~Net becomes widely accepted as a valuable educational tool, teachers' and educators' perceptions and understanding of its educational features will become increasingly important issues. This present study has focused on both these issues by determining the perceptions of teachers and educators of various educational features of STEM~Net, and by investigating the effect of an online unit of study on their understanding of these features.

The findings of the study suggest that teachers and educators perceive the educational features of STEM~Net to be useful and valuable to them in their

teaching. The study also revealed factors that may influence teachers' and educators' understanding of the educational features of STEM~Net. Key issues that were identified include training materials, group and technical support as well as technical difficulties and time and access constraints. Finally, the design of the online unit of study seemed to be critical to the success of the group activity. The design of the unit incorporated group discussions and interactions, with the researcher as facilitator. The focus on a specific topic that addressed the needs of the group also contributed to the very positive participants' assessment of the effect of the group activity.

While this study took place over a relatively short period of time, four months, it is clearly demonstrated that teachers and educators are eager to explore the full potential of STEM~Net in meeting their educational goals. Furthermore, they are willing to become involved in the design and implementation of activities that can increase their understanding of the educational features of STEM~Net. One teacher aptly summarized these findings:

The tutorials address the main issue of STEM~Net users --- to do things rather than to use the mail system only. Once a teacher retrieves something useful, he will make more and better use of the resource.

Implications

The overall findings of the study would seem to imply that teachers and educators are aware of the potential of educational computer networks to enhance professional development and to overcome professional isolation. The findings of the study also raise the issue of how to encourage teachers and educators to develop and use activities and innovative applications on STEM~Net that can best meet their educational needs. The results of this study, therefore, may suggest the following recommendations for the future development of STEM~Net.

1. As teachers become more familiar with the potential of the technology of computer networks they need increased support, particularly with technical training and problems. One way to provide this support could be through instructional units structured around the needs of the participants and facilitated by a group leader.
2. The educational functions of STEM~Net should be expanded to include educational software that can increase the efficiency of online research, particularly in the distribution and recording of survey questionnaires.

3. The technology of STEM~Net should be made more accessible to teachers and educators. Phone lines need to become more widely available. Ideally, every teacher should have access to STEM~Net in their classroom.
4. Teachers and educators are oftentimes not entirely familiar with computer network technology. STEM~Net should provide its users with a more "friendly" operating environment. The use of colourful icons, graphics, and menu driven systems would make the system easier to use and less threatening to the novice user.

In summary, the findings of this study suggest some design elements and supports that may be essential if teachers and educators are to fully integrate the technology of STEM~Net into their professional lives. Furthermore, from the literature and from this study it becomes apparent that it is essentially the utility of the network in meeting the educational needs of teachers and educators that will ultimately determine its success.

Recommendations for Future Research

The focus of this study was to determine the perceptions of teachers and educators of various educational features of STEM~Net; and, to investigate the effect of an online unit of study on their understanding of these features. The results of this study suggest several recommendations for further research.

First, since this study was limited to frequent users of STEM~Net, similar studies should be conducted to include all teachers and educators who have STEM~Net accounts. This would provide more information on how teachers and educators can be trained and supported in using the technology and integrating it into their professional lives.

Second, a similar study that uses a different focus topic for the online unit of study should be conducted. Such research could address the issue of how STEM~Net could effectively deliver both credit and non-credit online university courses or curriculum workshops.

Third, a further study should be conducted to determine the specific features of various educational functions of STEM~Net that teachers and educators find most valuable. For example, a study of electronic mail could reveal exactly how teachers use this facility of STEM~Net and how it meets their educational needs.

Finally, a research agenda should include further investigation of the

characteristics of learning online. Universities and colleges worldwide are offering course activities and programs online. Data from descriptions of these activities and from this study indicate there are benefits from online education. Online instruction may be an effective way to increase teachers' and educators' understanding of the educational features of computer networks. However, further research is needed to identify variables that may be important in the design and effective use of this new learning environment.

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Appendix A
Questionnaire

From elynch@calvin.stemnet.nf.ca
 Date: Wed, 5 Oct 1994 13:14:48 -0230 (NDT)
 From: Edith Lynch <elynch@calvin.stemnet.nf.ca>
 To: el-question@calvin.stemnet.nf.ca
 Subject: Questionnaire

I would greatly appreciate your completing the following questionnaire to help me in a study of STEM~Net that I am doing as a thesis for a Masters of Education degree. The purpose of this questionnaire is to determine which network activities K-12 teachers view as being valuable in overcoming professional isolation and in promoting professional development. As well, the questionnaire will be used to provide information in setting up a small group of teachers to learn more about the activities outlined.

To fill out the questionnaire press "r" (reply) and "y" (yes) when asked to include original message in reply. Type "n"(no) when asked "Reply to all participants? y/n." Use the arrow keys to scroll down through the text of the questionnaire. Then, type your responses in the brackets ([] or ()) as indicated. Type CTRL "X" to send your questionnaire.

While I realize that you have a very busy schedule, I would like for you to complete and return the questionnaire by October 19, 1994. I realize as well that your time on STEM~Net is valuable. Therefore, when you return your completed questionnaire, an extra hour will be added to your time usage quota for the month of October.

Thank you in advance for your time and cooperation. At your request I will be happy to forward you the final results and recommendations of this study.

Please complete the following:

1. At which grade levels do you presently teach:()
2. How many Mathematics methods courses have you completed:()
3. How many computer courses have you completed:()
4. How many training sessions/workshops for STEM~Net have you participated in:()

The following is a short description of some of the educational features of computer networking that were frequently rated in the literature as being among the most effective in overcoming professional isolation and in enhancing professional development of teachers. As well, you may indicate any other activity that you view as being effective in meeting these goals.

Electronic Mail (Email) -- Email is a computer messaging system which allows users to send messages to individual users or to lists of users. Teachers use email to consult with colleagues or other professionals in the district and around the world. The "pine" utility is used by most STEM-Net users to handle their individual electronic mail.

Computer Conferencing -- Computer conferencing is similar in many ways to normal conferencing. Computer conferences can be public or private. A private conference is limited to a predefined list of teachers and a coordinator. A public conference is open to all teachers who wish to exchange experiences, opinions and advice on any topic of interest. On STEM-Net, the "pine" mail utility with a conference mailing name can be used for private conferences, and the "tin" newsgroup utility can be used for public conferences.

File Transfer -- File transfer is a function closely related to email. File transfer allows teachers to "download" and "upload" reports, papers or educational software. The "kermit" and "z-modem" tools are used by most STEM-Net users for this activity.

Access to educational databases -- Networks can provide teachers with access to educational databases that contain lesson plans and other curriculum materials. Gopher and FTP are two tools that allow teachers on STEM-Net to search and retrieve educational information from central stores of files located on the network.

Bulletin Boards -- Bulletin boards allow individuals to post notes and requests for general viewing. It is an effective way to receive feedback from a large group on a variety of educational issues. STEM-Net users can post notices using the "tin" newsgroup utility. Also, program and group leaders can use the STEM-Net "gopher" utility to post notices.

Newsgroups -- Newsgroups are public discussions on a wide variety of topics. Teachers may read newsgroups for general interest and information. On STEM-Net, teachers can use the "tin" utility to access newsgroups.

Other -- (please specify and give a brief description)

Please put a number from 1 to 5 in each bracket to indicate your KNOWLEDGE of the activity. (A rank of 1 would indicate a very good knowledge of the activity, a rank of 2--good, a rank of 3--poor, a rank of 4--very poor, while a rank of 5 indicates no knowledge of the activity)

Electronic Mail ()

Computer Conferencing ()

File Transfer ()

Access to educational databases ()

Bulletin Boards ()

Newsgroups ()

Other [] ()

Please put a number from 1 to 5 in each bracket to indicate your LEVEL OF SKILL in the activity. (A rank of 1 would indicate very good skill in using the activity, a rank of 2--good, a rank of 3--poor, a rank of 4--very poor, while a rank of 5 indicates no skill in using the activity)

Electronic Mail ()

Computer Conferencing ()

File Transfer ()

Access to educational databases ()

Bulletin Boards ()

Newsgroups ()

Other [] ()

If you could actually undertake these activities in your teaching which would be top priority for your teaching and what would be the lowest? Please rank these projects and activities from 1 to 6 (or 1 to 7 if you add your own activity) to indicate your perception of the importance of these activities for you in your teaching. (A rank of 1 indicates that you give the activity top priority for your teaching, 2--second priority, 3--third priority, 4--fourth priority, 5--fifth priority, while a rank of 6 or 7 indicates last position in importance) Please use each number only once.

- ☐ Electronic Mail (Email)
- ☐ Computer Conferencing
- ☐ File Transfer
- ☐ Access to educational databases via Gopher
- ☐ Bulletin Boards
- ☐ Newsgroups
- ☐ Other []

Would you like to be part of a small group involved in learning more about the listed network features or activities? ()

If yes, which of the network activities would you most like to learn about? ()

Please indicate your level of participation in STEM~Net by putting an (X) next to the features of STEM~Net that you have used. (Mark all that apply) Are you presently involved in STEM~Net :

- () as a STEM~Net lead teacher
- () as a STEM~Net school board coordinator
- () in the development of a Gopher
- () in using electronic mail
- () in computer conferencing
- () in the transfer of files
- () in accessing educational databases
- () in using bulletin boards
- () in using the newsgroups

Thank you,
Edith Lynch

Appendix B

Follow up Letters

From: elynch@calvin.stemnet.nf.ca Thu Oct 20 11:29:40 1994
Date: Thu, 20 Oct 1994 11:29:38 -0230 (NDT)
From: Edith Lynch <elynch@calvin.stemnet.nf.ca>
To: el-question2@calvin.stemnet.nf.ca
Subject: Questionnaire

Earlier this month I sent you a Questionnaire relating to a study of STEM~Net that I am doing for my Masters of Education degree. The purpose of the questionnaire is to determine which network activities educators view as being valuable in meeting their needs and objectives.

While the response to the questionnaire was good there were some problems relating to the distribution list. The directions for answering the questionnaire may not have been clear. As a result there was some confusion in returning the questionnaires to me.

In the next few days I will forward the questionnaire to you again. I would appreciate it if you could complete the questionnaire and return it to me at your earliest convenience. Your input is not only important to me in my study but also in helping STEM~Net meet its mandate and realize its full potential.

To answer the questionnaire please follow these steps:

1. Press "r" to reply.
2. When asked "Include original message in reply?" press "y"(yes)
3. NOTE: When asked "Reply to all recipients?" press "n"

Then use the arrow keys to scroll down through the text of the questionnaire and type your responses in the brackets ([] , or ()) as indicated.

Thank you in advance for your time and cooperation. I realize that you have very busy schedules and that your time on STEM~Net is valuable. Therefore, when you return your completed questionnaire, an extra hour will be added to your usage quota for the month of October.

Your cooperation and patience is very much appreciated.

Yours Sincerely,

Edith Lynch

From: elynch@calvin.stemnet.nf.ca Wed Nov 9 13:49:10 1994
Date: Wed, 9 Nov 1994 13:49:09 -0330 (NST)
From: Edith Lynch <elynch@calvin.stemnet.nf.ca>
To: el-question2@calvin.stemnet.nf.ca
cc: Harvey Weir <hweir@calvin.stemnet.nf.ca>
Subject: Followup to Questionnaire

Dear Educators,

First, let me thank you for your cooperation and support in completing and returning the questionnaire. Your responses will provide valuable information not only for me in completing my thesis but also in determining the direction of STEM~Net to best meet our educational goals.

On your questionnaire you indicated that you would like to be part of a group to learn more about the listed network features or activities. I will be organizing this group very soon. From the results of the questionnaire, the topic that will be explored is "Accessing educational databases."

If you would like to be part of the group to learn more about educational databases could you please reply to me by Wednesday, November 16. The group activity should last for several weeks. Again, because your time on STEM~Net is valuable, an extra 5 hours will be added to your November quota when you "signup" to be a member of the group.

I hope to hear from you soon.

Thanks you,
Edith Lynch

***Please Note:** When answering this message be very careful to answer **"NO"** when asked to reply to all recipients.

From: elynch@calvin.stemnet.nf.ca Sat Nov 19 13:02:18 1994
Date: Sat, 19 Nov 1994 13:02:17 -0330 (NST)
From: Edith Lynch <elynch@calvin.stemnet.nf.ca>
To: el-question2@calvin.stemnet.nf.ca
Subject: Group Activity

Dear Educators,

Thank you once again for your cooperation and support in agreeing to become members of a group to explore the topic of "Accessing educational databases."

STEM~Net provides educators with access to databases that contain large amounts of information including software and instructional materials. To facilitate access to this information there are a variety of network "tools" that can be used. In this group activity, we will explore and discuss three of these tools that are available on STEM~Net.

They include:

- (i) FTP
- (ii) GOPHER
- (iii) WWW

Over the next few weeks I will give you some basic commands and information that will help you use the tools of the network more effectively. We'll talk about the particular tools and discover ways they can be best used in achieving our educational goals.

Before we start our discussion, I would like for you to evaluate the following tentative schedule and outline of each section.

WEEK 1: Wed, Nov 23 to Tues, Nov 29

FTP

- (i) What is FTP?
- (ii) How to access FTP
- (iii) How to use FTP
- (iv) File Compression
- (v) Archie

WEEK 2: Wed, Nov 30 to Tues, Dec 6

GOPHER

- (i) What is GOPHER?
- (ii) Basic Gopher commands
- (iii) Bookmarks and Booklists
- (iv) Veronica

WEEK 3: Wed, Dec 7 to Tues, Dec 13

WWW

- (i) What is WWW?
- (ii) WEB searches

WEEK 4: Wed, Dec 14 to Tues, Dec 19

Conclusion and Evaluation

I fully realize that you have very busy schedules, but to ensure the success of the activity, it will be important to participate regularly in reading the material and commenting on the topics. Also, as noted earlier, an extra five hours will be added to your time usage quota for the months of November and December to allow for your full participation in the group.

I greatly appreciate your cooperation and participation in this activity. I look forward to a very rewarding learning experience.

Thank you,
Edith Lynch

Appendix C

Tutorials

Dear Educators,

Networks are characterized by increased access to electronic resources including databases of educational materials. The vast amounts of information available in the databases can expand the learning environment of students and the professional development of educators.

However, as Harris (1993) noted, finding information on the network is like getting a drink from a fire hose. While computer networks make the information of the world readily available, we need the skills necessary to tap the many information sources accessible through educational networks.

The following series of tutorials will present some of the "tools" that are available on STEM~Net to help us access the store of materials available from a wide variety of educational databases.

I would like to thank you for your continued cooperation and support. I encourage you to feel free to contribute your ideas and comments on the activities outlined in the tutorials as well as your suggestions of how this activity can best meet your educational goals.

Thank you,
Edith Lynch

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ACCESSING EDUCATIONAL DATABASES

Table of Contents

PART 1: File Transfer Protocol (FTP)

PART 2: GOPHER

PART 3: World Wide Web (WWW)

=====

PART 1: File Transfer Protocol (FTP)

Part 1 discusses a tool called "FTP" that is used to access remote computers and retrieve files. Text files, computer programs, and graphics are just a few of the types of files available through ftp. This section is divided into 3 tutorials:

Tutorial 1: Transferring files from a remote computer to calvin

Tutorial 2: Downloading files to your computer at home/school

Tutorial 3: File searching

=====

PART 1: File Transfer Protocol (FTP)

Tutorial 1: Transferring files from a remote computer to calvin

In this tutorial we are going to look at the basic steps in accessing an ftp site and bringing files back to your account on STEM~Net. I will first briefly explain the procedure and some of the more commonly used commands and then go through a sample FTP session that will illustrate how these commands are used.

WHAT IS FTP?

File Transfer Protocol (ftp) is a program that allows you to go to another computer, find files that you want and bring them back to your own account on calvin (STEM~Net).

Many ftp sites store a wealth of valuable educational materials such as curriculum guides, instructional materials and educational software.

HOW TO ACCESS FTP

FTP can be accessed on STEM~Net either through the calvin prompt or the calvin menu. In either case you must know the address of the remote computer. For most ftp sessions type "anonymous" or "ftp" when prompted for name, and your "full email address" for password (which will not be displayed).

HOW TO USE FTP

a. Find the files

Once you are logged in to the ftp site there are several commands you can use to look around to find out what files are available at the site. Use "ls -l" or "dir" to list the files that are in a directory. Use "cd" to change the directory. Use "cdup" or "cd .." to move to the directory that is one level up.

b. Set the transfer mode

Files may be transferred in two modes--ASCII and binary. ASCII (or text files) usually have the extension txt, whereas binary files have extensions such as .tar, .zip, .Z etc. It is important when transferring binary files to set the transfer mode. To do this, type "binary" at the ftp prompt.

c. Get the files you want

To transfer a file from the ftp site to your calvin account use the "get" command. If you wish to transfer more than one file you can use the "mget" command.

***Note:** Keep in mind that by typing "help" you can see a list of all the acceptable commands for an ftp site.

EXAMPLE OF AN FTP SESSION

To illustrate how all the commands work I have included a sample ftp session. In this case, I "ftp'd" to a mathematics archive and retrieved a program called "ucalc24.zip" as well the files "ucalc24.abstract" and "ucalc24.readme" which contain documentation about the program.

NOTE: ANY COMMENTS ABOUT THE SESSION ARE INCLUDED IN BRACKETS()

The address of the site is "archives.math.utk.edu" a mathematics archive located at the University of Tennessee in Knoxville, USA and the files I want are located in the subdirectory

software/msdos/calculus/ucalc24

There are "two" ways to access FTP sites on STEM~Net:

1. From the calvin menu. To access the menu type "menu" at the calvin prompt. Choose item 7-- "Internet File Searches (Archie) and Transfers (FTP)..." and then item 2--"Transfer file from another computer (using FTP)." You will be asked for the name of the site and here you type the address of the site (e.g. "archive.math.utk.edu," "anonymous" for name and full email address for password)
2. From the calvin prompt. Type "ftp" and the address of the site at the calvin prompt, "anonymous" for name and full email address for password

calvin> ftp archives.math.utk.edu)

(Once you are connected the session will proceed as follows:)

Connected to archives.math.utk.edu.

220 archives FTP server (Version wu-2.4(2) Wed Apr 27 12:15:05 EDT 1994) ready.

Name (archives.math.utk.edu:elynch): anonymous

331 Guest login ok, send your complete e-mail address as password.

Password:

(Once I am logged in "anonymously" I am given the following information about the site)

230-*****

230- Welcome to the Mathematics Archives!

230-

230-You are user #3 in your class and the local time is

230-Mon Nov 7 09:31:43 1994.

230-

230-The Mathematics Archives can also be reached by gopher

230-and WWW using the same address. For help, comments,

230-suggestions, etc. write

230- help@archives.math.utk.edu

230-*****

230-

230-Please read the file README-accessing-archives.txt

230- it was last modified on Sat Jul 23 09:17:10 1994 - 107 230- days ago
 230-Please read the file README-intro.txt
 230- it was last modified on Mon Sep 20 15:13:03 1993 - 413 230- days ago
 230-Please read the file README-uploading.txt
 230- it was last modified on Fri Sep 23 19:35:14 1994 - 45 230- days ago

230 Guest login ok, access restrictions apply.

(I use the command "cd " to change to the directory where the file is located)

ftp> cd software/msdos/calculus/ucalc24

250 CWD command successful.

(I use the command "ls -l" to find out more information about the directory and the files it contains. Please note that drwxrwxr-x indicates that .cap is a directory while -rw-r--r-- indicates a file. Also note the size of each file is given: e.g. ucalc24.zip has 87082 bytes.)

ftp> ls -l

200 PORT command successful.

150 Opening ASCII mode data connection for /bin/ls.
 total 137

drwxrwxr-x	2	509	512	Aug 31 19:01	.cap
-rw-r--r--	1	125	1327	Aug 31 19:00	ucalc24.abstract
-rw-r--r--	1	125	49103	Aug 31 19:00	ucalc24.readme
-rw-r--r--	1	125	87082	Aug 31 19:00	ucalc24.zip

226 Transfer complete.

53 bytes received in 0.02 seconds (2.6 Kbytes/s)

(To set file transfer mode I type "binary")

ftp> binary

200 Type set to I.

To retrieve the files I need I use the "get" command followed by the name of each file.
 OR

I could have used the "mget" command with the name of the three files that I wanted
i.e. mget ucalc24.abstract ucalc24.readme ucalc24.zip

OR

the "mget" command with wildcards to get the three files

i.e. mget u*.*

(I type "get ucalc24.abstract" to transfer the file back to my calvin account. The ftp site lets me know when it has been transferred)

ftp> get ucalc24.abstract

200 PORT command successful.

150 Opening BINARY mode data connection for ucalc24.abstract (1327 bytes).

226 Transfer complete.

1327 bytes received in 2.9 seconds (0.44 Kbytes/s)

(I type "get ucalc24.readme" to transfer the next file. Again the ftp site tells me when the file has been transferred.)

ftp> get ucalc24.readme

200 PORT command successful.

150 Opening BINARY mode data connection for ucalc24.readme (49103 bytes).

226 Transfer complete.

49103 bytes received in 18 seconds (2.6 Kbytes/s)

(To transfer the file "ucalc24.zip" to my calvin account I type "get ucalc24.zip" and again I am told that the file is transferred to my calvin account.)

ftp> get ucalc24.zip

200 PORT command successful.

150 Opening BINARY mode data connection for ucalc24.zip (87082 bytes).

226 Transfer complete.

87082 bytes received in 25 seconds (3.4 Kbytes/s)

(To end the session I type "quit")

ftp> quit

221 Goodbye.

(After I exit the ftp site I note that the files I retrieved from the ftp site are located in my calvin directory)

```
calvin> ls -l
total 180
drwxr-xr-x  2 elynch 15   512 Feb 23  1994  Mail
drwxr-xr-x  2 elynch 15   512 Dec 13  1993  News
-rw-r--r--  1 elynch 15  1203 Nov 23 16:24  ucalc24.abstract
-rw-r--r--  1 elynch 15  9103 Nov 23 16:27  ucalc24.readme
-rw-r--r--  1 elynch      61582 Nov 23 16:27  ucalc24.zip
```

(*NOTE: I can view the contents of the text files "ucalc24.abstract" and "ucalc24.readme" while I am still on calvin with the "more" command. For example, to view the contents of "ucalc24.abstract" I type "more" followed by the filename).

calvin> more ucalc24.abstract

(The following is the text of the file "ucalc24.abstract")

ULTIMATE CALCULATOR 2.4
Copyright (C) 1992 by Daniel Corbier
corbier@delphi.com

Ucalc is a high precision scientific calculator which can evaluate expressions, solve equations, perform numerical integrations, and do summations. It supports many built-in functions, operators, numerical notations, and modes. It also allows for user-defined functions and variables. Graphs in cartesian and polar coordinates and will graph parametric curves and data files. There are two ways of running the Ultimate Calculator: either at the DOS command line as UCALC 5+4*8/2 [enter] or in an interactive environment.....

ucalc24.abstract: END

SUMMARY

In this tutorial we have gone through the procedure involved in transferring a file from a remote ftp site to a calvin account. The basic steps can be summarized as follows:

1. Access the ftp site at the calvin prompt with the "ftp" command followed by the address of the ftp site, or through the calvin menu (Item #7)
2. Once you are connected identify yourself to the ftp site ("anonymous" or "ftp")
3. Give your calvin address as your password.
4. Look around the directories for the files you want.
5. Set the transfer mode (ASCII or binary)
6. Get the file or files you want.
7. Quit

As noted, text files can be viewed and read at the calvin prompt. However, binary files such as ucalc24.zip are compressed files and cannot be viewed online. They must be "downloaded" and "unzipped" on a personal computer before they can be used. The next tutorial will give you instructions on how to do this. For now you might like to try the following activity.

SUGGESTED ACTIVITY

The following is a short list of sites and directories that contain educational materials such as software and descriptions of educational telecomputing projects. FTP to some of them following the directions given in the tutorial. If you wish share some of your experiences with the group noting any interesting "finds" or "problems" that you notice.

NOTE: While I have recently "visited" these ftp sites there is no guarantee they are still available. FTP sites have been known to disappear overnight!!!!

FTP sites

*Hostname: oak.oakland.edu

This site contains a wide variety of educational materials for all subject areas.

*Hostname: tcet.unt.edu

To find descriptions of telecomputing projects look in subdirectory path
pub/telecomputing-info/ed-infusions

*Hostname: archives.inath.utk.edu

This site contains a wide variety of software and teaching ideas for mathematics.
Look in subdirectory path

software/msdos

*Hostname: wuarchive.wustl.edu

This site contains an extensive collection of educational materials.

*Hostname: eric.syr.edu

This site contains selected ERIC full-text resources, including ERIC Digests, infoguides, helpsheets etc.

PART 1: File Transfer Protocol

Tutorial 2: Downloading files to your computer at home/school

In Tutorial 1 we discussed the procedure involved in transferring files by File Transfer Protocol (FTP) to our account on STEM-net. Oftentimes, for the information in these files to be used they must be transferred from our calvin account to a personal computer at home or school. Tutorial 2 will discuss the "process" involved in "downloading" files to a personal computer and "decoding" them so that the information they contain is made comprehensible to us.

FILE TYPES

There are basically two types of files accessible through File Transfer Protocol (FTP) --- ASCII (text) files and binary files. ASCII or text files, have names that end in extensions like .txt, .doc, .ascii, or .vox. Text files such as "ucalc24.abstract" can be viewed online. Binary files commonly have extensions like .gif, .wav, .Z, .exe, or .zip and cannot be viewed online. Furthermore, binary files are often "compressed" or "encoded" to permit easier storage at archive sites and to allow for more efficient transfer over the Internet and telephone connections.

DOWNLOADING FILES TO YOUR PERSONAL COMPUTER FROM YOUR CALVIN ACCOUNT

How a file is downloaded to your personal computer depends upon the type of telecommunications software you are using and the file transfer methods your software supports. Common transfer methods (or protocols) built into many telecommunications packages include: text (or ascii),kermit, ymodem, xmodem and zmodem. The text protocol can only be used for transferring text files. For binary files, such as images, sound files, or program application files, some form of binary transfer must be used.

STEM-Net supports three protocols: zmodem, kermit and text. We will look at these in some detail.

ZMODEM FILE TRANSFERS

The easier protocol to use, if your software supports it, is the zmodem protocol since it requires no user intervention once it is selected. The file transfers automatically to your personal computer from your calvin account. As well, your software will probably give you information on the progress of the file transfer.

File transfers (or downloading) using the zmodem protocol can be initiated on STEM-Net in two ways:

- (i) From the calvin prompt. To begin downloading a file type "sz" and the name of the file at the calvin prompt. For example to begin downloading "ucalc24.zip" type

```
calvin> sz ucalc24.zip
```

Note that will also work for text files such as "ucalc24.abstract."

- (ii) From the calvin menu. Type "menu" at the calvin prompt to access the calvin menu. Choose "6. Upload/Download Files..." / Choose 2. "Download files" / Choose "1. Z-modem for download." You are then asked for the name of the file you wish to transfer.

Once the name of the file is entered the file download should start. Once the transfer starts a transfer progress screen is usually displayed. After the file has been transferred, the transfer screen will disappear and you will be returned to the calvin prompt or the calvin menu.

KERMIT FILE TRANSFERS

File transfers (downloading) using the kermit protocol can be initiated in two ways:

- (i) From the calvin prompt. Type "kermit -i -s" followed by the name of the file. at the calvin prompt. For example, to begin the transfer of ucalc24.zip type

```
calvin > kermit -i -s ucalc24.zip
```

- (ii) From the calvin menu. Type "menu" at the calvin prompt. Choose "6. Upload/Download Files" / Choose 1. Kermit Binary Download. Enter the name of the file you wish to transfer -- e.g. "ucalc24.zip."

For kermit transfers, you will have to activate the "receive" command in your local software to complete the transfer. Once the transfer starts, a progress screen is usually displayed.

FILE COMPRESSION

As noted earlier, most binary files available on the Internet have been encoded or compressed for easier storage and transport. This means, that after binary files such as "ucalc24.zip" has been downloaded to your personal computer, they must be uncompressed or decoded before you can use the information they contain.

Before a file can be uncompressed, however, it is necessary to determine what file compression method was used. While there are many file compression methods on the Internet, there are several ways to determine how a particular file was compressed. Some ftp directories contain README files indicating how the file was compressed. The extension of the file will usually indicate what compression method was used and what software you need to uncompress the file.

The following table is a list of popular extensions of compressed files and the software you need to uncompress them. Note that most of the software you need to uncompress a file is also available by File Transfer Protocol (FTP).

FILE EXTENSIONS	PROGRAM NEEDED	COMPUTER
.arc	ARC, PKPAK	PC
.arj	ARJ	PC
.zip	PKUNZIP	PC
.zoo	ZOO	PC
.bin	MacBinary	Mac
.cpt	CompactPro	Mac
.hqx	BinHex 4.0	Mac
.Z	compress/uncompress	UNIX

*EXAMPLE - "unzipping ucalc24.zip"

The following example illustrates the procedure involved in uncompressing a file. The file is "ucalc24.zip." The file was downloaded from my STEM~Net account to my personal computer using the kermi protocol.

First I determine how the file was compressed. From the table above, I notice that the extension of the file "ucalc24.zip" indicates the file was compressed by a DOS program called PKUNZIP. To "unzip" or uncompress the file I use the following command:

```
pkunzip ucalc24.zip
```

As a result a number of files are extracted from ucalc24.zip:

```
PKUNZIP (R) FAST! Extract Utility Version 2.04g
02-01-93
Copr. 1989-1993 PKWARE Inc. All Rights Reserved.
Shareware Version
PKUNZIP Reg. U.S. Pat. and Tm. Off.
■ 80386 CPU detected.
■ XMS version 3.00 detected.
```

```
Searching ZIP: C:/FL/RECV/UCALC24.ZIP
```

```
Inflating: UCALC.EXE
Inflating: PLOTDEMO
Inflating: GRAPH1.DAT
Inflating: GRAPH2.DAT
Inflating: UCALC.DE
Inflating: CONVERT.DEF
Inflating: FILE_ID.DIZ
Inflating: EXAMPLES.DOC
Inflating: HISTORY.DOC
Inflating: QUEST.DOC
Inflating: UCALC.DOC
Inflating: REGISTER.DOC
```

After the file "ucalc24.zip" is decompressed I now have a DOS program that I can use in a high school mathematics class

SUMMARY

The process of transferring a file from a remote FTP site to a personal computer is a two-step process. Tutorial 1 discussed the first step of the process - transferring files from an FTP archive to your account space on STEM-Net. In Tutorial 2 we went through the second step of the process - downloading files from your STEM-Net account to your personal computer at home or school.

Some of the basic points covered in Tutorial 2 can be summarized as follows:

1. Downloading can be initiated on STEM-Net from either the calvin prompt or the calvin menu.
2. STEM-Net supports file transfers using Z-modem and kermit protocols. Z-modem is the easier method to use for file transfers since it requires no user intervention once it is selected.
3. Once a file is downloaded additional processing is often necessary since most files transferred over the Internet are compressed or encoded.
4. To uncompress or decode a file requires additional software such as PKUNZIP, ARC etc. This software is available at many ftp sites.

APPENDIX

While "downloading" can be interesting and profitable it also presents its share of problems and frustrations. The steps involved in downloading are dependent to a large extent on the type of software that we use and the transfer protocols it supports. However, there are some hints and ideas that can make downloading a little easier and less troublesome.

Given the amount of software and text available on the Internet transferring files from an FTP site to our personal computer is definitely a skill "worth" acquiring. In this appendix I will show how I retrieved and downloaded the file "pk2204g.exe" which contained the program I needed to "unzip" the file "ucalc24.zip."

The file I needed was available at the STEM-Net ftp site. To "get" the file I used File Transfer Protocol (FTP). At the calvin prompt I typed "ftp" and the name of site. I

gave "ftp" as my name and my calvin address for password. The session I logged is as follows. Note that the file I want is located in subdirectory

`/pub/msdos/compression`

Note also that the subdirectory contains additional software that you may need to uncompress files with extensions other than .zip.

```
ftp calvin.stemnet.nf.ca
Connected to calvin.stemnet.nf.ca.
220 calvin FTP server (OSF/1 Version 5.60) ready.
Name (calvin.stemnet.nf.ca:elynych): ftp
331 Guest login ok, send ident as password.
Password:
230 Guest login ok, access restrictions apply.
Remote system type is UNIX.
Using binary mode to transfer files.

ftp> cd /pub/msdos/compression
250 CWD command successful.
ftp> ls
200 PORT command successful.
150 Opening ASCII mode data connection for file list
(134.153.2.96,1526).
arj241a.exe
lha213.exe
pkz204g.exe
comp430d.zip
zoo210.exe
00-Index
226 Transfer complete.
ftp> binary
200 Type set to I.
ftp> get pkz204g.exe
200 PORT command successful.
150 Opening BINARY mode data connection for pkz204g.exe
(134.153.2.96,1555) (202574 bytes).
226 Transfer complete.
202574 bytes received in 0.22 seconds (9e+02 Kbytes/s)
ftp> quit
221 Goodbye.
```


The file is now transferred to my calvin account.

```
calvin> ls -l
total 297
```

```
drwxr-xr-x  2 elynch  15  512 Feb 23  1994 Mail
drwxr-xr-x  2 elynch  15  512 Dec 13  1993 News
drwx-----  2 elynch  15  1024 Nov 29 21:41 mail
-rw-----  1 elynch  15  202574 Nov 30 09:21 pkz204g.exe
```

To initiate the download to my personal computer I type "sz" followed by the name of the file I want to download.

HINT It is a good idea to specify a directory on the hard drive of your personal computer where files can be automatically sent during a download. This prevents "losing" your file or inadvertently overwriting existing files. Usually you can specify a receive file for your downloads in your software setup.

```
calvin> sz pkz204g.exe
```

Once the file begins to transfer I am presented with a progress screen that indicates the data is being transferred between STEM~Net and my computer. The time it takes to transfer the file depends upon the "speed" of your modem. Because my modem only has a maximum baud rate of 4800 the download took about 15 minutes.

The file "pkz204g.exe" is now on my hard drive in a directory called C:\RECV. The extension of this file indicates that the file is self-extracting. To extract the files it contains all I have to do is type "pkz204g.exe."

HINT To prevent the files contained in "pkz204g.exe" from being "lost" I created a directory on the hard drive called C:\PK to store all the extracted files.

PKSFX (R) FAST! Self Extract Utility Version 2.04g

02-01-93

Copr. 1989-1993 PKWARE Inc. All Rights Reserved. Shareware version

PKSFX Reg. U.S. Pat. and Tm. Off.

Searching EXE: C:/PK/PKZ204G.EXE

Inflating: README.DOC -AV

Inflating: SHAREWAR.DOC -AV

Inflating: WHATSNEW.204 -AV

Inflating: V204G.NEW -AV

Inflating: HINTS.TXT -AV

Inflating: LICENSE.DOC -AV

Inflating: ORDER.DOC -AV

Inflating: ADDENDUM.DOC -AV

Inflating: MANUAL.DOC -AV

Inflating: AUTHVERI.FRM -AV

Inflating: PKZIP.EXE -AV

Inflating: PKUNZIP.EXE -AV

Inflating: PKZIPFIX.EXE -AV

Inflating: ZIP2EXE.EXE -AV

Inflating: PKUNZJR.COM -AV

Inflating: OMBUDSMN.ASP -AV

Authentic files Verified! # PKW655

PKWARE Inc.

Thank you for using PKWARE! PKWARE Support BBS (414) 354-8670

I can now use the program to unzip any files with the extension .zip.

CONCLUSION - Finding it: "Archie"

If you have had the opportunity to "explore" some ftp sites in the last few days, you are probably aware of the wealth of information that is freely available at those sites. But with literally thousands of files obtainable at FTP archives we need to know how to locate the text, graphic or software we need. In the next tutorial we will discuss a useful searching tool available through STEM-Net called "Archie." Archie is a program that allows us to find the location of specific files that we need.

Also, as you retrieve and download files to your own computer there may be some hints and tips that you feel may be valuable to the "novice" or "expert" alike. I would encourage you to contribute your suggestions or to raise any concerns you may have with the group.

PART 1: File Transfer Protocol

Tutorial 3: File searching

Tutorials 1 and 2 discussed the process involved in transferring a file from a remote FTP site to your personal computer at home or school. If you have had the chance to "visit" some ftp sites you are undoubtedly aware of the wealth of information that is available. However, finding the files we need is not always a simple task. In Tutorial 3 we will discuss a valuable searching tool called "Archie" that can help us locate the information we need. In this tutorial I will summarize some of the features of Archie and describe two sample Archie searches: one from the calvin menu and the other from the calvin prompt.

WHAT IS ARCHIE?

Archie is a program that allows users to search FTP sites for specific files. The Archie catalog subsystem contains a list of subdirectories and filenames that are available at approximately 1200 FTP archive sites. There are numerous Archie servers located on the Internet including the following:

List Of Archie Servers

Internet Address	Location
archie.au	Australia
archie.univie.ac.at	Austria
archie.uqam.ca	Canada (French)
archie.cs.mcgill.ca	Canada
archie.funet.fi	Finland
archie.univ-rennes1.fr	France
archie.th-darmstadt.de	Germany
archie.unipi.it	Italy
archie.wide.ad.jp	Japan
archie.switch.ch	Switzerland
archie.doc.ic.ac.uk	United Kingdom
archie.unl.edu	USA (NE)
archie.internic.net	USA (NJ)
archie.rutgers.edu	USA (NY)
archie.sura.net	USA (MD)

HOW TO SEARCH ARCHIE

Archie allows us to search for files at FTP sites as long as we know the name of the file or part of the desired filename. There are a variety of ways for Archie to search for files, but the most common are "exact" or "sub" searches. In an "exact" search, Archie looks for files that match exactly the filename we specify. A "sub" search matches any substring in the filename. A "sub" search allows us to search databases just by giving the archie server a keyword to look for.

EXAMPLES OF ARCHIE SEARCHES

In the following searches I have used "Archie" to locate two programs that can be useful in a mathematics class. They were "ucalc24.zip," a graphing program and "fractint.zip," a program to illustrate fractals.

The search for "ucalc24.zip" illustrates how an Archie search is done using the calvin menu. The search for "fractint.zip" illustrates accessing an archie server from the calvin prompt.

Note, though, in doing any Archie search you may have to try several Archie sites before getting a connection. Also, you may have to enter *several* search terms before your search turns up files that are useful to you.

NOTE: ANY COMMENTS ABOUT THE SESSIONS ARE INCLUDED IN BRACKETS ()

Example 1. An Archie search through the calvin menu (To access the calvin menu type "menu" at the calvin prompt. Choose item 7. Internet File Searches (Archie) and Transfers (FTP) and then item 3. Search FTP site (using Archie). The FTP Search Menu gives a variety of ways to search for a file.)

FTP Searching Menu

- 0 Show Archie Sites and Default Server
- 1 Substring Search (with default server)
- 2 Exact Search (with default server)
- 3 Substring Search (with user-defined server)
- 4 Exact Search (with user-defined server)
- 5 User-defined Search

- u Go to Internet File Search and Transfer Menu
- m Go to Main Menu
- f Send Feedback to STEM~Net

(I choose Item 3 Substring Search (with user-defined server). I was then prompted to enter the name of an Archie server and the search pattern. As well I was asked to indicate the name of a file that would contain the output of the search. This file is automatically saved to my home directory.)

Select choice and press ENTER: 3

Name of server : archie.rutgers.edu
 Substring search pattern : ucalc24.zip
 Output file : find
 [1] 28639

(To view the results of the search in the file "find" select Item m --Go to Main Menu/ Select Item 5 File/Directory Maintenance/ Select 3 View a File/

Enter the name "find." The file "find" contains the name of an FTP site and the subdirectory where the file ucalc24.zip" is located. I can now use File Transfer Protocol (FTP) to retrieve this file.)

Name of file to view : find

Host freebsd.cdrom.com

Location: /./2/SimTel/msdos/calculat
 FILE -r--r--r-- 87082 Aug 22 03:23
 ucalc24.zip
 Location: /./3/garbo/pc/math
 FILE -r--r--r-- 87348 Aug 15 16:40
 ucalc24.zip

Example 2. An Archie search from the calvin prompt (To connect to an archie server from the calvin prompt I used the "telnet" command followed by the address of an archie server. I used "archie" for login)

```
calvin> telnet archie.sura.net
```

```
Trying 128.167.254.195...
```

```
Connected to yog-sothoth.sura.net.
```

```
Escape character is '^['.
```

```
SunOS UNIX (yog-sothoth.sura.net)
```

```
login: archie
```

(After I logged in to the archie server I was given some information about the server. Note that the search type is set at "sub." NOTE: If you wish to change the search type to "exact" use the command "set search exact.")

```
Last login: Mon Nov 14 12:13:44 from comp.uark.edu
```

```
SunOS Release 4.1.3 (NYARLATHOTEP) #3: Thu Apr 22
```

```
15:26:21 EDT 1993
```

```
Welcome to Archie!
```

```
Version 3.2.2
```

SURAnet is pleased to announce the release of archie with a new version of archie software. The catalogs have been rebuilt, but we are still under construction. We have approximately 50% of the anonymous FTP servers indexed, and we are working on getting the rest incorporated, but this will take a few days.

If you need help with the interactive client type 'help' at the 'archie>' prompt. If you have any questions, please read help >>FIRST<<, then if your question was not answered send e-mail to 'archie-admin@sura.net'archie-admin. (October 19, 1994)

```
# Bunyip Information Systems, 1993, 1994
```

```
# Terminal type set to 'vt100 24 80'.
```

```
# 'erase' character is '^?'.
```

```
# 'search' (type string) has the value 'sub'.
```

(To perform the search I used the "prog" command followed by keyword "fractint")

```
archie> prog fractint
# Search type: sub.
# Your queue position: 2
# Estimated time for completion: 5 seconds.
working...
```

(After the search is completed, information is displayed indicating names of FTP sites and the subdirectories where the file "fractint.zip" is located as well as the location of other files that contain information about fractals.)

```
Host cs.dal.ca (129.173.4.5)
Last updated 10:56 14 Oct 1994
```

```
Location: /comp.archives/alt.fractals
FILE -r--r--r-- 742 bytes 19:00 9 Jul 1992
yet-another-xfractint-release
```

```
Host faui43.informatik.uni-erlangen.de (131.188.31.3)
Last updated 06:18 17 Oct 1994
```

```
Location: /mounts/epix/public/pub/atari/graphics/fractals
FILE -rw-r--r-- 206963 bytes 18:00 21 Jun 1992
fractint.arc
```

```
Host iraun1.ira.uka.de (129.13.10.90)
Last updated 02:44 23 Oct 1994
```

```
Location: /pub/x11
FILE -rw-r--r-- 1290934 bytes 18:00 26 May 1992
xfractint-1.00.tar.Z
```

```
Host slopoke.mlb.semi.harris.com (132.158.82.36)
Last updated 21:43 17 Oct 1994
```

```
Location: /pub/pc/graphics
FILE -rw-r--r-- 71424 bytes 20:00 23 Dec 1990
fractint.zip
```

(NOTE: If you want to save the results of an Archie search, email them to your STEM-Net account using the "mail" command followed by your full email address)

```
archie> mail elynch@calvin.stemnet.nf.ca
```

(To exit, I typed quit)

```
archie> quit
```

```
# Bye.
```

```
Connection closed by foreign host.
```

```
You have new mail.
```

(To review the results of the Archie search I can read the message in Pine)

```
calvin> pine
```

(From the search results I now know the location of an FTP site and the subdirectory where the file "fractint.z:" is located. I can now use File Transfer Protocol (FTP) to retrieve the file.)

SUMMARY

Tutorial 3 discussed a file searching program called "Archie." Archie is a program that can search and locate files from lists of filenames found at over 1200 FTP sites worldwide. For educators an Archie search is an efficient way to locate information, graphics, or software that is invaluable for professional and student development.

Some of the basic points covered in this tutorial can be summarized as follows:

1. There are two ways to access Archie on STEM-Net:

- (i) Through the calvin menu
- (ii) Through a direct telnet connection from the calvin prompt

2. A search can be either "exact" or "sub." Since a "sub" search matches any keyword it is probably the most useful type of search.

3. In a telnet connection login as "archie." Type "help" at the prompt anytime to get a list of commands that are available. To save the results of a search use the "mail" command.
4. Archie tells you the location of the file. To retrieve the file use File Transfer Protocol (FTP).

CONCLUSION

Part 1 of Accessing Educational Databases- File Transfer Protocol- examined the procedure involved in accessing ftp sites that are extensive databases of educational materials. Tutorials 1 and 2 featured the transfer of files from a remote ftp site to a personal computer at home or school. Tutorial 3 presented "Archie," a program that allows us to find the location of files at ftp sites.

Harris (The Computing Teacher, February 1993, 33-35) called File Transfer Protocol (FTP) Archives "electronic treasure troves" and the searching of them "electronic prospecting." All that is required to discover the "internet jewels" is a little patience and practice. In the next few days I would like for you to use the skills introduced in the tutorials to locate some "treasure" of your own.

PART 2: GOPHER

Part 2 discusses a powerful information retrieval system called "Gopher." Gopher is a menu based "tool" available to STEM-Net users that provides easy access to educational databases located anywhere on the Internet. This section is divided into 2 tutorials:

Tutorial 4: Gopher commands, Bookmarks and Booklists

Tutorial 5: Searching Gopherspace (Veronica)

=====

PART 2: GOPHER

Tutorial 4: Gopher commands, Bookmarks and Booklists

This tutorial will briefly describe what Gopher is, outline the basic steps in accessing Gopher and illustrate some useful commands and features of Gopher. As well, the tutorial will discuss "Bookmarks," a way of creating a personalized Gopher menu.

WHAT IS GOPHER

Gopher is a program that allows users to search, display and retrieve information at many Internet sites without having to know the addresses or locations. Gopher uses a menu based system to organize Internet resources including text files, educational software, FTP sites and other Gophers.

Gopher was developed at the University of Minnesota (home to the sports team "Golden Gophers") where it was originally used to distribute campus information. Today Gopher is used to "go-fer" information at hundreds of sites across the Internet.

HOW TO ACCESS GOPHER

STEM-Net users can access Gopher either through the calvin menu or the calvin prompt:

- (i) From the calvin menu. Type "menu" at the calvin prompt. Select Item 2. Internet Gopher..
- (ii) From the calvin prompt. Type "gopher" at the calvin prompt.

The first menu displayed will be the Home Gopher Server for STEM~Net. It will be similar to the following:

Home Gopher server: calvin.stemnet.nf.ca

- > 1. STEM~Net and miscellaneous messages and information/
- 2. Organizations - messages and information/
- 3. NLTA Special Interest Councils/
- 4. K-12 Curriculum and Teaching/
- 5. Cross-curriculum areas/
- 6. Post-secondary and Professional Development/
- 7. School Visits and On-line Experts/
- 8. STEM~Net Help and Training/
- 9. On-line documents and resources/
- 10. Other gophers and the Internet/

MOVING AROUND A GOPHER MENU

Moving around a gopher menu is not difficult. Use the "up/down arrow" keys to move to a menu item. Press "enter" or type the number of the item you wish to view to select an item. "Left arrow" key or "u" exits the menu and returns you to the previous level. For more information on these commands or a full list of available commands in any menu type "?."

Menu items that appear in any gopher menu have codes that identify what kind of information the item contains. These codes include:

.	text document
/	displays another menu
<?>	initiates a search
<tel>	initiated a telnet session
<PC Bin>	binary file

RETRIEVAL OF FILES

Text files

Gopher can display and retrieve any text files that you find in a menu or submenu. In the following example I have selected Item 1 (STEM~Net and miscellaneous messages and information) from the menu for the Home Gopher server for STEM~Net/ From that menu I selected Item 1. STEM~Net messages and information/ From that menu I selected a text file -- "Acceptable Use Policy."

Internet Gopher Information Client v2.0.15

STEM~Net messages and information

1. A List of Changes
 2. A Warm Welcome to Registered STEM~Net Users
 ---> 3. Acceptable Use Policy
 4. An Initial Schedule
 5. Disk Quotas
 6. Local Telephone Numbers
 7. Mission Statement and Goals
 8. Monthly Usage Quotas
 9. Passwords Must Not Be Shared

To view the file in Item 3 I press "enter." The following text appears on the screen.

Acceptable Use Policy (4k)

24%

+-----

STEM~Net ACCEPTABLE USE POLICY (Revised September, 1994)

STEM~Net is a computer network for active professional K-12 and PUBLIC post-secondary educators in the province of Newfoundland and Labrador. It provides network connectivity among these educators, access to the Internet, and specific network services. It seeks to foster intellectual exchange, to create efficient and productive approaches to collaborative activity, and to support the teaching, curriculum and professional development activities of these educators.

1. All activity on STEM~Net shall be in support of, and consistent with, the STEM~Net mission and goals. Registered users are encouraged to contribute to the STEM~Net program and to initiate special projects in Is.

+-----

[Help: ?] [Exit: u] [PageDown: Space]

To read the text file on the screen, use the "space bar" to move forward a page; "b" to move back a page; "u" or "left arrow" to exit from the text file.

To retrieve a text file there are three options available. You can:

(i) Mail the file to your email account. To do this type "m" while the file is selected, and enter your email address.

(ii) Save the file to your home directory on STEM~Net. To do this type "s" while the file is selected. Enter a new filename or accept the default filename.

(iii) Download the file to a personal computer. To do this type "D" (Uppercase D). Choose a download protocol that your telecommunications software supports. (For more information on Downloading refer to Tutorial 3).

I choose to "save" the file "Acceptable Use Policy." I typed "s" and a dialogue box appeared containing a filename (see below). Note that I can accept the filename or edit it.

```

Acceptable Use Policy (4k)                                24%
+-----+
|  STEM~Net ACCEPTABLE USE POLICY (Revised September,      1994)
|

```

STEM~Net is a computer network for active professional K-12 and PUBLIC post-secondary educators in the province of Newfoundland and Labrador. It provides network connectivity among these educators, access to the Internet, and specific network services. It seeks to foster intellectual

```

+-----Acceptable Use Policy -----+
| Save in file: Acceptable-Use-Policy
|   [Help: ^-] [Cancel: ^G]
|
+-----+

```

require the formal approval of the STEM~Net Director or his/her delegate.

2. Each STEM~Net user is responsible for the activity which transpires through use of his/her user-permit and assigned STEM~Net resources, and for security of his/her user-permit, and the proper selection and

```

+-----+
[Help: ?] [Exit: u] [PageDown: Space]

```

BOOKMARKS AND BOOKLISTS

"Navigating" Gopher involves working through a series of menus and submenus. Sometimes we find an interesting menu item far from the top menu that we will want to "visit" again. To help us find the way back Gopher allows us to create and save "Bookmarks." Gopher "Bookmarks" are much like traditional bookmarks in that they "mark" exactly where a gopher item is located. Bookmarks are then kept in a Booklist that can be displayed like a regular gopher menu.

There are four basic commands in the STEM-Net gopher server for making and saving Bookmarks. They include:

- a ... Add current item to bookmark list
- A ... Add current directory to bookmark list
- v ... View bookmark list
- d ... Delete a bookmark

The following example illustrates how to make a Bookmark and how to display a Booklist. In a Gopher session I "found" a software archives at MERIT (University of Michigan) that I wanted to mark. I moved to the archive by the following menu path:

From the Home Gopher server at STEM-Net I selected Item 10. Other Gophers and the Internet/ 3.US Gophers/ 65. US K12 Gopher/ 6. Software libraries/

The following menu for the Software Libraries was displayed:

Internet Gopher Information Client v2.0.15

Software libraries

- > 1. Software archives at MERIT (University of Michigan)/
- 2. SUMEX-AIM (Includes Info-Mac: a large collection of Mac software)/

I selected Item 1. Software archives at MERIT (University of Michigan)/. While the item was selected I typed "a". A dialogue box containing the Bookmark name appeared (See below). To accept this Bookmark and the default filename I pressed "enter."

Internet Gopher Information Client v2.0.15

Software libraries

- >1. Software archives at MERIT (University of Michigan)/
- 2. SUMEX-AIM (Includes Info-Mac: a large collection of Mac software)/

+---Software archives at MERIT (University of Michigan)

[Name for this bookmark:
 [Software archives at MERIT (University of Michigan) |
 [Help: ^-] [Cancel: ^G]

+-----+
 To view the "Bookmark Menu" or Booklist I typed "v." Note that "Software archives at MERIT (University of Michigan)" has been added to my booklist. Note also that to access any item on your booklist at any time while in Gopher type "v," select the item and press "enter." Your list of Bookmarks is your personalized Gopher menu.

Internet Gopher Information Client v2.0.15 Bookmarks

1. Search Gopher Directory Titles using U.Texas, Dallas: mathematics ../
2. Gateways to Other Gopher Servers/
3. MSDOS Archive (Merit Network, USA)/
- > 4. Software archives at MERIT (University of Michigan)

SUMMARY

In this tutorial we have discussed Gopher and some of the commands that we need to successfully navigate through "Gopherspace." Some of the basic points in this tutorial can be summarized as follows:

1. Gopher is a menu based Internet application that integrates a wide variety of resources. Gopher provides educators with access to text documents, educational software, telnet sessions, ftp sites etc.
2. Gopher can be accessed on STEM~Net through the calvin menu or the calvin prompt.
3. Oftentimes, Gopher commands are displayed on screen. To receive a full list of available commands for any menu type "?."
4. Bookmarks and Booklists allow you to mark Gopher menus or files so that you can return to them at anytime without having to go through a series of menus. Remember type "a" to add a Bookmark and type "v" to view and use your Booklist.

*****HINTS*****

While most Gopher sessions are typically initiated through the Home Server menu for STEM-Net, you can connect directly to a remote Gopher server. On STEM-Net you can do this by typing "gopher" and a site address at the calvin prompt. For example, to connect directly to the Gopher at archives.math.utk.edu I would type:

```
calvin > gopher archives.math.utk.edu
```

Similarly, while it may seem that all the menus we access in a Gopher session are on STEM-Net, we are in fact moving from one remote site to another. Sometimes we may want to know where the information in a Gopher actually originates. This information can be viewed by typing the "=" (equal sign).

CONCLUSION

Gopher is a helpful way to explore the Internet. Through just one system we can access and retrieve a wide variety of educational resources. Unfortunately, we don't always have the time to "search" through a long series of menus for the specific information that we need. In Tutorial 5 we will examine a searching tool called "Veronica." "Veronica" is to Gopher what "Archie" is to FTP but a bit more. Veronica not only searches for the information you need, but brings it to you as well.

In the meantime, if you would like to really test your Gopher skills, you might be interested in the "Internet Treasure Hunt." The treasure hunt is a monthly contest organized by Rick Gates. The Hunt files can be found on the CICNet Gopher. The address is

gopher.cic.net

Select Item 15. The Internet Hunt

PART 2: GOPHER

Tutorial 5: Searching Gopherspace (Veronica)

Tutorial 4 discussed Gopher, an Internet tool that allows users to search and retrieve information from educational databases located anywhere on the Internet. Tutorial 5 will discuss "Veronica," a program designed to enable users to locate information in Gopher without having to search a lot of Gopher sites. In this tutorial, I will outline some of the features of Veronica, illustrate a sample Veronica search and present some ideas for composing Veronica queries.

WHAT IS VERONICA

Veronica, the Very Easy Rodent-Oriented Net-wide Index to Computerized Archives, is an Internet application which allows users to find specific information in Gopher.

Veronica searches an index of titles of Gopher items and returns the search result as a Gopher menu.

HOW TO ACCESS VERONICA

Veronica must be accessed through Gopher. To access Veronica on STEM~Net, first access Gopher either through the calvin menu (type "menu," select item 2. Internet Gopher.); or, from the calvin prompt (type "gopher" at the calvin prompt).

From the Home Gopher server for STEM~Net Select

- 10. Other gophers and the Internet/
- 6. Venturing into the Internet/
- 8. Veronica: Keyword Search of CWIS Menu Entries/

HOW TO SEARCH VERONICA

The following is the menu that was displayed when I accessed Veronica. Please note that the Veronica menu, like any other Gopher menu, changes from day to day. So, the Veronica menu you receive may look quite different.

Veronica: Keyword Search of CWIS Menu Entries

1. How to Compose Veronica Queries - June 23, 1994
2. Frequently-Asked Questions (FAQ) about Veronica - July 29, 1994
3. About Veronica: Documents, Software, Index-Control Protocol/
4. Search GopherSpace by Title word(s) (via SCS Nevada <?>
5. Search GopherSpace by Title word(s) (via University of Pisa)
6. Search GopherSpace by Title word(s) (via SUNET) <?>
7. Search GopherSpace by Title word(s) (via University of Koeln)
8. Search GopherSpace by Title word(s) (via UNINETT/U. of Bergen)<?>
9. Find ONLY DIRECTORIES by Title word(s)(via SCS Nevada) <?>
10. Find ONLY DIRECTORIES by Title word(s)(via University Pisa)
11. Find ONLY DIRECTORIES by Title word(s)(via SUNET) <?>
12. Find ONLY DIRECTORIES by Title word(s)(via University Koeln)
13. Find ONLY DIRECTORIES by Title word(s)(UNINETT..Bergen <?>

From the Veronica access menu (shown above) note that Veronica offers two types of searches:

(i) Search Gopherspace by Title Words

This search will return all menu items whose titles contain the keyword(s) you are looking for. The list will consist of text files, directories, binary files, telnet connections etc.

(ii) Find ONLY DIRECTORIES by Title word

This search will return only Gopher directories that contain the keyword(s).

The Veronica screen also shows a choice of sites that can be searched. Note that in the above menu Veronica can be searched via SUNET, SCS Nevada, UNINETT etc.

Veronica is a relatively new service on the Internet and also one that is widely used. You may find that connecting to a Veronica server is not always easy. Depending on the time of day and the server you choose, you might get messages similar to getting a "busy signal" on the telephone. If you get messages like "nothing available" or "Too many connections" try another server or wait a few minutes and try again.

Also, since Veronica searches the most popular items on gopher servers, there is likely to be a great deal of duplication among the items that are displayed as the result of a search.

****EXAMPLE OF A VERONICA SEARCH****

(In the following search I used Veronica to find information for a unit in Mathematics on Statistics. From the Veronica menu shown above I selected Item 11. Find ONLY DIRECTORIES by Title word(s) via SUNET. A dialogue box opened and I entered the keywords "mathematics and statistics.")

Veronica: Keyword Search of CWIS Menu Entries

1. How to Compose Veronica Queries - June 23, 1994
2. Frequently-Asked Questions (FAQ) about Veronica -
3. About Veronica: Documents, Software, Index-Control Protocol/
4. Search GopherSpace by Title word(s) (via SCS Nevada <?>
5. Search GopherSpace by Title word(s) (via University of

+-----

Find ONLY DIRECTORIES by Title word(s) (via SUNET) <?>

Words to search for mathematics and statistics

[Cancel ^G] [Accept - Enter]

+-----

8. Search GopherSpace by Title word(s) (via UNINETT/U. of Bergen) <?>
9. Find ONLY DIRECTORIES by Title word(s)(via SCS Nevada) <?>
10. Find ONLY DIRECTORIES by Title word(s) (via University of Pisa)<?>
11. Find ONLY DIRECTORIES by Title word(s) (via SUNET)
12. Find ONLY DIRECTORIES by Title word(s) (via University of Koeln.<?>
13. Find ONLY DIRECTORIES by Title word(s)(via UNINET of Bergen <?>

(After some time the following Gopher menu was displayed. Note that all the directories in the menu contain the words "mathematics and statistics.")

Find ONLY DIRECTORIES by Title word(s) (via SUNET): mathematics and statistics

-
1. Mathematics and Statistics/
 2. Statistics & Mathematics/
 3. SUNET Applied Mathematics and Statistics (ftp site)/
 4. MAST - Mathematics and Statistics/

5. MAST - Mathematics and Statistics/
6. Mathematics and Statistics/
7. =Mathematics and Statistics=/
8. Mathematics & Statistics/
9. Mathematics & Statistics/
10. MATHEMATICS (Mathematics 640, Statistics 960)
11. Mathematics, Statistics and Modeling Bulletins/
12. Mathematics, Statistics and Modeling Bulletins/
13. Mathematics and Statistics/
14. Business Mathematics and Statistics /
15. Mathematics and Statistics/
16. Mathematics, Statistics and Simulation/
17. QA Mathematics, Computing and Statistics /
18. Mathematics and Statistics/

(I can access any item on this menu the same way I would in any Gopher menu:

Use the "up/down arrow" keys to move to a menu item. Press "enter" or type the number of the item to select an item. "Left arrow" key or "u" exits the menu and returns you to the previous level. For more information on these commands or a full list of available commands in any menu type "?."

Also, if I wish I can add the results of the search to my Booklist. To "mark" all the items in the search at once I can type "A" (uppercase A).)

COMPOSING VERONICA QUERIES

Veronica works much like any other index search, such as ERIC for example. You enter a keyword(s) that you are looking for, and Veronica returns a Gopher menu containing related information. However, you can control the way a Veronica search is done by keeping in mind the following Veronica search features:

1. The search is not case sensitive. That is, you will get the same results with "mathematics" as "Mathematics."
2. You may get better results by using more than one word in your query. In composing multi-word queries note the following:
 - (i) The and, or and not Boolean operators can be used. For example, "mathematics and statistics" -- "business or commerce"
 - (ii) The truncation symbol (*) at the END of a word is a sort of wildcard search. For example, mathematic* will search for mathematics, mathematica, mathematician, mathematical etc.
 - (iii) A Veronica server, by default, normally limits a search to the first 200 items which match your keyword(s). If you wish to change the maximum number of returns you can do so with the "-m" option. For example to request a search of 400 items relating to "mathematics" include "-m400" in your request (i.e. "mathematics -m400"). For no limit to your search returns add "-m" to your request (i.e. "mathematics -m").

SUMMARY

Veronica is a valuable Internet application that helps educators locate resources and information in educational databases worldwide. Veronica searches thousands of Gopher sites and not only finds the information but brings it back to us.

In this tutorial we have explored some of the features of Veronica and the basic commands we can use in Veronica searches. The basic points of the tutorial can be summarized as follows:

1. Veronica is an Internet application that allows STEM-Net users to search Gopher sites.
2. The result of a Veronica search is a Gopher menu of topics that match your search criteria.
3. Veronica locates resources in Gopher by searching for keyword(s) that could be contained in filenames or directory titles.

CONCLUSION

Part 2 of Accessing Educational Databases discussed GOPHER, a menu based system that allows educators to search and retrieve valuable educational materials from databases located on the Internet. Tutorial 4 examined the commands and features of Gopher that permit users to easily navigate through "Gopherspace." Tutorial 5 presented Veronica, a program that searches for files in thousands of Gopher sites and returns the results in a Gopher menu.

Currently the STEM~Net Gopher is referred to as one of the main resources of STEM~Net (Getting Started on STEM~Net training manual, 1994). Gopher provides STEM~Net users with access to and an understanding of the scope of the educational resources that are available on the Internet. So, "whether you are a power user or network neophyte this rapidly evolving tool [Gopher] has much to offer" (Lynn Ward, UIUC Newsletter, 6(1)).

PART 3: World Wide Web (WWW)

Part 3, World Wide Web (WWW), is the third part of a three part series on "Accessing Educational Databases." Part 1 discussed File Transfer Protocol (FTP), a program that allows users to go to FTP sites and retrieve files. Part 2 discussed Gopher, a menu based program, that provides easy access to educational databases. This section will discuss the World Wide Web (WWW), the newest and fastest growing service on the Internet. This section will be covered in one tutorial:

Tutorial 6: Lynx and the World Wide Web

=====

PART 3: World Wide Web (WWW)

Tutorial 6: Lynx and the World Wide Web

The World Wide Web (WWW) originated in CERN (the European Laboratory for Particle Physics) and is intended to provide one access method for all Internet services. Two of the "tools" currently being developed for the WWW are Lynx and Mosaic. Mosaic is a graphical interface that not only displays text files, but also displays images, sounds and even animations. Mosaic should become available to STEM~Net users later this school year. Lynx, which can display and download images, is already available to STEM~Net users.

This tutorial will briefly describe the World Wide Web and outline how to use Lynx to browse the services and information available in the STEM~Net home page. As well, the tutorial will illustrate how to connect to other WWW servers using a URL or Uniform Resource Locator.

WHAT IS THE WORLD WIDE WEB (WWW)

The World Wide Web is an Internet application based on a technology called hypertext. Hypertext is defined as text with built in links to other text. To access the World Wide Web you must run a browser program, such as Lynx. Lynx displays documents in hypertext markup language (HTML) and can access documents from other sources including Gopher and FTP. As well, Lynx can be used to download binary files including images and software.

HOW TO ACCESS THE WORLD WIDE WEB (WWW)

Many sites on the Internet create and maintain "home pages." The STEM~Net home page is a hypertext display with links to many services and information including the STEM~Net Gopher and FTP site.

To display the STEM~Net home page and to access WWW, you can:

(i) Access the calvin menu (type "menu") and Select 4. Browse the World Wide Web (WWW)

(ii) At the calvin prompt type "lynx"

The following is what you will most likely see when the STEM~Net home page is displayed: NOTE: The pine editor cannot display bold or highlighted text. I have used ** ** to mark bolded text

STEM~Net (p1 of 3)

WELCOME TO STEM-NET'S WEB SERVER

STEM~Net Logo

STEM~Net is an educational computer network for professional K-12 and public college educators in Newfoundland and Labrador. If you have some questions about STEM~Net, please read our ****Questions and Answers.**** This should answer most of your questions. If you need assistance, here are the people you should contact:

- * Director - Harvey Weir (hweir)
- * Program - Nancy Parsons-Heath **** (nancy) ****
- * Training - Frank Shapleigh (frank)
- * Help - Dale Fraser **** (dale) ****
- * Operations - Leo Harlick (leo)
- * New passwords, class project accounts, etc. - Deanna Janes (djanes)

Here is a list of useful (I hope!) WWW sites organized by ****subject.****

-- press space for next page --

Arrow keys: Up and Down to move. Right to follow a link; Left to go back.

H)elp O)ptions P)rint G)o M)ain screen Q)uit /=search D)ownload

MOVING AROUND THE STEM-NET HOME PAGE

When Lynx displays a HTML page you will notice that some of the text is displayed as "bold," while one word or phrase is "highlighted." The "bold" text is a link to another document, while the "highlighted" text is the currently "selected" link. The "up/down arrow" keys are used to move from one link to another. The "right arrow" key or "enter" key is used to view a "selected" link. The "space bar" moves to another page and the "left arrow" key returns you to the previous link. You will also notice that the available commands for the screen are displayed at the bottom of the screen. Type "h" to get more information about the commands.

SETTING PERSONAL OPTIONS FOR LYNX

Before you "travel" any further into Lynx, you may wish to set a few options to configure Lynx for your personal use. One option you may wish to set is your email address. To access the options menu type "o" The following menu will be displayed:

```
Options Menu
E)ditor                : /usr/local/bin/pico
D)ISPLAY variable     : NONE
B)ookmark file        : .lynx_bookmarks.html
F)TP sort criteria    : By Filename
P)ersonal mail address : elynch@calvin.stemnet.nf.ca
S)earching type       : CASE INSENSITIVE
C)haracter set        : ISO Latin 1
V)l keys              : OFF
e(M)acs keys          : ON
K)eypad as arrows or  :
Numbered links        : Numbers act as arrows
U)ser mode            : Novice
```

Select first letter of option line, '>' to save, or 'r' to return to Lynx.
Command:

To enter your email address type "p" (personal mail address).

You will be presented with the following prompt:

"Please enter a valid internet mail address: "

Enter your full email address.

Press "enter." To save the changes and return to the STEM-Net home page type

">"

NAVIGATING THROUGH THE WORLD WIDE WEB (WWW)

Just as in Gopher the best way to learn about the WWW is to just jump in and explore. The following example of a typical "browse" through the Web will illustrate how to move from one link to another, how to display and retrieve text files, and how to download binary files.

****NOTE: ANY COMMENTS ABOUT THE SESSION ARE INCLUDED IN BRACKETS****

DISPLAYING AND READING A TEXT FILE

(While on the STEM~Net home page, I moved the down arrow key until the "bold" phrase ****STEM~Net User Questions**** was "highlighted." To activate the link I pressed "enter." The following text was displayed:

STEM~Net Questions and Answers (p1 of 7)

What is STEM~Net?

STEM~Net is being developed as a computer network for K-12 and public college educators in Newfoundland and Labrador. By assisting these educators in meeting their teaching, curriculum and professional development needs, STEM~Net aims to support their ongoing efforts to improve student achievement in this province.

What Type of program and services will STEM~Net provide?

From the beginning, STEM~Net will provide electronic mail, newsgroups, library and Internet services. Work will begin immediately on developing a variety of bulletin board services and "on-line" conferences, and a range of activities related to teaching and curriculum. These activities will be as wide-ranging as the imaginations of the teachers and resource people involved, and may include dynamic test item banks, on-line newsletters, "Ask an Expert" and class-based networking projects similar to the National Geographic KidsNet and the AT&T Learning Circles, just to list a few

-- press space for next page --

Arrow keys: Up and Down to move. Right to follow a link; Left to go back.

H)elp O)ptions P)rint G)o M)ain screen Q)uit /=search D)ownload

(Note: To read the text on the screen use the "space bar" or "+" to move forward a page, "b" or "-" to move back a page, and "left arrow" to display the previous link.)

RETRIEVING A TEXT FILE

(The file "STEM~Net User Questions" has over 7 pages of questions and answers about STEM~Net. I decided to retrieve the file for future reference. While the file was displayed I typed "p" (print). The following menu is displayed outlining the options for retrieving the file:)

Lynx Printing Options

PRINTING OPTIONS

There are 300 lines, or approximately 7 pages, to print.

You have the following print choices

please select one:

Save to a local file

Mail the file to yourself

Print to the screen

Locally attached printer

Commands: Use arrow keys to move, '?' for help, 'q' to quit, '<-' to go back

Arrow keys: Up/Down to move. Right to follow a link; Left to go back

H)elp O)ptions P)rint G)o M)ain screen Q)uit /=search D)ownload

(I selected "Mail the file to yourself" and the prompt "Please enter a valid internet mail address:" and my email address, as set in the options, is displayed (see menu below))

Lynx Printing Options

PRINTING OPTIONS

There are 300 lines, or approximately 7 pages, to print.

You have the following print choices

please select one:

Save to a local file

Mail the file to yourself

Print to the screen

Locally attached printer

Commands: Use arrow keys to move, '?' for help, 'q' to quit, '<-' to go back

Arrow keys: Up/Down to move. Right to follow a link; Left to go back

H)elp O)ptions P)rint G)o M)ain screen Q)uit /=search D)ownload

PRINTING Please enter a valid internet mail address:
 elynch@calvin.stemnet.nf.ca

(I pressed "enter" to accept and the file "STEM~Net Questions and Answers" was mailed to my email account on STEM~Net. I pressed the "left arrow key" and was returned to the STEM~Net home page.)

RETRIEVING A BINARY FILE

Just as in Gopher, a binary file cannot be displayed in Lynx. When you "select" a binary file you will be asked if you wish to "d" - D)ownload the file or "c" - C)ancel. In the next example I downloaded a binary image file "BIGPINK.GIF" that I found by the following "path" -- From the STEM~Net home page I moved the arrow keys until the word "nancy" was highlighted. I activated this link by pressing "enter." From the next page I choose "graphics" --- Then "Images"/ "Mandelbrot set images." The following is a list of the files in the "mandel" directory:)

mandel (p1 of 4)

All images in this directory are off the net; some subdirectories contain series by people here.

INDEX OF /MANDEL/

- * BIGPINK.GIF (754191 bytes)
- * H174985.gif (149125 bytes)
- * MM_ These .jpg images are off the net.
- * SECRET.gif (217600 bytes)
- * Snapshot.gif (176075 bytes)
- * amoeba These .gif images are by Scott Yost.
- press space for next page --

Arrow keys: Up and Down to move. Right to follow a link; Left to go back.
 H)elp O)ptions P)rint G)o M)ain screen Q)uit /=search D)ownload

(I selected the file "BIGPINK.GIF" and the following question was presented "This file cannot be displayed on this terminal: D)ownload, or C)ancel" I choose "d" (Download). The following options menu was displayed: (Note: The file could be saved to my STEM~Net account ("save to disk") or downloaded directly from Lynx to a personal computer.))

Lynx Download Options

DOWNLOAD OPTIONS

You have the following download choices

please select one:

Save to disk

Use Kermit to download to your computer

Use Zmodem to download to your computer

Commands: Use arrow keys to move, '?' for help, 'q' to quit, '<-' to go back

Arrow keys: Up/Down to move. Right to follow a link; Left to go back.

H)elp O)ptions P)rint G)o M)ain screen Q)uit /=search D)ownload

(I decided to download the file using zmodem (Option 3). A prompt containing the filename "BIGPINK.GIF" appeared. (Note that the filename can be accepted or edited.)

Lynx Download Options

DOWNLOAD OPTIONS

You have the following download choices

please select one:

Save to disk

Use Kermit to download to your computer

Use Zmodem to download to your computer

Enter a filename: BIGPINK.GIF

Commands: Use arrow keys to move, '?' for help, 'q' to quit, '<-' to go back

Arrow keys: Up/Down to move. Right to follow a link; Left to go back.

H)elp O)ptions P)rint G)o M)ain screen Q)uit /=search D)ownload

(I choose to accept the filename "BIGPINK.GIF" and pressed "enter" to start the download. Note that "downloading" a file to a personal computer is a process that varies with different telecommunications software packages. Check the documentation included with your software for more information on downloading. As well, you can refer to Tutorials 1 and 2 of this series for some basic points on downloading.)

CONNECTING TO OTHER WWW SITES

In Lynx, you can connect to other WWW sites either through the STEM-Net home page or by using a URL or Uniform Resource Locator.

THROUGH THE STEM-NET HOME PAGE

The STEM-Net home page has an extensive list of WWW sites organized by subject. To access the list move to the bottom of the STEM-Net home page (page 1) and select **"subject"**. The following list of topics is displayed: (Any of these can be selected by moving the "up/down" arrow key and pressing "enter")

WWW Sites by Subject (p1 of 6)

Here is a list of WWW sites for different subjects.

Agriculture
 Archaeology
 Architecture and Design
 Art
 Astronomy and Astrophysics
 Biology
 Business and Finance
 Computers

-- press space for next page --

Arrow keys: Up and Down to move. Right to follow a link; Left to go back.
 H)elp O)ptions P)rint G)o M)ain screen Q)uit /=search D)ownload

CONNECTING TO A WWW SITE USING A UNIFORM RESOURCE LOCATOR (URL)

A Uniform Resource Locator or URL is the path or link to a document or resource on the Internet. The first part of a URL specifies the method of access including FTP, Gopher, and Telnet. The second is the address of the remote computer where the resource is located. For example the URL,

<http://www.ksc.nasa.gov/ksc.html/>

points to the home page of the Kennedy Space Center.

(In the next example, I connected to the ERIC educational database in New York. As well, since this is a site I will "visit" again I decided to "Bookmark" it, as in Gopher.

This exercise was done from page 1 of the STEM~Net home page.

I typed "g" G(o) and entered the following address:

<http://eryx.syr.edu/COWSHome.html>

The home page for ERIC was then displayed:)

AskERIC Home Page (p1 of 3)

AskERIC: _____ AskERIC: Key Areas

[LESSONS] Lesson Plans [GOPHER] AskERIC's Collection

[ABOUT] About AskERIC [SEARCH] Search AskERIC

_____ AskERIC: Sun Related Information

-- press space for next page --

Arrow keys: Up and Down to move. Right to follow a link; Left to go back.

H)elp O)ptions P)rint G)o M)ain screen Q)uit /=search D)ownload

MAKING A BOOKMARK

(Before I proceeded any further into the ERIC database I decided to make a "Bookmark" for this URL. To do so I just typed "a" (add bookmark). I was then prompted to "Save D)ocument or L)ink to bookmark file or C)ancel? (d,l,c)" I choose "d". This saved the URL for the ERIC database to a personalized bookmark file. To access the Bookmark at any time while in Lynx just type "v" (as in Gopher). Note in the following illustration ERIC has been added to my Bookmark file:)

Bookmark file

You can delete links using the new remove bookmark command. it is usually the 'R' key but may have been remapped by you or your system administrator. This file may also be edited with a standard text editor. Outdated or invalid links may be removed by simply deleting the line the link appears on in this file. Please refer to the Lynx documentation or help files for the HTML link syntax.

1. AskERIC Home Page

SUMMARY

In the previous examples, we have discussed some of the features of Lynx that allow STEM-Net users to successfully navigate through the World Wide Web. Some of the basic points covered in this tutorial can be summarized as follows:

1. The World Wide Web (WWW) is an Internet application that provides one access method to all Internet services and resources.
2. Lynx is a "browser" program that allows users to access the WWW.
3. Lynx is a full screen browser that can display hypertext documents containing links to other files on the local system as well as files and resources located at remote sites on the Internet.
4. Lynx commands are normally displayed on screen. To access online help while viewing any document type "?" or "h."
5. Text files can be displayed and read in Lynx. As well, text files can be mailed to an email account on STEM-Net or downloaded to a personal computer.
6. Binary files cannot be displayed in Lynx, but they can be saved to a home directory on STEM-Net or downloaded to a personal computer.
7. Lynx allows users to mark frequently "travelled" links by storing them in a personal "Bookmark file." To create and save a Bookmark in Lynx type "a" and to view and use your Bookmarks type "v."

ADDITIONAL FEATURES OF LYNX

Several other keyboard commands in Lynx that will help in navigating the World Wide Web include:

- (i) The "backspace" or "delete" key will give you a history or a list of all the files you have visited in a session.
- (ii) The "m" key will take you back to the starting document.
- (iii) The "i" key will give you an index of documents.

- (iv) The "f" or "s" key will initiate a search. The "f" command will find keyword(s) in the current document. The "s" command initiates searching of index documents for keyword(s).
- (v) The "=" key shows information about the current document or link.
- (vi) The "c" key allows you to send a mail message to the owner of the current document.
- (vii) The "z" key cancels a transfer in progress.

You can connect directly to a WWW site without going through the STEM-Net home page if you know the URL of the site. To do so type "lynx" followed by a Uniform Resource Locator or URL. For example, to connect directly to the home page of the Kennedy Space Centre you would type:

```
lynx http://www.ksc.nasa.gov/ksc.html
```

Be careful to type a URL "exactly" as shown. The system is case sensitive and often a failure to connect is the result of a "typing" error.

CONCLUSION

Part 3 of Accessing Educational Databases discussed the World Wide Web, an Internet application that provides educators with one access method for all Internet services and resources. STEM-Net users can access the Web through Lynx, a "browser" that can display hypertext documents.

Hypertext documents are also used with multimedia to create hypermedia documents. When graphical browsers, like Mosaic, become available to STEM-Net users, they will be able to tap into the Internet and its resources with "graphical" ease.

Appendix D

Evaluations

From: elynch@calvin.stemnet.nf.ca Thu Dec 8 10:20:11 1994
Date: Thu, 8 Dec 1994 10:20:10 -0330 (NST)
From: Edith Lynch <elynch@calvin.stemnet.nf.ca>
To: el-question2@calvin.stemnet.nf.ca
Subject: Evaluation 1

Dear Educators,

Let me, first of all, thank you for your continued cooperation and support in my study of STEM~Net. Your response has been very encouraging.

To date, I have sent you three tutorials that discussed "File Transfer Protocol (FTP)." Before I send the remaining tutorials, I would appreciate your taking the time to complete the following short evaluation of PART 1. Since the tutorials in this study may be used on the STEM~Net Gopher, your input will be invaluable in making sure the tutorials meet the needs of STEM~Net users.

NOTE: To reply to this message type "r" (reply) and be very careful to answer ***NO*** when asked to reply to all recipients. Use your arrow keys to move through the text. Type your answers in the space provided.

1. Do you feel that the instructions in Tutorial 1 were clear?
2. Do you feel that the instructions in Tutorial 2 were clear?
3. Do you feel that the instructions in Tutorial 3 were clear?
4. Were you able to use the instructions to retrieve files from an FTP site?
5. Were you able to use the instructions to successfully "download" files to a personal computer?
6. Were you able to use the instructions to "unzip" or decode files on a personal computer?

7. Indicate how much time was needed (on average):

(i) to read the tutorials

(ii) to carry out the instructions

8. Do you feel the tutorials have improved your understanding of File Transfer Protocol (FTP)?

5. Feel free to comment on the tutorials:

Thank you,
Edith Lynch

From: elynch@calvin.stemnet.nf.ca Fri Dec 16 09:36:05 1994
Date: Fri, 16 Dec 1994 09:36:04 -0330 (NST)
From: Edith Lynch <elynch@calvin.stemnet.nf.ca>
To: el-question2@calvin.stemnet.nf.ca
Subject: Evaluation 2

Dear Educators,

In the past few weeks I have sent you 5 tutorials that have discussed some of the "tools" available on STEM~Net that permit us to access educational databases and retrieve valuable educational materials.

Part 1 of this three part series discussed File Transfer Protocol (FTP). In the section on FTP we outlined the process involved in searching and retrieving information from remote FTP sites and "downloading" this information to a personal computer at home or school. Your comments and evaluation indicated that you found the tutorials informative and useful. But more importantly, you indicated ways to improve the tutorials and raised issues that will help to make sure STEM~Net meets the needs of its users.

In Part 2 we examined Gopher, a more "friendly" way of accessing educational databases. The tutorials in this section covered Gopher commands and features and discussed Veronica, a Gopher search tool.

Before I send the remaining tutorial in the next section, World Wide Web (WWW), I would appreciate it if you could complete the following short evaluation of Part 2. Thank you for your continued cooperation and support. While I know this is a very busy time of year for you, I look forward to your replies.

NOTE: To reply to this message type "r" (reply) and be very careful to answer ***NO*** when asked to reply to all recipients. Use your arrow keys to move through the text. Type your answers in the space provided.

1. Do you feel that the instructions in Tutorial 4 were clear?
2. Do you feel that the instructions in Tutorial 5 were clear?
3. Did you "Download" any files from Gopher to a personal computer?

4. Were you able to use the Bookmark feature of Gopher to set up Bookmarks and a personalized Booklist?
5. Have you used "Veronica" to search Gopherspace?
6. What features of Gopher have you found particularly useful?
7. Indicate how much time was needed (on average) to read the tutorials?
8. Do you feel the tutorials have improved your understanding of Gopher? If so, how?
9. Feel free to comment on the tutorials?

Thank you,
Edith Lynch

From elynch@calvin.stemnet.nf.ca Wed Dec 21 17:56:58 1994
Date: Wed, 21 Dec 1994 17:56:57 -0330 (NST)
From: Edith Lynch <elynch@calvin.stemnet.nf.ca>
To: el-question2@calvin.stemnet.nf.ca
Subject: Evaluation 3

Dear Educators,

Let me, first of all, take this opportunity to express my appreciation for your continued support in my study of STEM~Net. Your response to the study has been most encouraging. Throughout the study, you have provided information that is invaluable not only to me in completing my thesis but also in determining what services and programs can best meet the needs of educators in Newfoundland and Labrador.

To date, I have sent you a series of 6 tutorials that have discussed some aspects of the process involved in accessing educational databases and retrieving materials that are beneficial for professional and student development. Tutorials 1, 2, and 3 discussed File Transfer Protocol (FTP), a program that allows educators to search and retrieve information from FTP sites all over the Internet. Tutorials 4 and 5 examined Gopher, a menu based program that gives educators a way to access educational databases without even knowing addresses or locations.

Tutorial 6 described the newest and undoubtedly the fastest growing resource on the Internet -- the World Wide Web (WWW). This tutorial focused on Lynx, a full screen "browser" that gives users on STEM~Net access to educational resources found on the World Wide Web. While I realize that this is indeed a busy time of year, I would appreciate your taking the time to complete the following evaluation of Tutorial 6. To help ensure that you have ample opportunity to read and evaluate the tutorials, the STEM~Net support staff has added an extra 5 hours to your time usage quota for both December and January.

My best wishes to you and yours for a Merry Christmas and a Happy New Year.

NOTE: To reply to this message type "r" (reply) and be very careful to answer *****NO***** when asked to reply to all recipients. Use your arrow keys to move through the text. Type your answers in the space provided.

1. Do you feel that the instructions in Tutorial 6 were clear?
2. Indicate how much time was needed (on average) to read the tutorial?
3. Were you able to successfully navigate the "Web" using Lynx?
4. Did you use Lynx to "download" files?
5. Were there any features of Lynx that you would like to know more about?
6. Feel free to comment on the tutorial.

Thank you,
Edith Lynch

Appendix E
Profile of Group Members

Table E-1

Profile of Members of Small Group (N = 32)

Variable	Sub-Group	Number of Respondents
Grades Taught	Coordinators	7 (22%)
	Grades 9-12	16 (50%)
	Grades K-8	9 (28%)
Number of Courses in Math Education	0 Courses	17 (53%)
	1 or 2 Courses	12 (38%)
	More than 2 Courses	3 (9%)
Number of Computer Courses	0 Courses	16 (50%)
	1 or 2 Courses	11 (34%)
	More than 2 Courses	5 (16%)
Number of STEM-Net Training Courses	0 Courses	13 (41%)
	1 or 2 Courses	12 (37%)
	More than 2 Courses	7 (22%)

Table E-2

Mean Ranks of Knowledge of and Skill in Using each Network Activity for the Small Group (N = 32)

Network Activity	Knowledge	Skill
Electronic Mail	1.69	1.66
Computer Conferencing	3.53	3.69
File Transfer	2.56	2.47
Access to Databases	2.63	2.53
Bulletin Boards	2.88	2.84
Newsgroups	2.25	2.31

Table E-3

Mean Ratings and Rank of Network Activities of the Small Group (N = 32)

Network Activity	Mean Rating	Rank
Electronic Mail	2.16	1
Computer Conferencing	4.28	5
File Transfer	3.31	3
Access to Databases	2.31	2
Bulletin Boards	4.91	6
Newsgroups	4.16	4



