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A qualitative analysis of ten secondary students' perceptions of four classes of online services and their ability to integrate them to develop a multidimensional information search strategy

Schooler, Douglas Keith, Ph.D.

The Ohio State University, 1989
A Qualitative Analysis of Ten Secondary Students' Perceptions of Four Classes of Online Services and Their Ability to Integrate Them to Develop a Multidimensional Information Search Strategy

DISSEDITION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

Douglas Keith Schooler, B.S.Ed., M.Ed.

* * * * *

The Ohio State University
1989
To My Wife, Kristy
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Minor Field: Science Education
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Chapter I

INTRODUCTION

Presented herein is a natural experiment in curriculum intervention. The nature of the project was a qualitative, interactive-reactive inquiry into the effects that exposure to four classes of computerized online services had upon a group of ten secondary students' information search strategies. The study was conducted during the entire second semester of the 1985-1986 school year, and departs from much classroom research in that its data collection sampling units were not days or class periods, but rather four, much longer cycles of approximately a month long each. Taking an extended and in-depth look at students' use of online resources, the central issues of this research project were concerned with determining the answers to four basic questions:

1. Prior to the curricular intervention, how did secondary students search for information in response to the demands of school (i.e. what were their search strategies)?
2. What were students' perceptions of, and affective responses to, intense exposure to four classes of online services (Knowledge Index (DIALOG), The Source, The Ohio State University's Library Control System (LCS) and Computerized Bulletin Board Systems (CBBS's))?

3. In what ways did exposure to online information searching alter the students' search strategies?

4. Were students able to integrate multiple online services with traditional offline sources to provide a search strategy superior to one conducted offline alone?

GOALS

The research began with the premise that students are active, systematic and purposeful learners of language and constantly negotiate and renegotiate its meaning through personal experiences (Britton, 1970). This is true whether the language is verbal, or generated on a computer monitor. Lindfors (1981) referred to the young learner as "an active observer, comprehender, questioner, producer, explorer, hypothesis-maker, tester and reviser." How learners design a strategy to seek out, obtain and organize information is not highly overt to the outside observer. Therefore the first goal of the research was to obtain baseline information from the participants regarding how they approached the task of information acquisition in the
context of meeting school demands for papers, projects or presentations. Through an interviewing process, students both verbally described and drew the search strategies that they would employ to seek out new information of an educational nature.

The second goal of the research was to provide the participants with instruction in word processing and the technical aspects of microcomputer telecommunications. This included training in the operation of a modem and telecommunications software.

The third goal was to sequentially expose students to a representative sample of each of four primary types of online computer resources with particular attention paid to how, and to what degree, students would integrate among the four services below to obtain needed information.

3. A bibliographic retrieval system, Knowledge Index (a subset of DIALOG).

The fourth goal was to qualitatively record, over time, the participants' reaction to online information retrieval and to gather data on how their initial search strategies
evolved from their originally described baselines as a consequence of exposure to online technology.

The fifth goal was to extrapolate grounded theory on the changing effect, if any, that intensive exposure to online telecommunications technology had upon students' information search, retrieval and organizational strategies.

**SCOPE AND LIMITATIONS**

Firstly, the natural experiment described herein dealt with a single instance of semester-long curriculum intervention on a population of ten secondary students. It did not take into account any of the following parameters: age, sex, academic performance, socio-economic status, ethnic/racial background nor, geographic location, except to state that the participants demonstrated great diversity along all these parameters, both demographic and academic. No attempt is made to generalize the findings of this research to other classroom environments, nor are any educational prescriptions presented. The study is presented as one case of the successful implementation of an intensive computer telecommunications environment and an analysis of its resultant effect upon the participants' information search strategies. The study is left to others to determine its broader meanings and usefulness.
Secondly, the principal researcher in this study alternated between the research role and that of the teacher himself. Recognized as a potential limitation, special steps were taken in the design of the study to ensure the integrity of data collection, reduction and analysis. Relevant data was collected from over eight sources, in part, to guarantee a very high degree of data redundancy and to provide strong triangulation. In addition, a videotape record was made of the entire classroom proceedings providing a concrete audiovisual record to further ensure the integrity of the research.

Lastly, this research attempted to present to students not a single class of online service, but four, with varying, and largely unresearched educational import. At the time of the study, there was found to be a severe paucity of research literature in the education field concerning secondary students’ use of any online service. The majority of work in this area is contained in the library science literature which is reviewed in Chapter Two. There was no research at all that dealt with the integration of multiple online sources with traditional offline sources of information.

For the purposes of preparing an earlier monograph on telecommunications the author performed an exhaustive literature review and reported that only the computer
hobbyist-oriented popular press had dealt extensively with microcomputer telecommunications, but then only as a new technology, not within an educational context (Schooler, 1984). As a result, certain design and curricular decisions were made without benefit of a large body of prior research. Lastly, while it is acknowledged there is a large body of research on the general topic of problem-solving, it was judged to be largely tangential to this work and is not exhaustively reviewed. This decision was made on the basis that the research concerned itself with whether students' search strategies were altered by online technology, not how students broadly solve problems by developing a search strategy in the first place.
DEFINITION OF TERMS

A number of terms will be used repeatedly throughout this document and are defined within their contextual meanings as follows:

1. BIBLIOGRAPHIC DATABASE SERVICE: A commercial, online service offering keyword searching of bibliographic information on a wide range of subjects. Examples include: DIALOG, BRS, NewsNet and Orbit.

2. CARRIER-SERVICE: Also called a "packet-switching network", this is a data communications network that enables one to connect to a distantly-located host computer, via a local telephone number without incurring normal, long-distance telephone charges.

3. COMPUTERIZED BULLETIN BOARD SYSTEMS (CBBS'S): Online system, usually small, operated by a private individual that includes electronic mail, games, file upload/download and a "bulletin board" area for members to post messages. Most do not charge for access.

4. CONNECT-TIME: Time, measured in minutes, that a connection is maintained to another computer system. Connect-time is generally how an online service measures the monetary charge levied against a member for using the service.
5. **DATABASE**: An organized collection of related information (data) stored within a large computer that is accessible, given certain restrictions, by other computers via telephone lines.

6. **DOWNLOAD**: To transmit data from a mainframe computer to a microcomputer. Downloading is, of course, the opposite of uploading.

7. **ELECTRONIC MAIL (E-MAIL)**: A system for electronically sending private communications and/or files to other's "mailboxes" (electronic addresses) contained within an online system.

8. **INFORMATION UTILITY**: A massive collection of disrelated online databases and other computing services such as electronic mail, games, teleconferencing, etc. stored on one or more mainframe computers. Examples of companies that are termed information utilities would be CompuServe, The Source and Delphi Inc. Such companies offer their computer's resources to the computer-using public via telephone lines for a fee based upon the time the user spends connected (online) to the system.

9. **MAINFRAME**: A very large, non-portable computer that operates at extremely high speed and possesses an enormous memory capacity.

10. **MICROCOMPUTER**: A small, generally portable computer of restricted memory and speed. Examples would be Apple IIe's, Macintosh and IBM-family PC's.
11. **MODEM**: The term "modem" is derived from a hybridization of the terms "MOdulator" and "DEModulator". A modem converts (or modulates) the electrical data coming from a computer into an acoustic signal which can be transmitted over phone lines to another computer anywhere in the world. At the receiving end, another modem modulates the acoustic signal back into electrical form so the receiving computer can understand the data being transmitted to it.

12. **ONLINE**: Connected to a network or host computer system. When a microcomputer establishes a telephone linkage to another remotely situated computer, it is said to be "online".

13. **ONLINE SEARCH STRATEGY**: The sequence of keywords (descriptors) that are entered at the keyboard to locate information stored in an online database.

14. **REAL-TIME**: Communication between two or more people occurring while all are online simultaneously. Contrast with sending mail to another's electronic address where it will wait, without regard to time, for the recipient to access it.

15. **SIG (Special Interest Group)**: The section of an online service that provides a messaging system, storage area for members' files and a conference area for use by members who share a particular interest.
16. SYSOP (System Operator): The person in charge of managing a SIG or Computerized Bulletin Board System (CBBS).

17. TELECOMMUNICATION(S): The transmission of information (data) from one computer to another via telephone lines.

18. UPLOAD: To transmit data from a microcomputer to a larger mainframe computer.

THE IMPETUS DRIVING THE RESEARCH

"Any sufficiently advanced technology is indistinguishable from magic."

-Arthur C. Clarke

The Information Society is the evolutionary outcome of the progressive development and decentralization of computing technology and communications technology (Vaughan, 1982). Its basis lies in the technical ability to substitute symbolic electrical information for printed, visual, audible or other manifestations of physical information, and transmit it at near light-speed via electronic media. Its very nature defies physical boundaries. The ability to access and manipulate information will be one of the pivotal issues involved in the progressive evolution of our society as we move out of the industrial era and into the electronic. In this writer's opinion, the isolated, protected and highly conservative institutions we call public schools are, in their current form, on the verge of social and academic
obsolescence. Instead of leading, schools have always followed. Schools derive the benefit of society's technological advancements years after business and industry. The time may have come to stop thinking of schools as having physical boundaries. If schools are ever going to have a chance at leading the evolution of society instead of continuing to reflect their ancestral roots, we might begin to view a school's walls as functioning best to simply keep out inclement weather. Students have an ever-increasing need for exposure to the global, communication-oriented mindset that is going to dominate their adult lives as a result of explosively expanding electronic technology.

It may be argued that the tiny, constantly out-of-date public school library is on its last legs unless it can move to acquire online connections to superior resources. Containing an ever-smaller subset of available published works, public schools will never receive the financial backing necessary to have first class printed, or audio-visual material collections in their libraries.

Conventional libraries are, by their very nature, limited collections of information, accessible by a limited number of people within a limited geographic area. Their collections of data are manifested in the rapidly dated and expensive form of ink on paper. Rarely, if ever, does a
patron have access to all that is known about the subject that he or she is interested in. Governed by space and economic limitations, libraries must be content with holding only a very small subset of all information available to them. This author is concerned that we are continuing to seriously handicap our students by not researching the notion of connecting them with the sources of information they need and deserve.

Let us consider the electronic alternative. For years, businesses, industry and those associated with higher education have been able to tap into major information services such as DIALOG or Bibliographic Retrieval Service (BRS). With these services they can search with computer-assisted speed through close to 95% of the collected body of published human writing from the past fifteen years. Even if a physical library existed somewhere in the world that rivaled that quantity of current information, how many public school students could ever hope to visit it?

Online retrieval of documents is far from being all that is available to the modem-equipped microcomputer. Electronic mail, teleconferencing, interactive educational games, direct access to the UPI and AP news services and consumer buying services are just a small fraction of the services available online to the education community. Just
because we, as students of a less electronically advanced
time, had to endure the trials and tribulations of small
libraries and manual typewriters is certainly no reason to
deny the power of online databases and word processors to
our students or to ourselves now. We must grow with our
students, providing as many opportunities for them as
possible. For if we do not lead, then surely we will be
led.

THE HISTORICAL PERSPECTIVE

In order to clearly understand where we are now,
consider the history of computers in schools. During the
infancy of educational computing, the most common systems
were not true computers in the current sense, but rather
were nothing more than dumb terminals which connected
multiple users to a remotely situated mainframe via
time-sharing. These so-called "dumb" terminals lacked any
internal computing ability. They were simply extensions of
the larger mainframe. They were connected to the host
computer by existing phone lines. This allowed the
computing educator to enter a program at a terminal, upload
to a mainframe, have it processed and the results quickly
delivered back, or downloaded, to their teletype.

Changing all of this was our nation's drive to place a
man on the moon by the end of the 1960's. It produced some
truly remarkable technological spin-offs. The development
of microcomputers are the perfect case in point. The Apollo missions necessitated light, compact and self-contained on-board computers to handle a myriad of navigational and maintenance tasks. In order to achieve that goal, electrical engineers made great strides toward the microminiaturization of electronic components. Gone is the day of the temperamental vacuum tube. Tiny wafers of silicon have now reduced the size of the computer to that of an ordinary typewriter, and at the same time, improved speed and efficiency. Thus, the stand-alone, portable microcomputer was born. Seeing the financial and logistic benefits to microcomputers, many schools disconnected their phone lines and their teletypes were relegated to the district warehouse and the self-contained micro became the educational standard.

The preceding illustrates a basic irony in educational computing and partly defines one facet of the problem dealt with herein. When the educational community saw that a microcomputer could process a BASIC program all by itself, it also saw no further use for the data-transmitting telephone lines to which the computers were linked. We were severely myopic in never seeing the link to the remote mainframe in its proper perspective. Business and industry were quick to utilize computer telecommunications, but education missed the boat entirely. An isolated
microcomputer is like a highly literate individual being stranded on an uninhabited desert island. Without others of one's kind to communicate ideas with, much of what we call human intellect is useless. Similarly, the microcomputer, however intrinsically remarkable, is perhaps operating at its fullest capacity only when it can call upon the assistance of its electronic kin.

Today, few educators would dispute the impact of computing on American education. Educational sales of microcomputers continue to climb at an astonishing rate. However, a visit to a school computer lab tells an interesting story. Perhaps hampered by time, money or lack of vision and/or technical knowledge, many school districts jumped on the computing bandwagon of the late 1970's and early 1980's by buying minimally configured systems at minimal cost. The basic units were generally composed of a motherboard, or central processing unit, a monitor/TV and a disk drive or two.

Obviously, many school districts purchased their computers en masse, usually at a discounted price for a prepackaged set of equipment. Perhaps a few systems were connected to a thermal or dot-matrix printer, but this, unfortunately was the end of the shopping list for most educational hardware purchases. Evidently, educators wanted stand-alone computers, and that is exactly what they got.
The educational meaning of the term "peripheral device" generally seemed to include only things that enhance the isolation of the system. Memory expansion boards and language cards were very common extra-cost options. Unfortunately, these sorts of peripherals only seem to underscore the isolation of the computer. We have been making the microcomputer better and better at communicating less and less.

The one piece of relatively inexpensive peripheral equipment very few schools are buying is the modem which is, in this author's opinion, the single most powerful peripheral device with which a microcomputer can be equipped. Despite their amazing utility, modems were, and still largely are, generally thought of as one of the "other" peripherals that are to be considered only after one has purchased all of the disk drives, printers, color monitors and joysticks that one could ever want. The great majority of public schools have yet to take steps in realizing the exponential increase in computing power that the acquisition of a modem would afford them, and that fact was one of the driving forces behind this research.
ELEMENTS OF THE PROBLEM

In examining the problem of introducing telecommunications into the secondary environment, three primary elements were identified as centrally important: A. Acceptability, B. Usefulness, and C. Cost vs. benefit.

Acceptability: Despite its common usage in business, industry and academia, computer-mediated telecommunication is a brand new concept in public school education. Little is known as to what degree it will be considered acceptable in the personal, affective sense. Much has been written on "cyberphobia" or computer anxiety as it is more often called. Telecommunications may potentially compound that problem for some, in that it forces them to deal not only with the computer directly in front of them, but also to the much larger and invisible mainframe to which it is online. In addition, most online telecommunication is, by virtue of its very name, highly interactive. Users are constantly being prompted by the system for information that requires on-the-spot decision-making skills. At this time, little information is available on how students respond to this type of environment. Therefore, a large part of the research revolved around obtaining data of an attitudinal nature. Also considered was the educational acceptability of this new technology. It might well be the case, for instance, that students will have no personal problems with
telecommunication but may fail to see it as an acceptable educational tool.

Usefulness: There are a myriad of online services available with an equally large target audience. There are relatively few that are specifically targeted for use by educators and secondary school students. This by no means implies that there is not an enormous number of potentially useful services and databases. Rather, one may logically infer by the scarcity of literature in this area that few educators and students simply know what is available to them online. Therefore a second facet of the research involved exposing of participants to a wide range of online offerings in order to determine if they perceive their differential usefulness to education. And if so, which services did they single out as having educational import? Going one final step further, did the participants feel that online telecommunication offered them not only educationally useful services, but also ones that could not be obtained by offline, conventional methods?

Cost vs. Benefits: Virtually all online services that the education community would be interested in are provided by vendors that exist to make a profit. Therefore, there is a charge incurred by the teacher/student in two ways. First, many information utilities such as The Source, CompuServe, or Delphi levy an initial membership charge simply to be
allowed access to their services. Secondly, all vendors collect from their users a widely varying charge per connect-hour of online time. Thus, schools would not only have an initial start-up fee, but also ongoing and variable monthly charges computed on the time that they used on the system. Some services are as low as $6.00 per hour while on the other hand, searching some of DIALOG's specialized databases can be as high as $300 per connect-hour. These are, of course, extreme examples and the true average is probably closer to $7-20 per hour.

It is clear that schools will be forced to take a hard look at which services they choose to subscribe to and how much time they can afford to spend online with them. At some point there must be a weighing of the potential benefits of online telecommunication against its financial cost. Almost certainly though, as more and more schools begin to go online, there will be a steady decline in connect-hour charges. To address the cost issue, data was gathered from the participants as to the degree to which they felt the services rendered justified the cost.

As a side-note, it should be mentioned that just getting to perform research in this area is a very expensive proposition and presented many technological and logistical problems. The author attempted to gain funding from several online services as it was not felt that most school
districts could fund a study of this size. He was successful in obtaining support from three of the four classes of online services utilized in the study. The Source, an information utility, granted immediate approval of free connect time stating that, "it was one of the best proposals" for educational research that they had seen to date. Ironically, DIALOG, the service most studied educationally and perhaps the single most useful of the four studied by the project, initially declined to be of assistance. DIALOG rejected a request for free connect-time on the contention that the research's design was flawed and simply couldn't be done. Teaching students DIALOG alone, they said, was sufficiently complex and any plan to expose them to three more services was folly. A letter of appeal brought little change in philosophy, but a grant of connect time anyway. This incident in setting up the research makes some interesting implications about what we, as adults, think students are and are not capable of learning, and who makes those decisions.
JUSTIFICATION FOR THE WORTHINESS OF THE STUDY

This research in microcomputer telecommunication was undertaken for the purpose of better understanding the parameters related to instituting online capability in the secondary setting as well as the nature and extent of their potential educational benefits. Using the author's earlier work on telecommunications as a foundation (Schooler, 1984) this document represents the first step in building a program of research in educational telecommunications.

The collection and analysis of data obtained from this pilot project yields guidelines for telecommunication utilization in high schools, provides answers to some basic questions concerning its uses and acceptability, and invites further research in this area. Presuming that one of the functions of research is to inform those upon which it is conducted, then some specific and potentially beneficial services that schools might receive as a result of this work include:

1. Schools can gain a greater understanding of the ways by which they can gain immediate online access to a greater range and depth of information than before the institution of the study. In addition to having access to databases that are dedicated to specific disciplines in the curriculum (e.g. Biosis Previews for the
biological and health sciences, or Microcomputer Index for computer information) schools could have greater access to databases dedicated to education itself. For example, ERIC (Educational Resources Information Center) contains over 475,000 citations related to all fields of education. SPIN (School Practices Information Network) and SPIF (School Practices Information File) can yield an enormous amount of information on curriculum projects, textbook evaluations, etc. In addition, schools could be able to access more generalized databases such as electronic versions of popular encyclopedias as well as current events, weather, financial data and other resources of an immediate nature. Thus, by instituting online capability, schools can dramatically extend the amount of information available to them concerning subject disciplines, education itself and educational administration.

2. Through memberships to any of the three major information utilities, schools can have access to electronic communication. For example, within as little as a few seconds of time, schools will be able to send and receive mail electronically. In the same vein, students and educators alike can hold real-time teleconferences where they and their counterparts from all parts of the U.S. and Canada can meet to discuss anything, using their microcomputers to instantly transmit their comments,
thoughts, or questions. CompuServe Inc. has already instituted a number of educator's SIGs or special interest groups. These SIGs operate electronic "bulletin boards" on which members may read messages left by others, as well as posting messages of their own.

3. Schools could also access a large number of dedicated computer-assisted instruction (CAI) programs through any of the three information utilities previously mentioned. Besides the routine CAI programs with which most computer-using educators have become familiar, there are even programs to help prepare students for the college board exams, to help find financial assistance for college and so on.

4. Online capability may help both students and teachers become better, more efficient, obtainingers and users of information.

5. By having access to online databases such as those described in #1 above, teachers may be able to significantly expand the depth and quality of the curriculum that is offered students. Similarly, students may demonstrate improved quality and depth in their own projects, papers and the like, by also having personal access to subject matter disciplines.
6. Utilizing electronic mail and teleconferencing, different school buildings within the same district and between districts can increase their level of communication and, perhaps, sharing of physical resources.

7. Through utilization of their own home computers, teachers, students and administrators can communicate with each other even when school is not in session. Work ranging from an English paper, to a budget proposal, or an assignment for a sick student can be effortlessly transmitted to its intended recipient through electronic mail.

8. Through increased usage by the education community, online resources may evolve and lead to improved services.

9. Telecommunications may provide an improved method for dealing with the problem of extended illnesses and students too severely handicapped to participate in person.

10. Telecommunications may provide a means by which noted individuals could make "guest appearances" in classrooms for students.
11. As more members of the general public acquire computers, telecommunications may prove to be a viable means of communication between school and community.

The list of potential benefits is limited only by one's imagination. The important point is that this new technology has not been allowed to make any significant inroads into the education community and a project to explore its potential benefits was, perhaps, warranted on that basis alone.
OVERVIEW OF THE TECHNOLOGY AND ONLINE SERVICES

In this final section of the introduction, a brief overview of the technology involved in computer telecommunications and of the four classes of online services studied will be presented. Still a relatively new technology, experienced by a very small segment of the education community, it is considered helpful, even necessary, to provide background information so as to make the numerous technical references to online telecommunications in the remaining chapters more understandable.

A MODEM

None of the research presented here could have been accomplished without an inexpensive hardware peripheral called a "modem". The term, "modem" is derived from a hybridization of the terms "MODulator" and "DEModulator". From these words it is apparent that a modem must do something and then un-do it. The something it does is convert (or modulate) the electrical data coming from a computer into an acoustic signal which can be transmitted over phone lines to another computer anywhere in the world. At the receiving end, another modem modulates the acoustic signal back into electrical form so the receiving computer can understand the data being transmitted to it. In
essence, the modem is nothing more than an electronic translator.

This process of modulation/demodulation is necessary because the electrical ancestry of the now defunct Bell System is quite different from that of a personal computer. The developmental history of the two systems succeeds in making them incompatible without the intervention of a modem to use as a translator.

The telephone is an analog device. Its circuits are designed to respond to signals that smoothly and continuously vary with respect to time. Human voice is an analog signal. As humans are socialized not to speak in a monotone, our voices' frequency patterns rise and fall constantly. Human voice is not simply "on" or "off". We alter the frequency of our voices over a range of approximately 15,000 Hertz or cycles per second.

In contrast, the computer is a digital device. Its circuits are designed to recognize only two conditions, on and off. There is no smooth and continuous analog change in the data moving through a computer's digital circuitry. There is no modulation of data, only abrupt, black and white switching from one state to another. When a user types his/her name into a computer, the system makes no attempt to create an electrical analog of the sound of that name.
Instead, the computer's digital circuitry consults its ROM or "Read-Only-Memory" where its factory-installed, permanent knowledge of the ASCII code is stored. ASCII stands for the American Standard Code for Information Interchange. This widely used code is a system of assigning all of our letters, numbers and symbols an arbitrarily agreed upon series of 1's and 0's called "bits" for "BInary "digiTS (Yuen, 1983). Generally, a group of eight bits defines a single alphanumeric character and is referred to as a "byte", the basic unit of a computer's memory. Thus, the letter "S" might be represented as 01010011 and an "C" as 01000001. A computer recognizes each letter, number, or symbol as a particular set of circuits that are either on (1), or off (0).

Much in the same way a telegraph operator listens to a series of digital dots and dashes and translates it into the spoken word, a modem takes the digital electrical signals from a computer and converts them into analog signals for telephone transmission. Digital "ons" or 1's become a pulse at a certain frequency, and "offs" or 0's become pulses at a second, different frequency. To get around the problem of simultaneous communication in two directions, the sending modem generates one particular pair of frequencies, while the responding modem transmits back a different pair.
Online Services Used in the Study

Despite their relatively rare usage in schools, online services are numerous, not only in quantity, but also in variety. Consider the standard library reference, Gale's Encyclopedia of Information Systems and Services. In its 1983 incarnation, this massive work was 1,242 pages long, and gave information on well over 2,500 online databases or information services.

There were four different classes of online services examined by this research: bibliographic, information utility, library circulation, and private bulletin board. Most commonly used in research are the commercial bibliographic database services. These massive information search and retrieval services are represented by: DIALOG, Bibliographic Retrieval Service (BRS), NewsNet and Orbit. The organizations are not databases themselves, but rather vendors of databases created by third parties. Among these are basically three different kinds of databases, plus some hybrids available online, that differ from each other in some fundamental ways. According to Roberts (1984) there are: full-text, bibliographic and "just the facts" types of individual databases.

Highly useful, but fairly uncommon, are full-text databases. These collections are typically organized by a common theme or subject area. The advantage of such
services are that one gets the actual information, in its entirety, rather than just a bibliographic reference to it.

Full-text bases are uncommon for a number of reasons, one of which is purely financial, for both the vendor and the end user. Keeping a massive full-text database online requires many megabytes of expensive memory storage. Secondly, one would probably not find it economically feasible to logon to a full-text database that might easily charge over one hundred dollars per connect hour, and then proceed to download a ten-page article at three hundred baud (about thirty letters a second). Unless one could not get the article any other way, this is an inappropriate search strategy.

Also contributing to high costs, an article downloaded from an online service will have some features the original printed article did not have. It will come with a number of descriptors, terms that were used in its classification, that may be of great value in cross referencing to other useful sources. These descriptors were added by an individual that was paid for abstracting the article for the database and adding descriptors to it. This all adds to the end-user's cost for using an online database. For the serious researcher, full-text databases are a dream come true but for the casual user, the cost may be prohibitive.
In contrast, bibliographic databases are much more common. As their name implies, they don't give access to the full-text of the article, but they will provide bibliographic information that one can then take to the local library to find the material. Often these bases will offer both indexing descriptors and abstracts in addition to a simple bibliographic citation. Thus, searching out information through a bibliographically oriented database would be a two-step procedure. First, one would download the citations perceived as good "hits" or sources of information. Secondly, one would physically track down the original sources in the library.

Bibliographic bases provide an economical first step in researching a given topic. Many bibliographic services provide the option of ordering the full text of the original source while online to be delivered (for a charge) through the mail. Knowledge Index, the subset of DIALOG chosen for the study, is particularly attractive to educators and students because it does not individually price the connect time of its databases. Instead, it offers an excellent subset (ERIC, Biosis Previews, Magazine Index, Books in Print, Psych Abstracts, etc.) of the bases offered by its parent firm DIALOG, at a flat rate of $24.00 per hour.
Bibliographic citation bases will be present for a long time to come because of their flexibility and cost. In addition, they are about the only way one can even hope to keep pace with the amount of new text written every day, which some experts place as high as 200,000,000 words per hour (Roberts, 1984).

The third major group of online databases have been called "just the facts" bases, or non-bibliographic. They don't provide citations of information sources, rather they just answer questions about the subject matter at hand often via tabular or charted, or graphed means. They typically store information that generally isn't found in books, articles, or newsletters. For example, suppose one wishes to know how many tons of sugar have been exported from the U.S over the past five years.

Logging onto the U.S. Exports Database will supply the time-series answer, often in graph or table format. Thus, what one gets is not an abstract of an article, or the article itself. It just, as noted before, gives you the facts. One of the largest of such services is Data Resources Inc., whose collection of ten million time-series studies goes back as far as 1929. Their bases cover such topics as employment, energy, interest rates, productivity and demographics (Roberts, 1984).
KNOWLEDGE_INDEX

Selected as the study's representative commercial bibliographic database service was Knowledge Index. Knowledge Index is a subsidiary of DIALOG, which in turn, is a subsidiary of Knight-Ridder News Service. DIALOG has been officially online since 1972, but it is not a database in and of itself. It is a vendor, or supplier of online databases that are produced by other firms. Some refer to DIALOG, and its competitors BRS and ORBIT, as "IP's" or information providers. Others have likened them to "information department stores" (Glossbrenner, 1983). For example, the massive database of educational literature, ERIC, is not produced by DIALOG, but ERIC can be accessed through DIALOG, as can nearly 300 other electronic databases, totalling in excess of 150,000,000 records of information. Some estimate that DIALOG has online nearly 95% of the collected body of human knowledge published in the last fifteen years.

The problem with using DIALOG, from the perspective of the private individual use, is sheer cost. DIALOG does not offer a flat rate for connect time like the information utilities just discussed. Each database offered by DIALOG is individually priced. The range of prices is enormous. Some of the databases can exceed over $100.00 per connect hour. In addition, many databases charge a dime or so
apiece for each bibliographic citation that is located. In short, DIALOG, ORBIT and BRS are probably out of the reach of the average individual, and are more suited to major libraries, and of course, business and industry.

DIALOG correctly perceived the need for individuals to access major bibliographic databases from their microcomputers at a reasonable cost (Ojala, 1983). Knowledge Index was their response and in November of 1982, they took a number of their most popular databases and, at a flat rate of $24.00 per hour or about $.40 per minute, made them available to the general public during the evening and weekend hours.

At the time of the research, Knowledge Index had 23 of DIALOG's databases online. By 1989, that number had swelled to nearly 70 online databases.

During the project there were 14 different sections available in KNOWLEDGE INDEX. Each section contained one or more databases. The database name was the same as the section name but was followed by a number. Most of the databases listed below disclose their general contents by virtue of their names and source of publication.
<table>
<thead>
<tr>
<th>Section name</th>
<th>Database name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. AGRI - AGRiculture</td>
<td>AGRICOLA (AGRI1)</td>
</tr>
<tr>
<td>2. BOOK - BOOKs</td>
<td>BOOKS IN PRINT (BOOK1) (Copyright by R.R. Bowker Co.)</td>
</tr>
<tr>
<td>3. BUSI - BUSINESS Information</td>
<td>ABI/INFORM (BUSI1) (Copyright by Data Courier, Inc.)</td>
</tr>
<tr>
<td>Database: TRADE AND INDUSTRY INDEX (BUSI2) (Copyright by Information Access Company)</td>
<td></td>
</tr>
<tr>
<td>4. COMP - COMPUTers and Electronics</td>
<td>INSPEC (COMP1) (Copyright by Institution of Electrical Engineers)</td>
</tr>
<tr>
<td>Database: INTERNATIONAL SOFTWARE DATABASE (COMP2) (Copyright by Imprint Software)</td>
<td></td>
</tr>
<tr>
<td>Database: MICROCOMPUTER INDEX (COMP3) (Copyright by Microcomputer Information Services)</td>
<td></td>
</tr>
<tr>
<td>Database: THE COMPUTER DATABASE (COMP4) (Copyright by Management Contents)</td>
<td></td>
</tr>
<tr>
<td>5. CORP - CORPORate News</td>
<td>STANDARD &amp; POOR'S NEWS (CORP1) (Copyright by Standard &amp; Poor's)</td>
</tr>
<tr>
<td>6. EDUC - EDUCation</td>
<td>ERIC (EDUC1)</td>
</tr>
<tr>
<td>7. ENGI - ENGINEering</td>
<td>ENGINEERING LITERATURE INDEX (ENGI1) (Copyright by Engineering Information)</td>
</tr>
</tbody>
</table>
8. GOVE - GOVERNment Publications
Database: GPO PUBLICATIONS
REFERENCE FILE (GOVE1)

Database: NTIS (GOVE2)
(Copyright by National Technical Information Service)

9. LEGA - LEGAl Information
Database: LEGAL RESOURCE INDEX (LEGA1)
(Copyright by Information Access Company)

10. MAGA - MAGazines
Database: MAGAZINE INDEX (MAGA1)
(Copyright Information Access Corp.)

11. MATH - MATHematics
Database: MATHFILE (MATH1)
(Copyright by the American Mathematical Society)

12. MEDI - MEDicine
Database: MEDLINE 1980+ (MEDI1)
MEDLINE 1973-79 (MEDI2)
MEDLINE 1966-72 (MEDI3)

Database: INTERNATIONAL PHARM-(MEDI4)
PHARMACEUTICAL ABSTRACTS
(Copyright by American Society of Hospital Pharmacists)

Database: BIOSIS PREVIEWS
1981+ (MEDI5)
BIOSIS PREVIEWS 1977-1980 (MEDI6)
BIOSIS PREVIEWS 1969-1976 (MEDI7)
(Copyright by BioSciences Information Service of Biological Abstracts)

13. NEWS - Newspapers
Database: NEWSSEARCH (NEWS1)

Database: NATIONAL NEWSPAPER INDEX (NEWS2)
(Copyright by Information Access Corp.)
"INFORMATION UTILITIES"

Much more than collections of individual databases are the highly eclectic "information services or utilities." These services are the most commonly accessed by personal computer users for a variety of purposes. The Source, CompuServe and Delphi are amazing, sprawling collages of factual databases, special interest teleconferencing groups, games, reviews, advice columns, online retail stores and electronic mail capability, to name only a very few of their features. Quite inexpensive by comparison to full-text databases (only $5-12.00/hour during the evening) the information utilities are aimed at satisfying the telecomputing needs of the general computing public. In some respects they can be very competitive with the encyclopedic databases. Some are capable of acting as "gateways"- electronic portals through which one can connect from one service to another.
THE SOURCE

Representing the category of "information utility" in the study was The Source of McLean, Virginia. (Until July, 1989,) The Source was owned by Reader's Digest, Inc. When it was acquired by its much larger competitor, CompuServe, based in Upper Arlington, Ohio. The prior ownership of The Source by Reader's Digest is perhaps quite fitting when one realizes that "Reader's Digest" is considered by many experts as the world's largest repackager and marketer of general information.

The Source is a huge, sprawling complex of services offering well over 1200 programs and features (Glossbrenner, 1983). A simple listing of its offerings should suffice to illustrate the eclectic nature of "information utilities".

SERVICES DIRECTORY

The commands on the right will call up information on the corresponding program or the program itself.

<table>
<thead>
<tr>
<th>Access numbers used to connect to The Source</th>
<th>ACCESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airline Schedules</td>
<td>HELP AIRSCHED</td>
</tr>
<tr>
<td>Almanac (daily)</td>
<td>TODAY</td>
</tr>
<tr>
<td>Bestsellers List (Publisher's Weekly)</td>
<td>BESTSELLERS</td>
</tr>
<tr>
<td>Book Ordering Service</td>
<td>BOOKS</td>
</tr>
<tr>
<td>Bulletin Boards</td>
<td>HELP POST</td>
</tr>
<tr>
<td>Business News (updated throughout the day)</td>
<td>BIZDATE</td>
</tr>
<tr>
<td>Business Publications Abstract Service</td>
<td>CONTENTS</td>
</tr>
<tr>
<td>(Management Contents, Ltd.)</td>
<td>HELP BIZDEX</td>
</tr>
<tr>
<td>Business Services Index</td>
<td>HELP CHAT</td>
</tr>
<tr>
<td>CHAT (Live conversation with another member of The Source)</td>
<td>HELP POST</td>
</tr>
<tr>
<td>Classified Ads</td>
<td>PARTI</td>
</tr>
<tr>
<td>Conferencing</td>
<td>HELP COMMANDS</td>
</tr>
<tr>
<td>Commands Used on The Source</td>
<td></td>
</tr>
</tbody>
</table>
Commodity News
Discount Shopping: General Merchandise
Records and Tapes
Classic Radio Programs
Dow Jones Hourly Indexes
ECOM Mail Message Service
Editorials (Syndicated Columnists)
Employment Network
Encode Text Files
Finance: Latest Stock Market Quotes
Stock Market Reports
Stock Performance Analysis
Stock Portfolio Management
New York Stock Exchange Indexes
Standard and Poors Indexes
Dow Jones Indexes
Metal Market Activity
Gold Prices (Daily)
Financial Modeling/Business Planning
Financial Programming
Games Library
Gold Prices (Daily)
Horoscopes
Hotel Guide (U.S. and Canada)
Mail
Mailgram Message Service
Members Directory
Members Currently Online
Menu of Services on The Source
Metal Market Activity
Microcomputer News
Movie Reviews
Music To Order
News and Sports Service (United Press Int’l.)
Business News
News Bulletins
News Features
News About The Source
New York Stock Exchange Hourly Indexes
Personality Spotlight
Phone Numbers to Connect with The Source
Programming/Advanced Applications
Radio Programs to Order
Rates and Fees for The Source
Research Service (Information On Demand)
Restaurant Guides: U.S and Canada
Shared-File System Explanation
As can be seen from the listing above, information utilities offer services that are neither better nor worse bibliographic database services, but simply different. The study was interested in how students might integrate the best of each type of service to formulate search strategies superior to any one service alone.
Because of their sheer number and accessibility, the thousands of free or low-cost Computerized Bulletin Boards from around the country constituted the third class of online resource studied. These systems, generally privately run, are perhaps best considered labors of love, put online and maintained by one person, the sysop or system operator. When calling a CBBS, one is not reaching a giant corporation. Far from that, one is more likely ringing into someone's basement or den, where he has dedicated a microcomputer to maintaining an electronic messaging system at little or no cost to callers.

Bulletin boards come in all sizes and shapes. Most are free, while others exact a variable membership charge. Some offer just the ability to read and leave electronic messages, while others offer games, newsletters, dating services and public domain (non-copyrighted) software for free downloading. Some are devoted to a particular subject area or computer system, while others are "jacks-of-all-trades." Most operate completely within the law, although there are many that operate as so-called "pirate boards", allowing the downloading of copyrighted, commercially-produced programs.
To illustrate the flavor of bulletin boards, and to distinguish them from bibliographic database services and information utilities, consider the following description of "The GameMaster" an elaborate CBBS running in Evanston, Illinois. Calling "The GameMaster" merely a bulletin board is a gross understatement, for it is actually a multi-room electronic "mansion" with each of its "rooms" dedicated to a particular game or group of games. One enters the mansion through the "foyer" where one's presence is announced to everyone else online via the house's public address system. One may confer with others in the "parlor", check for personal mail in the "mall room", or read "books" of instructions in the "library".

The illusion created by this elaborate system is impressive. While the vast majority of CBBS's were not so spectacular, CBBS's in general, provided an extremely low cost method of introducing students to the principles of computer telecommunications and thus, were chosen as the third of three online resources for the project. In addition, CBBS's with their messaging abilities, allowed students to inductively search for information by posting a general request for help for anyone who happened to read the message and wish to respond to it.
Completing the study's selection of four online classes to which to expose students was LCS, the Library Control System circulation control program. LCS is not unique to OSU. It is a massive database program that has been adapted for mainframe use by many institutions throughout the country. It is a shell, a framework program which can be filed with the shelf list of any major library. It then allows patrons to search the library's holdings from a terminal rather than a physical card catalog. LCS allows subject, author, author/title, title, call number, shelf position and other kinds of searches. The commands are three-letter abbreviations followed by a slash "/", followed by the "argument" or what one is requesting the service to locate. For example, entering the following command would request LCS to locate all indexed works by the author, Edgar Allen Poe:

"AUT/POE, EDGAR ALLEN"

Similarly, the search:

"ATS/POE GOLD BUG" would perform an Author/Title Search for Poe's "The Gold Bug".
Once the item has been located, LCS can be directed to indicate the circulation status of the material sought. It will respond with which library (or libraries) have the material, and whether it is available, checked out, on closed reserve, lost, etc. One major distinction between LCS and Knowledge Index is that LCS only indexes journal titles, not the articles contained within them.

LCS was chosen as the fourth online service in order to demonstrate to students how a library with a shelf list of millions of items catalogs its materials and provides students with a means of finding the journal and book citations located for them by Knowledge Index.

Having presented an overview of the research, its purpose, merits, goals and limitations plus an overview of the online services studied, Chapter III will discuss the methodology of the research in detail.
CHAPTER II

THE LITERATURE REVIEW

RETROSPECTIVE RESEARCH: PRIOR TO 1980

In reviewing the literature relevant to the questions posed by this study, one can readily recognize the newness of online search technology and the consequent scarceness of research prior to 1980. In his synthesis, Fenichel (1980) provides the most comprehensive review of research conducted in the 1970’s as it related to: (A.) Theoretical perspectives and models, (B.) Observations of Operating Systems, (C.) Studies of Individual cases, (D.) Controlled experiments, and (E.) Questionnaire surveys and interviews. Other bibliographies prepared by Hall (1977) and Hawkins (1979) primarily provided information about online systems themselves, not solution-oriented research.

"THE INFORMATION EXPLOSION"

Less than two decades old, online information searching and the technology that supports it was developed to deal with the astronomic growth of information in our society. In forecasting the labor deployment patterns of the United States through the year 2000, Smith and Dunn (1985) noted that over the past 125 years, the United States has shifted
from an agricultural-industrial society to an information-based society. They stated that analysts believe that 50% of the workforce is employed by some facet of the information industries and by the year 2000, some 60% to 70% will be so employed resulting in a loss of some 15,000,000 jobs as the economy shifts economic emphasis. Salton and McGill (1983) reported that the United States Library of Congress, which attempts to maintain both information currency and accuracy, was adding some 3,500 new items to its shelf list every day.

The amount of information growth has been determined to be not linear, but rather logarithmic. By 1800 the number of scientific publications was doubling every fifty years (Lawlor, 1979). And between 1800 and 1966, the number of scientific journals had increased from 100 to over 100,000 with no upper limit in sight. Moursund (1986) reported that some estimates place the number of years for known information in the world to double in quantity to be as little as 12 years. As a result of this information explosion, the requests for online computer database searches also has grown rapidly. Craver (1985) noted that in 1974 there were some 700,000 online search requests. By 1979 the number had grown to 4,000,000 and by 1981 to an estimated 6,000,000.
In 1984, there were approximately 70,000,000 bibliographic records online conservatively estimated to be growing at a rate of over 10,000,000 per year (Dowling 1984). DIALOG Information Services reported that it indexed some 150,000,000 records in 1989. As a means of dealing with this exponential growth of information, Agostino (1984) predicted that by the year 2000, a single, unified, and universal interactive information search and retrieval system would be in place.

WHERE IS ONLINE SEARCHING IN HIGH SCHOOLS?

Online searching has long been the province of business, industry and government where it is commonplace. It is only within the last decade that it has made any significant inroads into the education market, particularly, secondary schools. Tenopir (1986b) related that online searching with high school students was being performed at the Cypress-Fairbanks School District in Texas where DIALOG was being taught and the school district had developed its own curricular materials. She stated that other high schools involved in online searching included: Princeton HS; Bellarmine College Preparatory HS, San Jose, California; St. Thomas Aquinas HS, Ft. Lauderdale, Florida and Lexington School for the Deaf in Jackson Heights, New York. She quoted Ann Caputo of DIALOG as saying that high schools
account for 20-25% of all of DIALOG's educational or instructional passwords.

Fiebert (1987) discussed online searching at Radnor High School in Radnor, Pennsylvania where searching has been taught since 1979 as Radnor High was the first high school in the nation to use DIALOG. Craver and Ounanian (1984) described how two classes of high school students were trained in online searching at University High School, Urbana, Illinois. Callison and Daniels (1988) cited research in online secondary student searching being conducted at Carmel High School, Carmel, Indiana. Pruitt and Dowling (1985) reported that online high school searching has been in place since 1982 serving the 22 high schools in the Montgomery County Public School System in Maryland. Smith (1984) indicated that it was also being conducted in the states of California, New York, Florida and Pennsylvania. Summit (1985) added that DIALOG searching was being conducted in high schools located in Bath County, Virginia, Lynchburg, Virginia and The National Cathedral Schools in Washington, D.C.

Lynch (1987) related the use of an information utility-type online service in the East Lyme, CT public schools. The district chose The Dow Jones News retrieval Service over a more traditional bibliographic database like DIALOG because of the latter's perceived disadvantages such

OTHER NOTEWORTHY ONLINE SEARCHING PROJECTS

At the state level, Pennsylvania has instituted a program entitled, Access Pennsylvania: An Agenda for Knowledge and Information Through Libraries. Out of that state-wide project came an extensive curriculum guide for library research that included online searching (Gerhardt, 1987). At the college level, Ward (1985) reported on course-integrated DIALOG instruction in the undergraduate program at Stanford University stating a combination of online searching, word processing and exposure to superior library facilities that produced a positive outcome as expressed by students.

RELATIVE SCARCITY OF SCHOOL ONLINE SEARCHING

Roose (1984) explained that more schools were not involved in online searching due to many librarians' misconception that computerized databases are too difficult or sophisticated for young people. She countered that online materials run the same spectrum of difficulty as do printed materials and that children can select among them appropriately. She concluded that "no information resources
should be arbitrarily declared off-limits to young people". Liesener (1985) agreed that many rich sources of information potentially useful to children are unavailable because they are aimed at other audiences and the organizations marketing them are "insensitive or not interested in making special accommodations for students". Summit (1985) stated that modern information searching is being conducted mostly by commercial and governmental services by persons who are already convinced of the utility of online access. He argued that little effort was being made to create mass demand for online technology in schools where it would operate both as "a skill to be learned and as a tool to expand horizons of curiosity and intellectual endeavor".

**ONLINE SEARCHING. AN ALTERNATIVE TO THE LIBRARY**

Lawry (1986) states that there "is almost general agreement that the card catalog, if not dead, is at least, a candidate for last rites" and "increasing attention has been turned to the online catalog." But she, like Markey (1985) found that online searchers often have considerable difficulty with subject searches on online catalogs due to their controlled and often, less than obvious indexing structure. Concurring with the general findings was Lewis (1987). Despite some searching difficulties, however, users appear to overwhelmingly prefer electronic card catalogs over their printed versions (Ashoor and Khurshid, 1987).
Liesener (1985) noted that subject access is weak and growing worse due to the indexing restraints of printed materials. Similar studies on subject access through online catalogs was conducted by McCarthy (1986), Carson, (1985) and Frost (1987).

Some studies have shown that while online searching is preferred over conventional offline searching by many end-users, physically locating citations retrieved online was difficult. Callison and Daniels (1988) found that 60% of the Carmel students found "a great deal" of citations online but stated that their school library and local public libraries were much less supportive.

THE CHARACTERISTICS OF ONLINE PUBLIC SCHOOLS

Aversa and Mancall (1987) surveyed nationally the use of online services in school library/media centers. Of all public schools, high schools most frequently had online services available. School library/media specialists, it was found, are relatively new to online searching as these services have existed in their schools for only two to three years. Training was typically acquired from the database suppliers themselves with additional library-school courses and independent study completing the methods of training. Budgets for online searching were generally small. The median reported by the study was $500.00 per annum. Despite the small budgets, Aversa related, most schools did not
charge students for online searches and many taught students, faculty and administrators to conduct their own searches. Even in schools permitting end-user searches, there were few reported security problems. The choice of microcomputer hardware was overwhelmingly Apple IIe's with IBM, DEC and Texas Instruments trailing distantly. Online services were generally restricted to bibliographic search and retrieval services such as DIALOG, BRS and WILSONLINE. Subset versions of the preceding such as Knowledge Index and BRS/After Dark were uncommon. Topics searched most frequently centered around current events particularly in the social and natural sciences. The top four bibliographic databases searched were, in descending order, Magazine Index (containing the popular press), ERIC (education), UPI News and PsychINFO (psychology).

**How are Online Searchers Trained to Search?**

The literature concerning online training was extremely diverse. A great range of curricular materials have been prepared ranging from printed workbooks, through live demonstrations, to videotape. The consensus, however, appeared to be that many disrelated training methods have been successful and no one curriculum is superior. It was found, in fact, that often students learned to search adequately merely by watching their peers conduct a search.
Callison and Daniels (1988) reported that their student searchers either worked completely independent of others or in collaboration with their peers. Beck (1984) found that students often learned online searching techniques informally, "over the shoulder" of other students. Craver (1985) has produced a process for teaching college-bound high school students to search online. Craver and Ounanian (1984) related that their two online classes of high school students were successful. Eighty-five percent (85%) of the students felt that the course had provided them with "an understandable introduction to online bibliographic searching" and over ninety-six percent (96%) thought that they could "comprehend the relevant terminology and could formulate an effective search strategy" and were "gratified" with the results of the experience.

Gall (1986) studied how searchers in Indiana learned how to search and how they felt about the experience. She reported that "the majority of people learn by several methods" and that "they recommend the same for others rather than just one method". Her students stated that no one particular training method was preferable, but all agreed that they liked hands-on training with the advice and assistance of experienced searchers available and they preferred structured learning situations and rated the experience as an affectively positive one. Other curricular
designs for teaching online searching have been proposed by Howden and Boyce (1988), Haskell (1984) and Tillman (1987). Most efforts appeared to reflect online training programs designed for only a single service and did not attempt multiple service integration.

As online searching becomes more available, there appears to be a growing body of potential end-users that, while not currently performing their own searches, have expressed a desire to begin. Poisson (1985) researched online searching by physicians and reported that while only 8% of physicians are currently performing their own end-user searching, a full 71% of those surveyed indicated that they were interested in becoming online searchers.

**USING MULTIPLE SERVICES WITHOUT INTEGRATION**

Expounding on one curricular design for teaching online searching, Dowling and Pruitt (1987) related the usefulness of starting online search training via contact with local computerized bulletin boards (CBBS's). They cited ready access, low cost and relative ease of use as the primary reasons for the decision. They then suggested advancing students to an "information utility" such as CompuServe topped off by instruction in DIALOG. They did not attempt integration of the services into the students' overall search strategies.
THE CHARACTERISTICS OF ONLINE SEARCHERS

A number of studies have attempted to identify characteristics that could be associated with individual differences and online search behavior. Fenichel (1981) researched the amount and type of prior online experience in relationship to search behavior. Bellardo (1985b) related Graduate Record Exam scores and measures of creativity and personality traits to online search behavior. Borgman (1985) attempted to relate academic major to search behavior, and Woelfl (1985) examined the possible connection between learning styles and other cognitive variables and the search behaviors of experienced searchers of the database, MedLine. Sewell and Teitelbaum (1986) reported on their observations of end-user search behaviors over an eleven-year period.

Another body of research appeared that tends to refute the notion that there is an online searching personality or a type of individual best suited to performing online searches. In marked contrast to the research cited above, Anderson (1986) challenged the general assumption that only certain types of individuals can succeed at online searching. He cited "the myth of the expert searcher" and stated that "anyone with 30 minutes of training can do a good search" and the belief otherwise stems from, "confusing search skills with subject knowledge."
Earlier work by Bellardo (1985) and Fenichel (1980) also stated that special personality types were probably unnecessary in performing satisfactory online searches and that naive users could perform adequate searches with modest training. In her profile of online searchers, Bellardo described the following attributes of online searchers: (A.) Searchers make few explicit errors, (B.) Institutional affiliation has no impact on search skills, (C.) The type and quantity of training affects beginning searchers but those differences are not retained over time, (D.) Experience plays only a small role in search success, (E.) Fast-batch (broad descriptor) searchers fare no worse in their searches than do more interactive (narrow descriptor) searchers, and (F.) Experienced searchers have distinctive, predictable styles of searching that may or may not affect the quality of their results.

Wozny (1982) determined the following characteristics concerning freshman searchers: (A.) They used several information institutions, including home libraries but their main focus was their own school library, (B.) The teacher and library media specialist were the most influential in students' use of information, (C.) Citations located online rarely showed up in students' final paper bibliographies, (D.) The online searching produced enthusiasm for the research process, and (E.) online searching was crucial in
making students aware of the diversity of information sources outside of their own school library. Tenopir (1986d) argued that even though searchers often do not incorporate online citations into their finished research papers, they have, at least, broadened their awareness of information availability.

Similarly, Mancall and Deskins (1984b) summarized high school student searchers and, like Wozny (1982), found that although students used several information sources including public and home libraries, the school library was the primarily focus for research. Mancall and Deskins (1984b) also stated that the students' bibliographies showed a high number of books and periodicals but little usage of encyclopedias or nonprint materials.

In contrast, Wozny's work showed that while encyclopedias made up only ten percent of final paper bibliography listings, almost half of the students reported using them. In regard to the control of encyclopedia usage Kister (1979) found in his survey of public libraries throughout the United States that teachers often prohibited encyclopedia use by students and that while a majority of librarians disagreed with this practice they did little or nothing to stop it.
In agreement though, with Wozny's (1982) research, Mancall and Deskins (1984) found that there were few citations found by online means incorporated into students' bibliographies. They speculated that this non-inclusion may have been due to the fact that many of the citations retrieved online were either above the students' level of understanding or were too difficult to locate. Lastly, they noted that online costs were reduced by half when student searches were conducted by the librarian as opposed to the students themselves.

Some research has reported that online searching produces a shift in the type and quantity of materials used by searchers. Wozny (1982) studied ninth graders searching DIALOG and reported that the group tended to use a wider variety of material formats than offline.

ONLINE SEARCHING AS NON-LINEAR

Much research has been devoted to developing logical, step-by-step, linear methods for conducting a proper library based research. The number of "access points" or ways of getting at information is severely limited in relationship to the access allowed by online searching. As a result, some re-thinking has occurred as to the basic nature of the conducted research. Is online searching, in fact, a step-wise, linear procedure or is it more interactive and reactive?
Miller and Tegler (1986) described the non-linear nature of the research process saying it was "cyclical, organic and intuitive". They argued against the use of systematic library search strategies stating that "scholars generally employ less structured methods such as browsing, consulting with colleagues, or tracing footnotes and bibliographies. Printed indexes, by their very nature, tend to limit creative, cyclical interaction between researchers and information." As a result, Miller and Tegler reasoned that online searching is superior to offline in the sense that it is less linear and offers more access points to information. In related work, Ojala (1986) recognized that research can, and often is, conducted by serendipity, locating fortuitous sources somewhat accidentally.

**ONLINE SEARCHING ERRORS**

A relatively small number of types of errors committed by online searchers have been isolated and described. Seven basic types of online searching errors have been identified by Tenopir (1984b). They included: (A.) Boolean logical errors, especially in the use of "and" and "or" operators, (B.) Incorrect inclusion/exclusion of spaces in system commands, (C.) The use of numerals when referring to retrieval sets (resulting in the search for that number as a subject itself), (D.) Keyboarding (typing) problems, (E.) Ignoring the differences between the operation of different
databases, (F.) A feeling that the computer is infallible and will also find what is sought (over-reliance), and (G.) Confusion over the different command structures employed by different online services.

Similarly, Shaw (1986) continued to isolate problem areas for online searchers and reported nine sources of online searching errors. The problem areas were related to three major categories: database selection, search tactics and system interaction. Under database selection, problems were: (A.) Inadequate research on databases, (B.) Overlooking general interest or multidisciplinary databases, and (C.) Unnecessary searching in database index files.

Under errors associated with search tactics, Shaw cites: (A.) Inappropriate choice of search terms, (B.) Searching an excessive number of concepts via a single statement and, (C.) Simultaneous searching of multiple database files which often have different search vocabularies. In regard to problems related to interaction with the system itself, Shaw mentioned: (A.) Inappropriate fast batch searching, (B.) Incorrect acceptance of null set responses to searches and (C.) Difficulty in determining what to print out from the search results.
If a search is executed with the correct descriptors, in an appropriate database, a null set (no "hits") response from the system is fairly rare yet many novice searchers accept such responses as truly indicative that the system holds no information on the subject searched. Atkinson (1986) recognized the commonness of null set search responses (or "zero result" searches) and developed a set of tactics for an online searcher to take in the event of null search results. Most importantly, according to Atkinson were the techniques of: "dilating", "refining", "skipping", "changing", and "wandering".

**POSITIVE RESPONSES TO ONLINE SEARCHING**

All of the literature reviewed reached consensus on at least one point. Students taught to perform online searches view their experiences as overwhelmingly positive. Students find online searching both practically useful and pleasurable.

Halperin and Pagell (1985) described students' affective responses to online training at the Wharton School at the University of Pennsylvania. On a 1-5 Likert scale (with 1 = "Strongly Agree"), students gave median responses of "1" to questions concerning whether or not they agreed that online searching was useful to them, presented little difficulty, and produced satisfactory results. Ashoor and Khurshid (1987) reported similar affective responses in
their study of online searchers at The University of Petroleum and Minerals Library in Dhahran, Saudi Arabia. Further agreement as to the positive affective ratings given by new searchers was provided by Craver (1985).

Krausse and Etchingham (1986) examined online searching in the Humanities at The University of Rhode Island and all the participants in their study related strong positive affective responses to being trained in online searching with 61% of the subjects rating the experience a "1" (on a 1-10 scale). Reaching similar results in a earlier study assessing students' responses to online searching at The University of Delaware was Kobelski and Trumbore (1978).

Via the pre- and posttesting of middle school searchers of online encyclopedias, Eastman and Krendl (1984) found strong affective shifts toward the positive along the indices, "computers and self", "libraries and self" and "computers and gender".

Eastman (1986) in her later study of middle-school use of videotex noted students made particular note of the sense of power and control that online searching gave them. They also stated that online searching was "fun" and professed to have future expectations of continued online searching. Eastman also found that students considered online searching "easier than books" despite adult judgment that online
searching was, in fact, more difficult than using printed materials. Eastman found that the term *easier* had distinct, multiple meanings, however, such as, easier = "faster", easier = "less effort", easier = "more information" and easier = "information currency". She concluded that adult perceptions of electronic searching do not match the perceptions of young students.

The Educational Program Coordinator for DIALOG, Anne Caputo (1985) stated that, "students *enjoy* online searching and that research can be a pleasurable experience". Searching enjoyment was also cited among student searchers by Tenopir (1986d) and Craver (1985).

Vollaro and Hawkins (1986) examined end-user searching by patent attorneys in 1984 and related their affective responses. The "comfort" level was relatively high and the users were satisfied with their search efforts. They were found to be still "enthusiastically doing their own searches" when a follow-up study was done in 1986. Lodish (1987) found high affective ratings at the Montgomery Blair High School in Maryland by all components of the school hierarchy including the administration, faculty, media specialists and students. Lodish quoted the principal as saying, of online searching, "It's mind boggling".
Callison and Daniels (1988) stated that about a third of the Carmel students said the experience "opened up new directions for new ideas on my topic" and "provided more in-depth information on my topic". They also said that online searching was a "fast and efficient way to locate materials" and "allows you to access many indexes at once".

**PERCEIVED VALUE IN ONLINE SEARCHING**

Paisley and Chen (1982) and Slesnick (1984) stated that electronic information searching not only achieves its immediate purpose of information retrieval but has the advantage of reflecting a broad conception of computer literacy.

Tenopir (1986d) also related that The Commonwealth of Virginia Department of Education had adopted fundamental knowledge of databases and online searching as a required competency for graduating seniors.

Mancall (1984) determined six advantages of online searching: (A.) It presented an opportunity to solve a problem with a computer, (B.) Increased speed, (C.) Allowance of greater currency of information, (D.) Provision of more access points than printed references, (E.) More comprehensive than offline searches, and (F.) The creation of excitement for the research project. As disadvantages, she cited: (A.) Inappropriateness for certain subject
searches, (B.) Computer malfunction, (C.) Little opportunity for distantly retrospective searches, (D.) Cost, (E.) Physical access to citations received and (F.) Online searching demands the re-thinking of the educational objectives of student training programs. Confirmation of very similar advantages/disadvantages was provided by Craver (1985).

Mancall and Deskins (1984a) suggested four logical goals for placing online services in schools: (A.) Generation of new instruction opportunities, (B.) Generation of enthusiasm for the research process, (C.) Expansion of students' conception of available information and, (D.) Extension of students' knowledge of the diversity of information-providing sources. Beck (1984) added that school children should be taught information searching skills so that they could, "exploit information technology in their society, rather than be exploited by it".

As part of the design of an online searching curriculum that incorporated a bulletin board, an information utility and a bibliographic search and retrieval service, Dowling and Pruitt (1987) administered a questionnaire to students asking questions ranging from the clarity of the objectives, through the competence of the instructors to the overall value of the instruction. On a one-to-four Likert-style
scale, ninety percent (90%) of the participants gave the highest possible marks in all categories.

Fleibert (1987) stated that the goal of online searching at Radnor High School was "awareness - to encourage them (students) to include online searching when looking for information". In earlier work, Fleibert (1985) found that there was benefit to students in linguistic development as students defined and redefined topics, constructed synonyms for searching and combined language with mathematics in tying together search descriptors with Boolean logical operators such as, "and", "or", and "not".

Callison and Daniels (1988) stated that "the value of online search experience for the high schooler is not only the ground-level experience with future technologies he or she will experience, but the challenge to make information-use decisions based on facts, relevancy, recency and authority". Moursund (1986) stated that every student should learn to use computers as tools to help solve the problems of any given discipline.

Lodish (1987) reported that the benefits of high school online searching included: (A.) The reinforcement of research and thinking skills via another medium, (B.) Acquisition of skills necessary to narrow and focus a topic under investigation, (C.) Branching out of the school...
library to other, larger collections, (D.) Problem solving by breaking down a problem into its component parts, and (E.) The development of long-range planning skills in order to take proper advantage of the Maryland Inter-Library Loan Organization. A trend that she identified resulting from online training was a gradual change in the school's periodical holdings. As a result of their online searches, students had made frequent requests for journals that their library did not subscribe to. As a result, online searching applied a subscription pressure upon the library and helped shape its shelf list.

Brophy (1986) studied online searching at the high school level and reported that four advantages of providing online services were: (A.) Increased reference capability of the library, (B.) Greater assurance of materials availability, (C.) A greater capacity for bibliographic development, and (D.) An increase in students' knowledge in regards to information quality, quantity and scope. Brophy also stated that the excitement generated by online searching had a motivational effect on students.

In citing some implications for the future, Pruitt and Dowling (1985) said that online search training would become as routine for students as instruction in card catalog use is currently. More public libraries will offer online services as school-trained searchers will come to expect and
demand it. Libraries will experience a reallocation of resources as online reference materials replace their printed counterparts. Lastly, they foresaw that online services would become ready-reference tools replacing printed versions of *Books in Print*, Ulrich's International Periodicals Directory, etc., as they will be seen as avenues of first search for information, not just for in-depth research.

REPORTED ANTAGONISM AND SHIFT FROM LIBRARIES

The literature indicates that a number of end-users view online searching as a means of escaping traditional library usage. Some searchers expressed outright hostility toward libraries. Callison and Daniels (1988) notes that some of the subjects reported that online searching, "...sure beats running around different libraries". In a similar vein, Diodato (1984) reported that in the popular press articles that he examined (55 articles from 25 magazines), disparagement of libraries is increasingly common. Eight of the 55 articles discussed online searching as a way to avoid or minimize conventional offline, library-based searching. One searcher, he said, made the argument that, "...in a sense, information banks have taken up where Melvil Dewey left off...He never figured out how to get rid of the legwork, the digging in the stacks, or...the key source that is out of data, misplaced, or on loan".
Liesener (1985) commented on the changing role of the library as a result of online technology stating,

"The older concepts of passive culture repositories or centers for the development of an enjoyment and appreciation for reading good books while identifying very important functions, do not appear to be actively responsive to the entire range of needs identified as crucial for survival and achievement in an extremely complex, information abundant and rapidly changing world."

Kupferburg (1986) researched various end-user professionals from law, education, medicine and chemistry and reported that all expressed high affective responses to online searching. They also cited the timesaving nature of computerized searching but also stated, to Kupferburg's dismay, that "All of the searchers spoke of their delight because they now have to spend less time in the library". Ojala (1986) took note of this trend, also stating that many end-users see online searching as a way of, "avoiding cumbersome card catalogs, missing issues of periodicals, and the general dreariness of using a library".

ON THE COST OF ONLINE SEARCHING

Halperin and Pagell (1985) indicated that an important difference between offering free and charged end-user searching was the volume of business that free searches generate that offset costs via increased volume. Cost-comparison studies of various online services were discussed by Cloud and Hambric (1987). Many pricing
comparison studies were found to be not useful to this study as the pricing schemes for public schools are often radically different than those levied upon other types of organizations. This was particularly true in the case of bibliographic retrieval services such as DIALOG that offer low, flat-rate charges to public schools with no additional per-citation-retrieved charge added. This is opposed to the much higher individual pricing of databases and a citation charge that is commonly assessed business, industrial, and scientific users.

ALLOWING STUDENTS TO CONDUCT THEIR OWN SEARCHES

Most online searching is still performed by "intermediaries", typically trained librarians who search on patrons' behalf. However, surveys indicate that performing their own searches is important to an increasing number of end-users.

Online searching has been available for many years at Loyola University. Snow (1988) discussed a graduate-level program that allowed students to execute their own searches (as opposed to an "intermediary" such as a librarian). At Loyola, it was found that students who had online searches performed for them tended to view the results as "magical" and the searches sudden appearance from "nowhere" appeared to foster passive use of the library. Students felt they were leaving their research largely in someone else's hands.
This was judged in contrast with the library's philosophy of helping students become more independent by making their own decisions. Snow found that the best solution was to teach students online search techniques, to have them design and execute their own search, but then to return to allowing the library staff to conduct their searches. The response was enthusiastic as students reported a greater sense of understanding and participation in their own research processes.

Craver (1985) noted that in her research of student searchers at University High School (Urbana, Illinois) one of the few regrets mentioned by students was that they, "wished they could have done the actual searching without the assistance of a librarian". According to Halperin and Pagell (1985) novice online search students surveyed via a Likert scale disagreed (median score = "4") that a trained searcher would have retrieved more useful information than the students themselves did. Foster (1987) also found that searchers in the Cleveland Public Library preferred to conduct their own online searches.

In speculating on why many end-users prefer to conduct their own online searches, Ojala (1986) stated that likely reasons included: (A.) Personal intrigue with the technology and, (B.) The development of an "information junkie" personality which manifests itself in someone who is
deeply impressed by the sheer volume of online information available and his ability to handle it.

**REVIEWS OF BIBLIOGRAPHIC DATABASES**

Tenopir (1986) reviewed the major online services relevant to the education community as did Rubin (1984) and Samples (1984). Weiss (1976) compared the relative performance of Orbit vs. DIALOG using six representative databases. Edelhart and Davies (1983) compiled a directory of hundreds of available online databases. Both Tenopir (1983) and Janke (1984) provided descriptions of the consumer-targeted online services BRS/After Dark and Knowledge Index. Ferrarini (1984) also reviewed BRS/After Dark. Aversa, et.al., (1987) presented an overview and assessment of the current range of online information services available for secondary students. Pietro and Kremin (1983) examined SPIN (School Practices and Information Network) and its educational usefulness. O'Leary (1986) discussed the database vendor, Wilsonline, and Snow (1985) described a number of medically-oriented databases. Johnsen (1984) reviewed seventeen databases available on DIALOG and/or BRS that were of particular interest to educators. They concluded that while the various databases were highly useful, current cost considerations would perhaps preclude many schools from accessing them.
ALTERNATIVE BIBLIOGRAPHIC RETRIEVAL SERVICES

A number of public schools have elected not to employ the services of a bibliographic search and retrieval service such as DIALOG or BRS. For a number of reasons, including cost, less technical training, and consumer-orientation, many are choosing instead to provide access to "information utilities" such as The Source, CompuServe, Delphi, or The Dow Jones News/Retrieval Service. Tenopir (1986b) indicated that many elementary and middle schools do not feel that their students need access to such a sophisticated system as DIALOG although the number of such schools using it is increasing. One suggested alternative was the use of an "information utility" aimed at the consumer market such as those mentioned above.

The appearance of these services has resulted in a broadening of the concept of what constitutes a database. Ojala (1986) stated that the lines distinguishing what is a database and what is not are blurring as end-user-oriented "information utilities" such as The Source, CompuServe and Dow Jones News Retrieval Service continue to grow in popularity.
INFORMATION UTILITIES

As an assistance in contacting online services Sovner (1982) produced a telephone directory of database publishers. Similarly, but with broader scope, Cane (1983) compiled a telephone directory of modem-answering numbers that provide access to a wide range of online services down to private computerized bulletin board systems (CBBS’s).

TECHNICAL ASPECTS OF TELECOMMUNICATIONS

Much of the literature on the technical aspects of online telecommunications was found to be in the popular press, particularly in computer hobbyist/enthusiast magazines. They provided excellent background information on the hardware and software required for microcomputer-based online searching. General references covering the whole of computer telecommunications from a technical standpoint were, Murphy (1984), Schooler (1984), Yuen (1983, 1984), Archibald (1983a, 1983b), Derfler (1982), Glossbrenner (1983), Anderson (1985), Keating (1985) and Lockwood (1985a).


ON THE RESEARCH METHODOLOGY

Since this research was a natural experiment in curricular intervention which focused upon student talk as its primary data source,

This study represented a natural experiment in interactive-reactive, participant/observer research. The primary data source was student talk gathered over a semester's time. With the heavy emphasis upon analysis of talk, a qualitative design was employed. The project's design and theoretical constructs were drawn largely from research in sociolinguistics and the handling of speech as data as described by Hymes (1974), Evertson and Green (1986), Green and Wallat (1981), and Gumperz (1982). Concepts of participant observation were related by Spradley (1980). The analysis of speech via a taxonomic categorization was also done by Spradley (1979). General methods of qualitative research were presented by Bogdan and Bicklen (1982) and Guba and Lincoln (1981). Schoeller (1985) discussed various computer software programs of his own design for use in qualitative data analysis. The most significant was a modification of the "search" command of a common word processing program to isolate and collect into a
separate file, all lines of a transcript that contained any given word or phrase. Another allowed automatic line numbering of transcripts.

In summary, it has been shown that the literature concerning online searching and computer telecommunications in general is still somewhat scarce and has been forged from two distinct areas, that of library science, and the popular computer press. More synthesizing work is needed to help bridge the gap between library-conducted online searches and the desire by an increasing number of end-users to design and execute their own. Also, there is a marked absence of work examining the collective value of conducting searches via the integration of multiple, but disrelated online services. That was one of the primary functions of this study.
CHAPTER III

METHODOLOGY OF THE RESEARCH

Chapter Three will discuss the following attributes of the inquiry undertaken:

1. The Purpose of the Project.
2. The Questions Investigated.
3. The Experimental Design.
4. The Class Characteristics.
5. The Population.
6. Funding Acquisition.
7. Site Acquisition.
8. The Research Timeline.
10. Data Collection.
11. A Discussion of the Multiple Sources of Data.
12. The Necessity of Triangulation.
13. Data Reduction.

PURPOSE

This research in secondary school-level online information searching was undertaken as a natural experiment in curriculum intervention. It was designed as an interactive-reactive study to yield information documenting the methods by which: (A.) Students currently search out information in response to school assignments, (B.) Their perceptions of, and affective responses to, four classes or online information sources, and (C.) Their ability to integrate these sources to produce information searches superior to any previously employed.

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Students' use of conventional libraries as primary information sources has been extensively studied. Similarly, research on teaching students to perform computerized database searches via a single bibliographic search system such as DIALOG or BRS is commonplace in both the education and library science literature. There are, however, three other, distinctly different classes of online services whose collective educational potential has not been studied. Besides the bibliographic search-and-retrieval services typified by DIALOG, there exists, in addition: (A.) Online library circulation management databases such as The Library Control System (LCS) program used by many institutions to index their collections, (B.) The self-proclaimed "Information Utilities" represented by CompuServe, The Source and Delphi, and (C.) Computerized Bulletin Board Systems or CBBS's. Each service presents offerings quite dissimilar from the others.

No previous study has attempted to systematically expose students to all four classes of online services and gather data regarding students' ability to integrate the services and extract useful information in dealing with the information searching demands placed upon them via the normal course of secondary schooling.
THE QUESTIONSPOSED BY THE STUDY

Specifically, this research attempts to answer four questions:

1.0. What was the structural organization of the innovation presented to students?
   1.1. What was the nature of time and task?
   1.2. What is the role of the student?
   1.3. What was the role of the teacher/researcher?

2.0. How do secondary students search for information needed to fulfill the requirements for school papers, projects or presentations?

3.0. What were the students’ perceptions of, and affective responses to, exposure to four classes of online services (Knowledge Index, The Source, LCS, and Computerized Bulletin Boards)?

4.0. In what ways did exposure to online services alter the students’ current types of search strategy?
   4.1. What were the indicators of change or growth in the students’ knowledge of search strategies for information?
   4.2. Did students integrate across the four classes of services to produce searches superior to any single service?
THE DESIGN OF THE EXPERIMENT

Designed as a natural experiment in information searching of high school students, a semester-long class teaching online telecommunications was specially created. This class provided a bounded unit in which systematic observation of students as online searchers could be undertaken. In addition, the use of the class provided a place where changes in student knowledge could be explored over time and student perceptions could be explored over time. This approach provided a means of exploring both process and product from an emic (insider's) perspective as well as from an etic (outsider's/researcher's) perspective. The class was taught by a teacher who was a regular member of the school's faculty.

POPULATION:

Ten, students ranging from sophomore through senior elected take a course entitled, "Computer Science II". The students were naive to the nature of the project when they self-selected the class. Once enrolled, students' permission was obtained and they were given the opportunity to drop the class if they were uncomfortable with its research project orientation. All elected to participate.
COURSE/TASK DESCRIPTION:

The course simply entitled, "Computer Science II" met 55 minutes per day, five days per week for 21 weeks (January to June) of 1985 at The Whitehall-Yearling High School, a suburb of Columbus, Ohio. The students were set up in the high school's computer laboratory with their own Apple IIe, printer, telephone line, modem and telecommunications software.

Each student was given free and functionally unlimited access to four classes of online services: bibliographic search-and-retrieval (DIALOG), "information utility" (The Source), Library circulation control (LCS), and numerous Computerized Bulletin Board Systems (CBBS's).

RESEARCH DESIGN CYCLE: AN OVERVIEW:

A cyclical five-phase design was employed to meet both instructional and research needs. From the instructional standpoint, the researcher had to play the role of teacher for short periods, communicating technical information to students on how to operate each online service. Then, creating both time and space for the teacher to distance himself and act as the researcher, long periods of independent exploration time was created for the students. These periods were characterized by very low instruction or intervention of any kind by the researcher. These times
were spent in systematic observation of the students as they interacted with each new type of online service.

To judge student's competence with each service, search assignments were made in which students had to locate and present information on an academic topic that the researcher knew was contained within each system. When the exploration of one service drew to a close, a group meeting was held to discuss the service under study. After the meeting, the cycle began again, with a high level of direct instruction in the technical operation of the next type of online service. Thus, the typical design pattern throughout the experiment and role of the teacher/researcher was as follows:

THE DESIGN CYCLE

TECHNICAL SYSTEM INTRODUCTION PHASE:
ORIENTATION: TEACHER

During this phase, there was typically a teacher-centered lecture on the basic operation of an online service from a technical standpoint. During these sessions, an overview of the system and its rules of system operation were laid out along with a general roadmap of the particular services that each would offer.
INDEPENDENT STUDENT EXPLORATION/DISCOVERY PHASE:
ORIENTATION: RESEARCHER

Changing roles, and creating distance, the researcher then allowed prolonged periods of independent student exploration with minimal teacher intervention while the researcher observed and recorded the students' exploration. This was a sound design decision for both instructional and research purposes. From a research standpoint, time had to be set aside during which the researcher could move back from a student instruction mode and into a quiet role of passive observer. Only in cases of serious technical problems was the teacher-mode reentered and then only for brief periods.

The student exploration time allowed prolonged periods during which the researcher could videotape the class sessions, make field notes, etc. Also sound from a pedagogical position, the quiet student exploration time allowed for several goals to be accomplished. First, the online services studied are extremely large. DIALOG indexes over 150,000,000 articles and has a relatively complex command structure. LCS catalogs millions of books. The Source offers over 1,000 different services from AP News to computerized mail. Bulletin Boards, while individually small, were extremely numerous and diverse in their offerings. Students needed extended time to simply find
their way through each system and richly experience their wide-ranging offerings.

Secondly, each student came from a differing background in terms of computing expertise. Some picked up the technical operation skills very rapidly, others more slowly. Some were touch-typists, others "hunted and pecked". Thirdly, the students needed quiet, hands-on time to try out their new-found skills in an independent, non-graded, low-threat manner to prevent them from being overwhelmed by a type of computing that none had experienced before. Therefore, it was neither practical, logical or even desirable to attempt to move the students through the systems as a cohesive group. From an affective standpoint, students repeatedly stated their satisfaction with the project’s design.

**INTRODUCTION OF A SEARCH FOR INFORMATION PHASE:**
**ORIENTATION: RESEARCHER**

At the conclusion of the system experimentation phase, the researcher intervened and made an assignment, a search for some specific information, and then stepped back again to observe the students’ attempts to produce the information requested. Sometimes the students made their own search assignments, something related to other other classes, or to personal interests.
DIRECTED STUDENT SEARCH PHASE
ORIENTATION: RESEARCHER

The students returned to their computers and planned and executed a search for the information requested in step 3 above.

GROUP MEETING PHASE:
ORIENTATION: RESEARCHER

The researcher then held a videotaped group meeting to discuss, present findings, share feelings and perceptions, successes, and failures. At the meeting's conclusion, the cycle began anew with a teacher lecture on the operation of the next online service. This cycle was repeated four times. At the end of the fourth cycle, the participants selected a topic of their own choosing for a final paper/project which invited integration of the four types of online services examined. During that time, the teacher functionally ceased to exist and the researcher collected data on the students' progress with their final projects.
PHASES OF IMPLEMENTATION OF THE RESEARCH

PHASE I: ACQUISITION OF ONLINE RESOURCES

It was the inherent nature of this research project that it be, by many public school's standards, quite expensive to conduct. It was judged likely that outside funding or grants of some type would be needed to set the study in motion. The design of the project called for the employment of four different online services: The Ohio State University's Library Control System (LCS), DIALOG, The Source, and various and sundry privately operated bulletin-board systems (CBBS's).

Costs varied tremendously among the four classes of online services. LCS was a local phone call away and provided its services free of charge. Most of the CBBS's were also free unless the participants elected to call a remotely located system and incur long-distance telephone
changes. DIALOG and The Source, in contrast, charge by the connect-minute. DIALOG's hundreds of databases are differentially priced depending upon the nature of the information contained within the database and what the consumer traffic will bear. A low-end figure might be $15.00/hr. extending upward to well over $100.00 per connect-hour. The Source, while substantially less expensive than DIALOG, was still beyond the reach of many schools to provide on an unlimited-usage basis.

Dr. Roger Summit, CEO of DIALOG Information Services in Palo Alto, Ca. was submitted a copy of the study's proposal as was Nancy Beckman representing The Source in McLean, Virginia. (see Appendix "A"). The Source was eager to participate and donated virtually unlimited connect time and user's manuals for ten individual accounts. They also did not place any restrictions on what the participants might elect to do while connected to The Source.

In contrast, DIALOG initially rejected the project based on their contention that DIALOG itself was quite complex and learning it alone was more than enough of a challenge to secondary-level students without attempting to merge its offering with those of The Source, LCS and assorted CBBS's. A second letter, one of appeal, was sent to DIALOG and brought a change in their position. They
offered five open accounts to their system with three hours of connect time each.

Based upon the author's earlier online experiences and in conjunction with DIALOG, a minor substitution of services was made. DIALOG provides, to private individuals, an evening, weekend and holiday-offered subset of DIALOG, with a slightly less complex command structure called "Knowledge Index". For a flat-rate of $24.00/hr. one can have access to many of the most popular databases offered on regular DIALOG. It was this version of DIALOG that was offered to the project without charge or restriction.

One should note that schools may now access, during the regular school day, either Knowledge Index (called "ClassMate" in the education market) or regular DIALOG (referred to as "The Classroom Instruction Program" or "CIP") for $15.00 per connect hour. Since the project's completion, Whitehall now subscribes to CIP and training in its use is required for several classes.

PHASE II: SITE SELECTION

The research was performed in the newly-built Microcomputer Lab at The Whitehall-Yearling High School located in Whitehall, Ohio on the east side of Columbus. It was selected as the research site for four reasons. Firstly, the principal investigator had ready access to the
location as he had been a member of its science department faculty two years prior to the study. Secondly, key high school and district level administrators were highly supportive of university research in educational computing, an area in which they were struggling without leadership to provide for their students. Thirdly, the researcher had been away on professional leave from the Whitehall District for three of the past five years and thus was unknown to the subjects participating in the study. Lastly, but critical to the success of the project, the Whitehall district was willing to provide substantial financial support for the project through its purchase of ten, Hayes Inc. 300 baud modems and the installation and monthly maintenance of ten residential-type phone lines in the computer lab including long-distance charges. Residential, private lines were needed since otherwise, the participants could not receive calls from an outside computer as those calls would have been routed through the district’s Centrex system to a human operator. Upon hearing a human’s voice, rather than a single-pitch "carrier tone", the participants’ systems would have terminated the incoming calls.

Whitehall was also willing to purchase video and audio tape and grant the usage of its video equipment for data collection. To make the research as unobtrusive as possible both for themselves and the researcher, the Whitehall
administrators elected to make the project into a regularly scheduled and accredited semester course simply entitled "Computer Science II". The only course in their computing curriculum at the time was, "Computer Science I", a semester-long course in BASIC programming. The project was run as a course, during the second semester of the 1985-86 school year.

**Phase III: The Participants and Their Selection**

The subjects consisted of a group of 7 male and 3 female students voluntarily drawn, via normal registration procedures, from grades ten through twelve (Whitehall's BASIC computing class was not open to freshmen because it presumed a knowledge of Algebra). The student participants were self-selected, not chosen by some set of criteria by the principal investigator.

All of the participants had completed the school's introductory computer science course in BASIC programming. They blindly elected to enroll in a second, undescribed semester course in computer education simply entitled, "Computer Science II". They were completely unknowing as to the content nature of the course except to assume that it pertained to computers. While it can be presumed that these individuals had successfully completed a prior course in BASIC programming, no other demographic or academic
information was considered relevant to their participation in the study.

These students registered for the course as they did for all their others. They did not know the researcher, nor did they know that they were actually volunteering for a research project. After the "course" began, students were advised as to the special nature of their situation and required to have consent forms signed if they wished to continue (see Appendix B). All opted to remain with the project.

PHASE IV: SETTING UP THE ENVIRONMENT

The newly-constructed Apple IIe computer laboratory at the high school was utilized for the study. Using district funds, Whitehall agreed that ten of the lab's Apple IIe microcomputers would be equipped with 300 baud modems. These, in turn, were connected to individual, private phone lines. The course, "Software Tools II" met for one period a day (sixth), five days per week, for the entire second semester. Just as in all the other courses at the high school, attendance was taken, assignments given, tests administered and grades recorded. It must be noted, however, that actual letter grades were only employed during approximately the first six to nine weeks of the study. This was the period during which students were acclimating to the new environment and learning the technical
fundamentals of word processing and modem operation. After that point, grades meant less and less as ten students began working independently on just as many different topics.

The final project, while not strictly graded on a traditional A-F basis, was required for passage of the class. Essentially, grades were used in the early part of the project to ensure that students felt they were in a regular class, with a regular instructor and should approach the material presented in a serious manner.

**PHASE V: THE TIME LINE**

Below is a time-line table illustrating the relationship between time and task in setting up the research, executing the curricular intervention, gathering data and data analysis. Across the X axis is time, collapsed to months for some tasks and expanded to show individual weeks of activity for others. Down the Y axis are the researcher's activities. Events are listed in reverse chronological order with earlier tasks at the top. It moves progressively downward through the four online cycles described earlier, to types and dates of data collection and finally, the data analysis itself conducted over the summers of 1988 and 1989. This time line is intended only to illustrate the chronological sequence of the research design itself. It is not meant to demonstrate the flow of the *curriculum* nor the everyday activities of teacher and
students. That timeline, divided at the daily level, can be found in Chapter Four immediately following the social history of the class.
Figure 2. Time Line of the Research
COMPUTER TECHNOLOGY EMPLOYED

Qualitative research presents a unique set of problems in data management, reduction and management. Working with data generally less compact than that collected via numerically-oriented quantitative research can entail many time-consuming managerial activities. Therefore, careful planning was done to use computer technology to assist in the handling of data in this study.

To assist in the analysis of study's questions, one primary piece of microcomputer software was employed. **AppleWorks 2.0** (Claris Software, Inc.) was selected as the main data analysis tool, for it combined the three functions deemed most necessary in handling the large amount of data collected during the semester-long project: word processing, database management and spreadsheets. Some author-created software was also employed and it is published later in this chapter for the public domain.

*AppleWorks*'s basic functions were expanded using the full array of Beagle Brothers **TimeOut** software that provides AppleWorks such things as graph generation, spell-checking, sideways printing ability, etc. At the project's inception, it was thought that only the superior capabilities of a mainframe computer running a text-editing program like **WYLBUR** would be able to process the project's high volume of qualitative, text-oriented data quickly and efficiently.
Since the conclusion of the data gathering phase, very significant technological advances in microcomputer hardware and software have permitted an enhanced Apple IIgs to handle all of the data analysis in one large chunk. Hardware add-ons including an Applied Engineering one-megabyte RamWorks memory card, a TransWare accelerator card, a 1200-baud Applied Engineering DataLink modem and a 20 megabyte Sider hard disk drive allowed the data to be processed without the need of mainframe assistance. The specifics of the hardware and software configuration are considered worthy of mention as they greatly streamlined the analysis of data and in some cases provided information that would have been extremely time-consuming and/or impossible to provide by more conventional means of qualitative data analysis. Others doing similar research in the future may wish to evaluate some of the methods described in this chapter.

**THE DATABASE COMPONENT**

Data management was initially a concern due to having to deal with so many instances of classroom talk collected over a relatively long period. All totaled, more than 1,200 statements made over five months had to be organized in some coherent fashion. Initially, it was planned that the comments simply be keyed into the AppleWorks word processor and then later moved around as categories of talk emerged.
Better suited to this type of data handling, however, was AppleWorks database component which allows data to be sorted alphanumerically by any string of characters. For example, a mailing list database might contain the following categories of information: Name, Address, City, State, Zip Code, and Phone Number. One could sort the database alphanumerically by any of these categories, or more importantly, selectively search through them for specific data. Consider the search request below. Manually locating all of the entries that satisfy its criteria could be laborious, time-consuming and error-prone.

Find all entries that:

1. Contain "er" in the last name
2. Live in a state that starts with "N"
3. Have a zip code ending in "G"
4. Have "Main" in the street address

While finding the addresses that match all four of these peculiar criteria might produce a worthless list by most standards, the point is, a computer database could answer a question like this almost instantly because it assigns no priorities to particular search categories like human fillers do. We tend to manually file by last name alphabetically or by an account number of some sort. In contrast, computers don't "care" what they search for. All data are equally important and accessible, even in string fragments (find last names containing "er").
this reason, a database was chosen as the vehicle to handle
the volume of talk-related data.

THE SPREADSHEET COMPONENT

The design of the research called for the construction
of a large table which detailed the structural nature of the
research as well as its curriculum. Also, many other tables
were necessary to properly present the data and its
interpretation. The common element to all of these tasks
was a grid-like row and column orientation. A computer
spreadsheet was chosen to handle these tasks.

Besides allowing easy-to-read row and column placement
of data, using a spreadsheet for this phase of the analysis
provided another useful feature that would be tedious and
time-consuming to perform without computer assistance. And
that is the indexing of talk and/or activity that is so
often managed manually via a stack of cross-referenced index
cards or similar paper-based means. All spreadsheets share
a common trait. They designate columns alphabetically (A,
B, C, etc.), and rows numerically (1, 2, 3, etc.). The
intersection of a column and row is a cell identified
alphanumerically (A1, D34, R121) and so forth. By using a
spreadsheet's "FIND" or "SEARCH" command (in AppleWorks
case, "Open-Apple-F"), any text string can be sequentially
located throughout the entire spreadsheet. For example,
assume that all of Lisa's talk or activities are preceded in
the spreadsheet by the prefix "Lisa:". By searching for the
text string "Lisa: ", the spreadsheet will locate each and
every occurrence of cells tagged with the "Lisa:" notation,
thus generating a list of cell locations where one can
examine Lisa's comments or activities. Using this
technique, a list was rapidly made for each participant
locating their talk and/or activities. This made managing
the 22,000 cells of data much simpler.

VALUE TO THE RESEARCHER OF INTEGRATED SOFTWARE

More and more productivity software being written is
designed as an integrated package. Integrated software
possesses three advantages. Firstly, multiple modules (word
processor, database and spreadsheet), of similar design and
command structure simplify the mastery of each. Secondly,
each module can read (import/export) the other's files.
Thirdly, data from each module can be electronically cut and
pasted into the others allowing, for example, a table
created with the spreadsheet to be seamlessly merged with
its word processor-created explanation.

Using an integrated software package like AppleWorks
gives the qualitative researcher yet another advantage when
merging data created by different modules that should not be
taken for granted. And that is that when writing a
description of the data contained in a spreadsheet or
database, the data contained within them can be merged into
the word processor without re-keying. The various spreadsheet and database excerpts that the reader will see throughout this chapter were "cut and pasted" from their original sources. Thus, duplicate entry is not necessary and the chance of data presentation error is greatly reduced since it is untouched from its original source. The graphs in this chapter were produced in the same manner, created automatically and directly from spreadsheet data. Then, with AppleWorks through the enhancement of TimeOut SuperFonts, graphs were placed directly into the text of this paper with the command, "<Pn>" , meaning "place picture (graph) #n here". Thus, this entire document, save pages that are printed sideways, was one, seamless file devoid of manual cut and paste.

"SandS" and "NumberTrans"

As stated earlier, the analysis of bulky qualitative data presents its own unique set of problems, not the least of which relates to simple preparation of the data for later processing. The transcript of a verbal exchange is one of the most common sources of qualitative data. Running on page after page, it is often unduly difficult to locate a particular passage of dialogue. To address this problem, one must often resort to the laborious task of line numbering the transcript which typically slows transcription substantially. While there are the "cut and
past" tricks of attaching a numbering strip down the left margin of the page, etc., there is a better way.

Before AppleWorks emerged in the mid-1980's, Apple's AppleWriter was one of the best word processors for the Apple II family of microcomputers. It is still considered by many to have formatting capabilities superior to that of AppleWorks which sacrifices individual module power for module inclusivity. AppleWorks simply does more overall than AppleWriter. Apple no longer sells AppleWriter and its legal fate is somewhat murky. Paul Lutus, the author of AppleWriter even placed a version of his work into the public domain directly under the name FrEdWriter which is widely available at little or no cost. In any event, there are two programs available, designed by the author which can be of significant assistance to the qualitative researcher. Both are hereby released, without restriction, into the public domain. Both are written for use with the DOS 3.3 version of AppleWriter II using its own built-in Word Processing Language (WPL) and probably can be easily modified for use with the newer ProDOS version. AppleWriter also has the ability to share ASCII data files back and forth with AppleWorks, so conversion of files is no problem.

The first program is called NumberTrans. It is a simple but efficient program that from within AppleWriter will sequentially line number any text file, (001, 002,
To use the program, simply secure a copy of AppleWriter, type the program as you see it below and save it to the program disk as "NumberTrans". Next, when you have a transcript to number, follow the following short steps:

1. When you've finished typing your transcript, save it to disk for safety.
2. Type "Control-P" (Print Program will appear on the screen).
3. Type "PD8" and press RETURN (this "prints" the file to disk formatting it however you have commanded and placing RETURNS at the end of each line.) This is important. NumberTrans needs to know where each line ends so it can place the line number correctly. (You have two alternatives to this PD8 trick). The first is to directly type your transcript with RETURNS after each line to start with. Then you can forget this step. The second is to type up the transcripts using AppleWorks and then print it "as an ASCII file to disk". This will also insert RETURNS at the end of each line.
4. You'll be prompted for a file name under which you can print this file. Call it something different from the original master file. Anything that makes sense to you is all right.
5. Type "Control N" (for a "new" screen) and answer "Yes" to the question it poses. Your screen should now be blank.
6. Type "Control-L" (for "load") and enter the name of your new file.
7. Type "Control-P" (No RETURN).
8. Type "Do NumberTrans" (RETURN).
9. Sit back and watch "NumberTrans" sequentially number your long transcripts for you.
10. When it's finished save the numbered file back to disk.
"NumberTrans"

The Apple Writer II Transcript Numbering Program
(DOS 3.3 Version)

By

Douglas K. Schooler and Thomas Millichip
(Released into Public Domain Aug., 1989)

psx  2
psy  8
psz  98
b
f/=001 /
y?
pas00=$a
loop  f<><>$a(x) <
y?
pgo  setup
pgo  end
setup  psx  +1
psy  -1
pgo  chk
pas0=$a
chk  psz  -1
pgo  loop
pas=$a
pgo  loop
end  b

The second program, is a powerful improvement on the
"Search" or "Find" capability of all word processors. The
problems with search functions is that when they’re done,
they’re done. In other words, one can search, for example,
for occurrences of "like" in a body of text and the word
processor will dutifully respond with a serial presentation
of each and every occurrence of the word (or a partial
word). It doesn’t however, do anything with what it finds.
It just shows them. It doesn’t record where they occurred,
how often, etc.
To address this problem, the author designed another WPL program for AppleWriter called "SandS", for Search and Save. When executed, this program will scan any text file (again, with RETURNS after each line) and will write to a separate file, copies of all lines that contain the term one is searching for. For example, one could search for the term, "difficult" using SandS. When the program finishes its run, there will be a separate file on disk containing only those lines (and line numbers from NumberTrans) that contain the search term "difficult" in any context. The use of the program is even simpler than NumberTrans. Just load the line numbered file into AppleWriter, type a "Control-P" followed by "Do SandS" (RETURN). From there just follow the screen prompts. Here is the program, also committed to the public domain.

```
pnd
ppr#
psx 20
plp ppr
psx -1
pgo plp
ppr
ppr The Apple Writer II String Search and Save Program
ppr (DOS 3.3 Version)
ppr
ppr By
ppr Douglas K. Schooler and Thomas Mimlitch
ppr (Released to the Public Domain Aug., 1989)
ppr
ppr WARNING: This program erases the file in memory.
ppr Be sure you've saved the file that you are about to
ppr search before proceeding. RESET to abort.
ppr
ppr * Directions *
```
1. Enter the file (and drive) to search in the following manner: "Filename,D1". Enter "D2" if file to be searched is in disk drive number two.

Pin What filename and drive location to search? =a

Enter the filename and disk drive number to which the results of the search will be saved.

Pin What name and drive are results to save under? =c

ny s$c
l$a b
f<<<>< y?
 b
psx 0
pyd
Pin Please enter your search term =b

loop f<$b<
 ?
pgo match
pgo bad

match d
 f<<<
 y?
pgo begin

begin d
 f<<<
y?
s$c<<n+
pgo savok
pgo bad

savok f<<<<
 ?
pgo loop
pgo bad

bad ny l$c

DATA COLLECTION

To condense all the major sources of data with their subsequent plan for reduction and analysis, consider the following summary outline. At it's conclusion, a more-detailed discussion will be presented in the same order.
I. SOURCES OF DATA GATHERED

A. Daily classroom video tapes.
B. Entry- and exit-point interviews.
C. Student-produced service reaction/evaluation papers.
D. Entry-point and exit-point flow charts of search strategy.
E. Student online logbooks.
F. Group meetings.
G. Final projects.

II. DATA REDUCTION

A. Transcription of daily videotapes to a structural time-line to document curricular design and the nature of time and task.

1. Further reduction from the daily-based time-line in "A" above to another time-line illustrating time spent by each discernable task or activity type (i.e. online session, group meeting, interview, logbook maintenance, etc.).

B. Creation of a computer database into which all recorded "talk" (written and verbal) could be transcribed and indexed for later evaluation.

1. The database would index: who the speaker was, what was said, when it was said, in what context, in response to what question (if any), needed contextualizing information, and lastly (derived from the data itself) via a Spradley Taxonomy, a taxonomic class representing the major thread or theme of the talk.

2. Then, further reduction of the talk database to include and cross-compare talk across the identified taxonomic spectrum focused primarily on three participants who were judged to meet the design's need for a range in sex, age, computing experience, response to the technology, completion of class requirements, etc.

III. DATA ANALYSIS

A. From the two structural time-lines, one daily curricular and the other organized by task, the structural nature of the course was extracted answering question set 1 concerning the student nature of time and task and the relative roles of A. the student, B. the teacher, and C. the researcher.
B. From the indexing talk database, a Spradley-style taxonomic analysis was performed.

1. The 1,200-plus instances of indexed talk were examined repeatedly by three individuals looking for patterns or themes running through the talk.

2. Tentative descriptive titles were assigned to the data as thematic issues emerged.

3. The examiners met and re-evaluated the database repeatedly as new themes emerged or new linkages among the talk were discovered.

4. Eventually a taxonomy of approximately 11 major domains and a total of about 40 subcategories was identified.

C. Using the three selected students as representives of the range of the group, a reduction was made of the talk data into another table showing:

1. The three students' names down the "X" axis, followed by the major themes in each's talk vertically arranged under each identified taxonomic category across the "Y" axis.

2. Below the identified themes of talk, another category illustrated related comments made by other participant's in the study.

3. The next row stated which of the study's four basic questions (or questions), the talk themes related to answering.

4. Finally, a tentative answer to the question was entered on the last line of the table.

5. The table eventually looked like that shown below.
Taxonomic
Category 1...2...3...4...5...6... etc.

<table>
<thead>
<tr>
<th>Student 1 Talk</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Student 2 Talk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student 3 Talk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Related Group Talk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major Themes of talk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Related Questions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Answer to Q's.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 3. Talk Analysis Chart

6. The analysis was used primarily to address questions 2 (How do students search?) 3 (Perceptions and affective response to online technology) and 4 (Evidence of change in the participant consequent to exposure to online technology).

D. Quantified graphing of talk data

1. A total count for talk for each taxonomic category was made and bar-graphed to document relative numbers and thematic relationships among categories.

E. Student-drawn charts of search strategy.

1. Students' entry-point and exit-point flow charts were placed side-by-side and evaluated for evidence of change that could be attributed to the exposure of online technology.

2. Such evidence included: increased complexity, additional information sources, integration of on- and offline search techniques, recursive searches, less linearity, less reliance on encyclopedias, more use of journals, etc.
3. The analysis was used primarily to address questions 2 (How do students search?) 3 (Perceptions and affective response to online technology) and 4 (Evidence of change in the participant consequent to exposure to online technology).

F. Student-written account of searches employed for final project.

1. Each student included in the final, a description of how the information needed to produce it was obtained.

2. Evaluation of the description was performed along the same parameters as step "E-2" above.

3. Use of analysis was directed at question set 4 (Did exposure to online technology alter students' search strategies?)
<table>
<thead>
<tr>
<th>QUESTION</th>
<th>DATA COLLECTION: SOURCES</th>
<th>DATA REDUCTION/ANALYSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 What was the structural organization of the innovation presented to students?</td>
<td>1. Daily videotapes of classroom</td>
<td>1. Transcription of talk/activity onto time-line structural spreadsheet</td>
</tr>
<tr>
<td>1.1. What was the role of the teacher/researcher?</td>
<td>1. Daily videotapes of classroom</td>
<td>1. Transcription of talk/activity onto time-line structural spreadsheet</td>
</tr>
<tr>
<td>1.2. What was the role of the student?</td>
<td>1. Daily videotapes of classroom</td>
<td>2. Student online logs</td>
</tr>
<tr>
<td>1.3. What was the nature of time and task?</td>
<td>1. Daily videotapes of classroom</td>
<td>1. Transcription of talk/activity onto time-line structural spreadsheet</td>
</tr>
<tr>
<td>2.0. How do secondary students search for information needed to fulfill the requirements for school papers, projects or presentations?</td>
<td>1. Entry point interviews</td>
<td>1. Creation of a database indexing talk/activity via a Spradley Taxonomy</td>
</tr>
<tr>
<td>2.1. What were the students' perceptions of, and effective responses to, exposure to four classes of online service?</td>
<td>1. Daily videotapes</td>
<td>2. Comparison of entry and exit-point flow charts</td>
</tr>
<tr>
<td>2.2. Did exposure to online services alter the students' current type of search strategy?</td>
<td>1. Daily videotapes</td>
<td>1. Transcription of talk/activity onto time-line structural spreadsheet</td>
</tr>
<tr>
<td>2.3. What were the indicators of change or growth in the students' knowledge of search strategies for information?</td>
<td>1. Exit-point interviews</td>
<td>2. Creation of a database indexing talk/activity via a Spradley Taxonomy</td>
</tr>
<tr>
<td>2.4. Did students integrate across the four classes of services to produce searches superior to any single service?</td>
<td>1. Exit-point interviews</td>
<td>3. Comparison of entry and exit-point flow charts</td>
</tr>
</tbody>
</table>

**Figure 4. Summary of Collection and Analysis Plans**
DISCUSSION & ANALYSIS OF DATA COLLECTION

DATA COLLECTION

Data for this curriculum research were collected from five primary sources and three secondary sources including, but not completely limited to the following:

PRIMARY SOURCES:
A. 2-Open-ended interviews as described above (videotaped).
B. Videotapes of nearly all class sessions.
C. Personal logs maintained by the subjects of their online experiences.
D. Group Meetings (videotaped).
E. Student-drawn flow charts of search strategy.

SECONDARY SOURCES:
F. Researcher's personal observations recorded on audio or videotape.
G. Participant assignments, tests, presentations, etc.
H. Final projects.

VIDEO TAPE

Videotapes were taken while the subjects were engaged in online sessions and were oriented toward capturing a visually described account of the physical setting and overall class climate. There were, however, acknowledged limitations to taping in a computer laboratory. A computer laboratory is a noisy place and does not lend itself well to the audio component of a stationary video camera. The sounds of keys being tapped and printers running effectively generated a high background noise level that drowned much of the low-level subject audio. The indiscriminate nature of an electronic microphone compounded the problem. For this
reason, the researcher continuously circulated in an attempt to focus on activities or conversations that merited recording.

When the conversation among the participants was judged significant and reasonably audible, the camera or a hand-held audio tape recorder was moved in closer. As a direct, but anticipated consequence of the technical difficulties encountered, the videotapes of daily sessions assume a lesser role in the data analysis than the one-on-one student interviews, group meetings, student logs, final reaction papers, etc. The daily tapes basically function to document the overall structure of the experiment and demonstrate the chronology of time and task throughout the semester. They were, however, scanned in their entirety, for spontaneous audible comments made by the instructor or students as they related to the study’s major inquiries. Lastly, they functioned to triangulate data from other sources.

Videotape was also used to record the initial and final interviews, as well as group meetings and presentations. In the case of the interviews and group meetings, videotape also served to augment and clarify the written transcripts by supplying potentially valuable paralinguistic data.
SUBJECT-GENERATED DATA

Subject-produced data was gathered in five primary forms. Firstly, each participant maintained a log or journal. Within these documents were the records of the subjects' specific online contacts as well as their personal reaction to them. Beyond these two requirements, the subjects were encouraged to add to their journals any other items of information that they deemed significant to them.

The second source of participant-generated information was the design and execution of a project of each participant's own choosing. The idea was to give the participants a greater sense of ownership in the project by exploring a topic of their own choosing, as well as giving them the opportunity to explore a specific topic in depth via telecommunications. Information was gathered concerning the outcome of each project in terms of subject-perceived usefulness, acceptability, ease of information retrieval, etc.

Thirdly, the entire group met with the researcher for videotaped group meetings where ideas, successes and failures were discussed. These meetings typically were scheduled at the conclusion of the participants' interaction with one of the four online services.
Fourthly, each participant prepared a written reaction paper of 1-2 pages in length describing their reaction to LCS and visit to the OSU libraries.

Lastly, each student, early in the project prepared a written IRP or Initial Reaction Paper. Composed in February, the IRP contains an account of each student's affective response toward the project.

A secondary source of subject-produced data was the various quizzes and tests that were taken during the project. These were not considered a highly significant source of data as all of the participants consistently showed satisfactory progress toward mastering basic telecommunications skills. Therefore, these evaluations served primarily to reinforce the ambience of the sessions as being that of a basically ordinary high school class and not a fish bowl of educational research. The researcher was aware of potentially damaging effects of the "Hawthorne Effect" and the possibility of the researcher "going native" (Gold, 1958). Thus, every attempt was made to make the participants feel as though the project was just like every other class they took except for the presence of the ubiquitous videotape camera.
MULTIPLE DATA SOURCES AND TRIANGULATION

Multiple, overlapping means of data collection were employed in order to piece together the largest, and most encompassing picture of the acceptability and usefulness of microcomputer telecommunications in the secondary school environment. Since the principal investigator was also the teacher, redundant data collection was necessary to provide triangulation and to minimize the bias of the one-man researcher/observer/teacher.

With the data temporally separated, from multi-sources, the data lent itself well to analysis by modified analytic induction as described by Bogdan and Bicklen (1982). The data was initially analyzed by looking for classes or types of student responses, activities, knowledge, and attitudes and a loose descriptive theory of the experience began to evolve. Data categories were generated by the data itself rather than being overlaid on the environment a priori. Later, as the data continued to accrue, cross-comparisons were made looking for trends and changes in the participants. In response, the theory was cycled back upon itself and modified until, at the conclusion, an explanation was formulated for the broadest number of cases, using each negative example to call for a reflective, reactive reformulation of the theory.
The purpose of staging two interviews (near-entry and near-exit) with each participant was to monitor any factual knowledge base or attitudinal, affective changes that might appear as the project progressed. Some of the questions asked during the first interview concerning entry-level knowledge and attitudes were modified or dropped during later interviews. The participants were told that they were the teachers and there were no right or wrong answers to any of the questions. They were encouraged to state anything and everything that occurred to them relative to the project.

The interviews were open-ended and were subject to the modification of questions over time. Depending upon the direction in which the participant's responses went, other questions were added as were deemed appropriate. The process was designed to be as reflective and reactive as possible - an attempt to approximate a normal conversation. Not all students, therefore, were asked exactly the same questions via exactly the same sentence structure. Great care, however, was taken to ensure that the researcher came away from the interviews with a defensible sense of equivalence among them all.

The interviews were conducted by appointment in a quiet room, free of others who might disrupt the interview. The
researcher placed a videocamera several feet behind his right shoulder and videotaped each student's interview for later, written transcription. The initial interviews were intended to last approximately one-half to three-quarters of an hour but the actual length ran as much as an hour dependent on how informative (or simply talkative) the interviewee was. This was particularly the case during the second interviews in which questions were added, and the participants were more familiar with the researcher. The interview was terminated by mutual agreement when both sides felt that there was nothing more either wanted to say or ask.

Besides documenting basic demographic data, the questions posed in the initial interview were designed to establish not only a concrete or factual knowledge baseline but an affective, attitudinal starting point from which later interviews would be compared and contrasted. The question list remained flexible at all times as the environment evolved and matured. The following is the basic interview outline guide used in all the interviews. Questions marked with an asterisk ("*") were added for the second set of interviews after the participants had had substantial online experience.
GENERAL GUIDE FOR INTERVIEW QUESTIONS

PART 1: BASIC DEMOGRAPHICS

1. What is your first name?
2. How old are you?
3. What grade are you in?

PART 2: PAST COMPUTER EXPERIENCE

4. How do you feel about computers?
5. Have you used a computer before? If so, in what ways?
6. Do you own a computer?

PART 3: BACKGROUND KNOWLEDGE

7. Why did you enroll in a second computer course here at Whitehall?
8. Did you know what this project was going to be about when you enrolled?
9. What can you tell me about microcomputer telecommunications?
10. Do you know the meaning of any of the following words; modem, online, The Source, database, CompuServe, DIALOG, electronic mail (etc.)?

PART 4: SEARCH STRATEGY - DEFINITION & METHOD

11. What does the term "search strategy" mean to you? (The actual meaning is explained/negotiated until we arrive at a mutual understanding with which to approach the remaining interview questions.)
12. When you are asked to find information for a project, paper, or presentation at school (something of an academic nature), where physically do you think of looking first?
13. When you are asked to find information for a project, paper, or presentation at school (something of an academic nature), what kinds or types of sources do you think of looking for?
PART 5: TWO SEARCH EXAMPLES

In both of the hypothetical "assignments" asked below, the participant was asked to not only verbalize his or her answer, but also to sketch it out in a flow-chart fashion. The rationale for the selection of the topics described in questions 14 & 15 below was three-fold. Firstly, the topics were judged appropriate topics academically for a secondary student enrolled perhaps, in a social science, or music-related course. Secondly, they were designed to generate a degree of interest in the student. Concepts of nuclear warfare was and still is prominent in the popular media to which students are typically exposed. With regard to the musical impact question concerning The Beatles, their resurgence in popularity is part of a larger trend that appears to be glorifying many of the attributes of the 1960's and the project's participants were not unacquainted with The Beatles music. Lastly, the topics were not obscure, arcane topics, but rather were judged within the common frame of reference of students generally.

SEARCH 1: HIROSHIMA

14. Suppose that you had to do a project, paper, or presentation on, "The Effects of the Bombing of Hiroshima during the Second World War". How would you go about finding the information that you need?

SEARCH 2: IMPACT OF THE BEATLES

15. Suppose that you had to do a project, paper, or presentation on, "The Beatles Impact Upon Popular Music?" How would you go about finding the information that you need?
PART 6: GENERAL SEARCHING KNOWLEDGE

16. Within a given type of information source, for example, "Books", are there different types of information that you can get from them? If yes, can you give me an example?

17. Can you give me an example of a case in which the type of information that you are looking for would partly (or completely) determine where you would go, or do, in order to find the answer?

PART 7: ATTITUDES ABOUT INFORMATION RETRIEVAL

18. How do you feel about using libraries to hunt for information?

19. What do you do when you can't seem to locate the information that you need to answer a question?

20. How do you feel about the quality of the information that you get from your typical sources?

21. What are the best and worst aspects of the way(s) which you currently use to find information?

22. How did you originally learn how to find information in response to school demands?

23. Have the ways in which you locate new information changed much over the last few years?

PART 8: OPEN-ENDED CONCLUSION

24. Do you have anything else to say or ask of me?

PART 9: QUESTIONS ADDED FOR 2ND INTERVIEW

*25. What are your impressions of online telecommunication?

*26. Do you think that the services we have worked with are understandable to the general high school population?

*27. Which do you think (LCS, DIALOG, The Source, CBBS's) is least useful? Most useful? What were each's strong and weak points?

*28. Which of the four has the strongest potential for education? Which has the least?
Has microcomputer telecommunications changed the way you think about searching for information. If so, how?

If you were in a position of power to do so, what suggestion/changes would you make among the four classes of online services that you have worked with?

Should online capabilities be a part of school (having ready access to LCS, DIALOG, etc.)? If not, why? If so, in what ways?

Do you think it is unduly difficult to move from system to system? (i.e. DIALOG to The Source)

Are you enjoying yourself in this project? Why or why not?

THE STRUCTURAL TIME-LINES

Concerning the study’s first question on the structural nature of the class, the primary source of raw data was approximately sixty hours of classroom videotapes. Capturing the overall structure of the setting, every class day was videotaped in its entirety. Sometimes the camera was stationary and recorded the sessions from the perspective of a visitor seated in the corner. At other times, when the participant’s conversation or activity was particularly significant, the camera was moved closer as unobtrusively as possible to focus on a subset of the overall class activity.

Camera positioning and consequently the type of data collected was often dictated by the often very quiet nature of the classroom. The students typically worked independently much of the time with only a general guideline of what they should be doing. For example, the teacher
might brief students on the basic functions of The Source's "SourceMail" or electronic mail service. After the short introduction, each member of the group would be allowed to interact with SourceMail as he or she saw fit. Thus, while all were on basically the same topic, each participant was, in fact, conducting his or her own independent exploration of the service under study. Working relatively quietly on their own, the participants made poor subjects for a distantly placed video camera. For this reason, much of the videotape records not the students themselves, but rather the contents of their computer monitors as they interacted with various online systems. Such "screen shots" divulged the linear flow of an individual student's activity as he or she worked through an online session.

The first step in the data reduction and analysis of the videotapes was to replay the sixty hours, in sequence, and transcribe first to paper any audible student/teacher, or student/student talk, plus descriptions of any clearly observable (but often silent) student activities. Once the transcription was made, an AppleWorks spreadsheet was designed to show the structural nature of the project from the tape transcriptions.

Normally, computer spreadsheets are used for managing numerical data, often in the context of accounting or other financial record keeping. In this case, a spreadsheet, with
its row and column orientation, lent itself well to
designing "boxes" of descriptive data or talk identified by
who is speaking (or performing an activity), when it is
occurring, what tape it is recorded on, and at what tape
counter position the specific sequence can be found. For
purposes of illustration, a small example, is provided on
the next page, with a larger, actual section of the
structural spreadsheet in Chapter IV.
Figure 5. Sample of the Structural Time-Line
In the preceding example, the left-most column records the tape number, 1A/1B, 2A/2B, etc. Using T-120 videotapes, two successive classes could be recorded on one two-hour tape, hence the notation "1A/1B". Secondly, the date is recorded and lastly, the "Tape Adj." or Tape Adjustment Number. This number relates to the number range located across the top of the spreadsheet. These column headers, 0-99, 100-199, 200-299, etc. represent the videocassette recorder's digital tape counter numbers. Zero represents the beginning of the tape and the session ends for the day around 3,000+. Since two class days are recorded on each tape, the second session does not really start at tape position zero, but for clarity's sake, all classes are charted as beginning at zero. To find the actual location of a particular instance of talk or activity during the second session, one must add the tape adjustment number to the noted "B" tape counter position. For example, in the second day of the above example (Tape 2B), Daryl asks at tape position 075, "Can we call any board we like?". Noting the tape adjustment number is "+3400", one must add 3,400 to 075 and advance the tape to counter position 3,475 to hear Daryl's question.
Be advised, however, that the tape counter positions are peculiar to the author's own Panasonic VCR. It was discovered that they are not standardized to any set unit of time. Tape counter calibrations are unique to any given model of VCR and are not consistent across brands. Therefore, the tape counter locations can be expected to vary as the tapes are played back on different makes of VCRs but can, at least, be used as a guide for locating a particular event. Also, in a few cases, (group meetings, typically), there is more talk than could be recorded in a single 100 tape-unit "boxful". The tape position counter notations within the boxes are accurate, even though they may not correctly correspond to the numbers across the top of the spreadsheet.

Each new day begins with a box labeled "Primary Activities". The notations within these boxes provide the author's summary of the day's events. The next column of boxes to the right labeled "0-99" indicate the actual start of the videotape. Where one encounters a "----------->" arrow pointing to the right, one may assume that the class is continuing in the same vein as the last labeled box to the arrow's left and there are no clearly audible comments on the videotape, nor is there any previously un-noted activity going on. The arrow essentially means, "status
quo", or nothing new to report at the macro level of entire classroom taping.

The overall structural spreadsheet is probably best viewed on a wall where it occupies approximately one hundred square feet. To make the spreadsheet more manageable, a second, data-reducing spreadsheet was created that distills the former down by categorizing the events into nine basic areas as follows:

1. Straight Teacher Lecture. Low student participation.
   One-way information flow.
2. Teacher Lecture. Discussion-centered (Q&A). High student participation.
3. Students Online. 1=BBS; 2=Source; 3=LCS; 4=Knowledge Index; 5=Carrier (Tymnet or Telenet).
4. Group Meeting.
5. Interviews (one-on-one).
7. Student Presentation.
8. Offline reading, writing, organizing of materials.
   Printing out downloads. (Housekeeping-type activities.

The entire spreadsheet is found in Chapter Four immediately following the presentation of the classes' social history but as one can see from the sample below, the date is found across the X-axis and the nine activity types are down the Y-axis. The first eight days of the project are illustrated by time and task. The notation
"[++++++++++]" indicates that the activity listed to the left was occurring on the date(s) listed above. The longer the bar, the more consecutive days it occurred. A three-plus sign bar ([+++]) signifies one day. For example, on Wednesday, March 13th there was a teacher-centered lecture. The notation "5" above the bar indicates the nature of the lecture [(1=BBS's, 2=The Source, 3=LCS, 4=Knowledge Index and 5=ACarrier (Tymnet or Telenet)]]. Further, on Monday, March 3rd through Friday, March 7th, the chart shows that students were online to BBS's.
### DISTRIBUTION OF TIME AND TASK

**Time Line Structural Analysis of Video Tapes**

D. K. Schooler August 1988

**MARCH WEEK 1**

**Day of the week ------->** Mon Tue Wed Thur Frl Sat Mon Tue Wed

**Calendar date -------->** 3/3 3/4 3/5 3/6 3/7 3/10 3/12 3/13

**Activity Type (below):**

<table>
<thead>
<tr>
<th></th>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thur</th>
<th>Frl</th>
<th>Sat</th>
<th>Sun</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher Lecture</td>
<td>[++]</td>
<td></td>
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<td></td>
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<tr>
<td>Low student participation</td>
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<td>[++]</td>
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<tr>
<td>One-way information flow</td>
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<td>[++]</td>
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<td>Teacher Lecture</td>
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<tr>
<td>Discussion-centered (Q&amp;A)</td>
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<td>HI student participation</td>
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<tr>
<td>Students Online</td>
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<tr>
<td>Students Online (Last Week)</td>
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<tr>
<td>1=BBS 2=Source 3=LCS</td>
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<tr>
<td>4=Knowledge Ind 5=Carrier</td>
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</tr>
</tbody>
</table>

**Group Meeting**

|                                                                 | [++]|     |     |      |     |     |     |

**Interviews**

|                                                                 | [++]|     |     |      |     |     |     |

**Working on Logbooks**

|                                                                 | [++]|     |     |      |     | [++]|     |

**Student Presentation**

|                                                                 | [++]|     |     |      |     |     | [++]|

**Offline reading, writing, organizing of materials**

|                                                                 | [++]|     |     |      |     |     | [++]|

**Printing out downloads**

|                                                                 | [++]|     |     |      |     |     | [++]|

**Field trip**

|                                                                 | [++]|     |     |      |     |     | [++]|

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**Figure 6. Sample of the Time and Task Time-Line**
A timeline table was designed by reviewing the daily video tapes. This table documents the various phases of the experiment and shows the relationship between time and task as well as the role of the teacher and the role of the student. The table resembles the following:

<table>
<thead>
<tr>
<th>Type of Day (18 weeks)</th>
<th>Activity</th>
<th>1</th>
<th>2</th>
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<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
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<tbody>
<tr>
<td>Class Tape</td>
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Figure 7. Activity Time-Line Design

Ten students were initially involved in the experiment. One moved away at approximately the midpoint and another, a senior, dropped before the end and took all materials with him. Eventually a subset of the participants, representing distinct phenotypes, was separated from the group and further analyzed, using group, aggregate data to support their classification.
THE TALK DATABASE

A database was designed as an indexing system of the tapes, interview transcripts, logs, etc., for examining A. the nature of student comments, and B. their frequency. Comments were examined for what was common to all and for what was unique. The locations of the comments on the tapes were noted and filed on a computer database for reference and sorting. A sample entry is shown on page 129.

Once the talk database was generated, a Spradley taxonomic analysis (Spradley, 1979) was made of the student and researcher talk recorded from a variety of sources over approximately fifteen weeks. To prepare the talk data for a Spradley-style analysis, an indexing system had to be devised for cataloging the high volume of talk.

For purposes of analysis, a rule was generated early on, regarding what constituted "talk". The concept of participant "talk" was taken to mean not only any student/teacher or student/student communication but was broadened to include not just verbalizations, but also their written counterparts. In other words, participants were asked on several occasions to write short, non-graded papers expressing their thoughts, concerns and feelings about their online experiences. These writings were treated as talk since they also represented communication from the student
to the teacher. Talk, therefore, was compiled from the following sources.

1. Audible talk gleaned from the structural spreadsheet (which in turn was generated from the daily classroom videotapes).
2. Entry-point interview transcripts.
3. Exit-point interview transcripts.
4. Initial Reaction Papers (IRP’s). Written in February by students describing their earliest feelings and thoughts about microcomputer telecommunications and the project in general.
5. LCS Reaction Papers (LCS-RP). Another student-generated document detailing their field trip experience with The Ohio State University’s Library Control System.
6. Group meeting transcripts on each service and a final overall (closing) meeting on the entire experience.

In creating the database, careful thought had to be given to what categories of information would be needed to properly index the talk to ensure a successful analysis later. Eleven categories were finally chosen:
1. **WHO**: (Who is speaking?)

2. **CELL**: (The location of the original date: an alphanumeric cell if the data came from the structural spreadsheet; a page number if it came from a transcript).

3. **DATE**: (When was the data collected?)

4. **SRC**: (What is the *source* of the item? i.e. logbook?, reaction paper?, etc.)

5. **CNTX**: (What context is the item in? What was being talked about? The Source, LCS?)

6-7. **COMM1 & COMM2**: (Standing for Comment 1 and 2, these two categories held the actual talk or activity description. Two lines of approximately 75 characters each were allotted for the participant's statement.)

8-9. **INT.Q1 & INT.Q2**: (Standing for "Interview Question 1 & 2", if the indexed talk was in response to a direct question, then the question itself was placed in these two categories. Also placed here, if necessary, was any additional contextualizing information that might assist in properly classifying the talk item.)
10. **CLASS1**: (This category was the last to be completed as it represented the taxonomic classification of the talk item (i.e. "enjoyment", "frustration", "successful search", etc.). These categories were generated from repetitive themes in the talk itself, not overlaid upon it *a priori*.

9. **CLASS2**: (This category was included to handle cases when a *subtype* of talk under "CLASS1" was considered necessary. For example, the primary classification of a talk item might be "Affective Change" and the subtype (CLASS2) might be "Future Expectations".

Below is a sample entry in its "label" format (as opposed to a column-oriented "table" presentation). It shows the database categories as well as its basic overall design.

**SAMPLE DATABASE ENTRY**

<table>
<thead>
<tr>
<th>CNTX: INT1</th>
<th>WHO: WARREN</th>
<th>CELL: 8</th>
<th>CLASS1: DISLIKE</th>
<th>CLASS2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: Feb 28</td>
<td>SRC: INT1</td>
<td>CLASS2:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMM1: W: I don't like it at all.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMM2: W: I would rather spend my time at home with computers.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT.Q1: So you're saying, &quot;I like it, but...&quot; or &quot;I don't like it at all&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT.Q2: because it takes too much time&quot;? (offline library searching)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 8. Talk Database Design
From the excerpt above, one can determine the following:

1. Warren is speaking (WHO).
2. He made the comment on Feb. 28th (DATE).
3. It was in the CONTEXT (CNTX) of INT1, (the first interview).
4. The SOURCE (SRC) of the statement is a transcript of INT1 (the first interview).
5. The passage is located (CELL) on page 9 of the first interview transcript. Cell refers to the specific original data location (spreadsheet cell location, page number, etc.).
6. He is being asked (by the researcher) how he feels about searching in libraries for information in response to the demands of school (INT.Q1 & INT.Q2).
7. He is responding that he does not care for library research and would prefer to work with his computer (COMM1 & COMM2).
8. Lastly, the classification, (CLASS1), based on high group repetition of similar statements, was determined to be "DISLIKE".

In the manner illustrated above, all clearly audible or written instances of student, teacher, or group talk, when the entire class says something collectively (ex. verbalizing a group consensus response to a question) were
entered in the database. The database eventually cataloged over 1,200 instances of talk recorded between February 28th, (1985) and June 6th of the same year.

Using a database provided a number of ways of looking at the data. One could sort by date and person and get a listing of all of the comments made by each individual in chronologic order. Sorted by context and name, the database would display all of the comments made by each person on a particular topic (LCS, Knowledge Index, etc.)

For example, consider the database printout below. It is a listing sorted by "WHO" = "LISA" and arranged in chronologic order. It shows all of her comments and actions from the start of the project until its conclusion. NOTE: Several key categories are not shown due to the simple limitations of paper width. No classification is shown for the data displayed, nor are any contextualizing questions (INT.01 or 2). Also, some of the talk itself is truncated. It is intended only as an illustration of how the database could be employed to generate different views of the same data set. Later, as the theoretical framework underlying the analytic taxonomy is presented, a larger view of the talk database will be presented.
It has really changed the way I think about computers and about I really enjoyed dialing a telephone from my seat without actual I enjoyed using the Apple Writer word processor program before w I really enjoyed dialing a telephone from my seat without actual I expect that is a skill that will help me in college next year. It was a little hard get used to communications programs as they I like this class because even though I can get help when I need While I don’t always succeed, it helps me be more self-reliant a This course has turned out to be a real surprise. I didn’t expect, or know about anything that we’re doing now. While I don’t always succeed, it helps me be more self-reliant a I don’t know if you don’t find anything in Whitehall about Beat Well, encyclopedia, our good friend, but they don’t go very far. And, since it’s rather recent, you can look under the mag’s, and Whitehall is closer anyway and if you feel you have enough at Wh If you really want to make it better, then you go to Bexley and Or you could always try—and then—or, I really don’t know. As I’ve gotten older I’ve realized that there’s a whole lot more And as you get older, you know, you get the car and you can go a I could have told you that they send information, and that’s abo Modem? Never heard of it. Online? No. Database? No idea. The sou To find a way to attack something and find out just how it works You figure out where you’re going to start and how you’re going Where physically do you think of starting your search at? You might check the school library if you have like a lunch peri Generally look for general books about that topic. Well you look for a general book over the entire area, then look If you’re desperate you can go look in the encyclopedia. I’d expect a much different viewpoint from each source. I say since they happened, different people would know about it So does the subject to a certain extent determine the type of se How do you feel about using libraries to hunt for information? Even though we’ve been taught the card catalog and all that, I u They’re (books, info, etc.) just sort of hard to look for. More towards the negative side. You go and you ask your friends if they have any books. You kno You can always ask your parents, they might know something on it

Figure 9. Database Sorted by Name and Date
Sorted differently, and yielding a different view of the data, is a sample subset of all of the participants' comments whose "CNTX" (context) category contained the string "LCS" and could therefore be assumed to represent the group's comments about OSU's Library Control System.

<table>
<thead>
<tr>
<th>Selection: CNTX contains LCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNTX</td>
</tr>
<tr>
<td>LCS-RP</td>
</tr>
<tr>
<td>LCS-RP</td>
</tr>
<tr>
<td>LCS-RP</td>
</tr>
<tr>
<td>LCS-RP</td>
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<tr>
<td>LCS-RP</td>
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<td>LCS-RP</td>
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<td>LCS-RP</td>
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<td>LCS-RP</td>
</tr>
<tr>
<td>LCS-RP</td>
</tr>
<tr>
<td>LCS-RP</td>
</tr>
</tbody>
</table>

Figure 10. Database Sorted by Context and Name

The left-most column (comment type) was generated after the comments were recorded. It was expected that the data would cluster and allow the students to be grouped into three of four models from which representative students were extracted for detailed analysis.
THE SPRADLEY-STYLE TAXONOMY

After all the comments were entered into the database, it was printed out in its entirety, sorted by name and date. This was done so that one could concentrate on a single individual's talk in its correct chronology. A team of three individuals independently examined the database entries looking for thematic repetition, comments that were being made by many members of the group. These repetitive comments were then tentatively labelled with a descriptive keyword that either actually appeared in the context of the talk, or could be rationally judged to be syntactically equivalent in their meanings. Statements like, "I love this. . .", "I'm really into this. . .", "This stuff is completely cool. . ." all imply, "I have positive feelings about this."

Some categories were readily identified. Others were more difficult to discern and thus, the entire database was reviewed over and over again, seeking new patterns and linkages in the data. In labeling the categories, careful consideration was given to whether or not the label would ultimately shed light on the four basic questions posed by the study. It was found early in the analysis, that one could subdivide 1,200+ instances of dialogue into a huge number of categories if that was one's desire. The question that was asked repeatedly was, "Is this taxonomic
arrangement of the data rational, rule-governed, and channeled toward answering the four pertinent questions of the study?"

Eventually, some eleven major subdomains of talk were identified. These eleven generally branched into others until a typical taxonomic "inverted tree" was produced. In total, some forty-two (42) categories of talk were described. The categories turned out to be of unequal weight, not only in the number of comments ascribed to them, but also in the bearing that they had on addressing the study's questions.

THE TAXONOMY AND ITS RULES

From the general domain of "talk", the ten subdomains were isolated and defined according to the following descriptive rules and examples. The examples given (generally four per category) are actual excerpts from the talk database that were judged to demonstrate the intended range of each category. In the few cases of tightly linked, intercontextualized comments that could clearly fall under two dissimilar categories ("Well...yes and no"-type responses), those entries were duplicated and given a second coding. A box diagram of the Spradley taxonomy that developed from the data is shown on the next page. Following the chart is an extended discussion of the rationale behind its construction.
## THE TAXONOMY

<table>
<thead>
<tr>
<th>BACKGROUND</th>
<th>PRIOR COMPUTING</th>
<th>PRIOR EXPECTATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>T'CHER INSTRUCTION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SEARCH</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENTRY SEARCH</td>
<td>SEARCH SUCCESSFUL</td>
<td>SEARCH UNSUCCESSFUL</td>
</tr>
<tr>
<td></td>
<td>HIROSHIMA 1</td>
<td>BEATLES 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MISUSE</td>
</tr>
<tr>
<td>EXIT SEARCH</td>
<td>SEARCH SUCCESSFUL</td>
<td>SEARCH UNSUCCESSFUL</td>
</tr>
<tr>
<td></td>
<td>HIROSHIMA 2</td>
<td>BEATLES 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MISUSE</td>
</tr>
<tr>
<td><strong>T</strong></td>
<td>SYSTEM SATISFACTION</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LIKE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ENJOY</td>
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<td>EASY</td>
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<td>IMPRESSIVE</td>
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<td></td>
<td>VALUE</td>
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<td></td>
<td>SIZE POSITIVE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TEACHER IMPRESSION</td>
<td></td>
</tr>
<tr>
<td><strong>A</strong></td>
<td>SYSTEM DISSATISFACTION</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DISLIKE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DISCIPLINE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HARD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TECHNICAL PROBLEM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NOT USEFUL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SIZE NEGATIVE</td>
<td></td>
</tr>
<tr>
<td><strong>NEGATIVE</strong></td>
<td>LEGAL ISSUE</td>
<td></td>
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<tr>
<td></td>
<td>COST</td>
<td></td>
</tr>
<tr>
<td><strong>K</strong></td>
<td>DISCOVERY</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D-SERENITY</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D-FACTUAL KNOWLEDGE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D-EXPERIMENTATION</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D-POWER</td>
<td></td>
</tr>
<tr>
<td><strong>CHANGE</strong></td>
<td>PRESENT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FUTURE EXPECTATIONS</td>
<td>POSITIVE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NEGATIVE</td>
</tr>
<tr>
<td><strong>MISCELLANEOUS</strong></td>
<td>CONCERNS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ADVICE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NEWNESS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TECHNICAL QUESTIONS</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 11. The Taxonomy**
1. **TEACHER INSTRUCTION**: This subdomain dealt exclusively with the primary talk mode of the teacher/researcher, that of giving instruction. It was included in the analysis primarily as a triangulation of what was stated about the role of the teacher/researcher from the data contained in the structural spreadsheet and time-line spreadsheet. Teacher Instruction talk generally confined itself to the beginnings of classes and occasional technical advice-giving to a student. A sample of comments identified as Teacher Instruction include:

**Report**: CONTEXT/DATE ORDER  
**Selection**: CLASS1.contains INSTRUCTION

<table>
<thead>
<tr>
<th>CNTX: SOURCE</th>
<th>WHO: TEACHER</th>
<th>CELL: AH196</th>
<th>CLASS1: T:INST</th>
<th>CLASS2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: Apr 8</td>
<td>SRC: SS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMM1**: CHALLENGES STUDENTS TO LOCATE NEWS ON CLINT EASTWOOD'S MAYORAL  
**COMM2**: CANDIDACY, THE TWA HIJACKING, AND TODAY'S BASEBALL SCORES

<table>
<thead>
<tr>
<th>CNTX: KI</th>
<th>WHO: TEACHER</th>
<th>CELL: AP417</th>
<th>CLASS1: T:INST</th>
<th>CLASS2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: May 13</td>
<td>SRC: SS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMM1**: NOW MAKE UP 3 SEARCHES FOR ACTUAL SEARCHING OF YOUR OWN TOMORROW.  
**COMM2**: COME WITH 3 QUESTIONS AND THE DB AND DESCRIPTORS YOU WANT TO SEARCH.

<table>
<thead>
<tr>
<th>CNTX: KI-G</th>
<th>WHO: TEACHER</th>
<th>CELL: F439</th>
<th>CLASS1: T:INST</th>
<th>CLASS2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: May 16</td>
<td>SRC: SS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMM1**: SHOWS STUDENTS LIST OF 45 CITATIONS HE HAS FOUND UNDER TREE RINGS AND  
**COMM2**: DROUGHT. TEACHER CHALLENGES CLASS TO REPRODUCE SEARCH.

**INT.Q1**: SEARCHED FOR A SCIENCE STUDENT'S SCIENCE FAIR PROJECT.
2. **BACKGROUND**: Background comments were those that established a baseline of information concerning not only the students' factual computing knowledge, but also their affective response to computers. It also ascertained the degree of entry-point awareness held by students about the nature of the project and any prior expectations that they might have held concerning it. Thus, Background comments were subdivided in A. Prior Expectations and B. Prior Computing. Sample comments identified as Background include:

**Prior Computing**:

Report: CONTEXT/DATE ORDER  
Selection: CLASS1 contains PRIOR COMPUTING

CNTX: INT1 WHO: ERIC CELL: 1 CLASS1: PRI COMP  
DATE: Feb 28 SRC: INT1 CLASS2: 

COMM1: I'm taking courses at Franklin University and SummerTech. 
COMM2: I ended up buying an ..... 1000 as a starting computer.

INT.Q1: What is your computing background?

CNTX: INT1 WHO: LISA CELL: 1 CLASS1: PRI COMP  
DATE: Feb 28 SRC: INT1 CLASS2: 

COMM1: I've played around with a little BASIC, but that was just drawing some  
COMM2: graphics and stuff—not much.

INT.Q1: What ways have you used computers?
COMM1: T: SO YOUR EXPERIENCE WITH TELECOMMUNICATIONS IS MOSTLY AN ACADEMIC
COMM2: ONE? E: YEAH, MOSTLY, YEAH...NO REAL PRACTICAL USE.

INT.Q1: TEACHER NOTES ERIC KNOWS MEANING OF TELECOMMUNICATIONS TERMS VIA INT.Q2: READING RATHER THAN ACTUAL USE.

Prior Expectations:
Report: CONTEXT/DATE ORDER
Selection: CLASS1 contains PRIOR EXPECTATIONS

COMM1: No. I (thought it) was ... something like what we did like what you
COMM2: did last semester. I had no idea it would be of this magnitude.

INT.Q1: Did you know what this course was going to be about?

COMM1: This course has turned out to be a real surprise.

COMM1: At first I thought it was just more programming, like Computer I.
COMM2: Finding new ways to program, but I found that wasn’t the case.

INT.Q1: Did you know what you were walking into (when you signed up for this class?)

COMM1: The day began with very high expectations of the Randtriever and Library
COMM2: Control System. These expectations were met with great satisfaction.
3. **COST:** Comments under the "Cost" category reflected many students' concerns about the perceived high cost of telecomputing. Most were surprised at the amount of "free" online access that the project gave them and they expressed serious doubts that a school would institute online capability for its students in the absence of a reduced rate structure, grants, or some other form of financial assistance. Comments of this type were easy to spot and generally looked like the following:

Report: CONTEXT/DATE ORDER  
Selection: CLASS1 contains COST  

---

**CNTX:** INT2  **WHO:** ERIC  **CELL:** 7  **CLASS1:** COST  
**DATE:** May 13  **SRC:** INT2  **CLASS2:**

**COMM1:** T: What you’re saying is your search strategy, in some degree, is  
**COMM2:** dependent upon money. E: Yes, to some degree.

---

**CNTX:** IRP  **WHO:** JEFF  **CELL:** 1  **CLASS1:** COST  
**DATE:** Feb 24  **SRC:** IRP  **CLASS2:**

**COMM1:** I can only find one major problem with your course. I would have to rob  
**COMM2:** a bank to use Dialog for 1 hour.

---

**CNTX:** INT2  **WHO:** LISA  **CELL:** 13  **CLASS1:** COST  
**DATE:** May 13  **SRC:** INT2  **CLASS2:**

**COMM1:** I can’t see Whitehall doing it. I just can’t see them--it’s amazing they do.  
**COMM2:** got this class going.

**INT.Q1:** (Lisa is surprised that Whitehall has this capability (however, transient). Orig. Q: Do you think that it’s too expensive for schools?)
COMM1: T: Do you think this would be really useful to the average H.S.? COMM2: W: Yea, I think it's worth the money.

4. LEGAL: The comments relegated to the Legal Issues category were particularly interesting to both the students and the researcher. Legal comments focused primarily on the illicit, illegal uses of telecomputing. Very early in the project, the students discussed the popular movie of the time, "War Games" and seemed both fascinated and empowered by their classroom environment's close connection with the film's subject matter. Thematically, Legal talk centered on the concepts of software piracy, illegal system entry ("hacking") and the like. Within the first month of online contacts, the students had reached two corporate computers illegally, albeit accidentally. The phone numbers of these two Columbus, Ohio-area companies were one digit different from two legitimate modem-answering BBS's. Still, students seemed both pleased and apprehensive at the brief intrusion into these large corporate computers. In neither case, of course, was any damage done, but watching the students' reactions to their own, however inadvertent "hacking", was amazing. They quickly became aware of the tremendous power wielded by the deliberate, malicious hacker who can wreak electronic havoc on a computer of his or her own choosing with often minimal effort. In the
first case of accidental entry, the students reached the computer of a local electronics firm which prompted them for a password which they took considerable pains to guess until one rather savvy participant reminded them of the infinite password possibilities. In the second case, a main food chain's computer was reached and the students were greeted with a dynamic display of the freezer temperatures in one of their supermarkets. There was no prompt, no menus and no request for a password. The students quickly tired of this but were nonetheless impressed with themselves for having gotten in at all!

Typical Legal Issues comments were the following:

Report: CONTEXT/DATE ORDER
Selection: CLASS1 contains LEGAL

CNTX: BBS    WHO: BECKY   CELL: P52   CLASS1: LEGAL
DATE: Mar 7   SRC: SS

COMM1: ACCIDENTLY DIALS WRONG NUMBER ENTERS KROGER'S
COMPUTER DISPLAYING
COMM2: FREEZER TEMPERATURES FOR THEIR PICKERING STORE

INT.Q1: Accidental Intrusion into a corporate computer system

CNTX: BBS -G    WHO: ERIC    CELL: AD67   CLASS1: LEGAL
DATE: Mar 11   SRC: SS

COMM1: DISCUSSES EASE OF WRITING "AUTODIALER" PROGRAM
COMM2: (LIKE THAT SEEN IN THE MOVIE "WAR GAMES"

INT.Q1: Eric possesses the skills in BASIC to create such a program
INT.01: "LockSmith" is popular bit-copying program that will copy
many "copy-protected" software titles.

5. **POSITIVE**: Throughout the project students were encouraged
to share their feelings and thoughts with the teacher and
the rest of the group. Some comments were purely
affective, emotional outbursts, ("Oh man, this is far
out!!"). Others were more restrained comments of general
satisfaction, ("Yes, LCS appears to be a very good
system."). There were a great many statements of an
overall positive nature to categorize and it readily
became apparent that student positivity took many forms.
A decision was made, therefore, to subdivide "Positive"
talk into as many as eight subcategories listed below
with examples of talk that illustrate the nature of each.
A. **LIKE**: Talk items filed under Like were those that either used the term "like" in the context of approval or were considered functional synonymous. On occasion, a thesaurus was consulted to confirm that a particular classification of "Like" was valid with regard to other positive categories. These comments had to imply a sense of fondness, approval, warmth, preference or inclination toward the object of the statement. Examples would be:

Report: CONTEXT/DATE ORDER  
Selection: CLASS1 equals LIKE

<table>
<thead>
<tr>
<th>CNTX: OVERALL</th>
<th>WHO: DARYL</th>
<th>CELL: J580</th>
<th>CLASS1: LIKE</th>
<th>CLASS2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: Jun 6</td>
<td>SRC: SS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMM1**: I LIKED ALL THE DIFFERENT INFO. SO MANY THINGS THAT YOU CAN PUT TOGETHER  
**COMM2**: (TEACHER: WHAT DID YOU THINK OF THE ENTIRE PROJECT?)

<table>
<thead>
<tr>
<th>CNTX: IRP</th>
<th>WHO: DEBBIE</th>
<th>CELL: 1</th>
<th>CLASS1: LIKE</th>
<th>CLASS2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: Feb 24</td>
<td>SRC: IRP</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMM1**: I like the class but it is different than other ones. I have to think  
**COMM2**: about what I am doing and why the computer does or doesn't do something.

<table>
<thead>
<tr>
<th>CNTX: INT2</th>
<th>WHO: WARREN</th>
<th>CELL: 8</th>
<th>CLASS1: LIKE</th>
<th>CLASS2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: May 13</td>
<td>SRC: INT2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMM1**: T: What are your impressions of online telecommunication?  
**COMM2**: W: I like it, for one thing.

<table>
<thead>
<tr>
<th>CNTX: BBS-G</th>
<th>WHO: DARYL</th>
<th>CELL: BD68</th>
<th>CLASS1: LIKE</th>
<th>CLASS2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: Mar 11</td>
<td>SRC: SS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMM1**: MODEM MANIA WAS THE BEST. EASY TO USE AND WELL ORGANIZED  
**COMM2**: (DARYL'S APPRAISAL OF BBS'S)
B. **ENJOY**: More exuberant than the "Like" category, comments under "Enjoy" convey a sense of personal joy, fun, or of having a very pleasant time. Although in the final analysis, both "Like" and "Enjoy" probably point in the same direction by addressing students' affective response to the experience, "Enjoy" differed from "Like", for sake of classification here, by representing a higher degree of emotional satisfaction, of actually having fun.

Examples included:

*Report: CONTEXT/DATE ORDER*

*Selection: CLASS1 equals ENJOY*

<table>
<thead>
<tr>
<th>CNTX: LCS-RP</th>
<th>WHO: BECKY</th>
<th>CELL: 1</th>
<th>CLASS1: ENJOY</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: Apr 16</td>
<td>SRC: LCS-RP</td>
<td>CLASS2:</td>
<td></td>
</tr>
</tbody>
</table>

**COMM1**: I enjoyed the system and was very impressed with the fact I did not have to go looking through the card catalog for a book.

<table>
<thead>
<tr>
<th>CNTX: OVERALL</th>
<th>WHO: BECKY</th>
<th>CELL: BJ581</th>
<th>CLASS1: ENJOY</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: Jun 6</td>
<td>SRC: SS</td>
<td>CLASS2:</td>
<td></td>
</tr>
</tbody>
</table>

**COMM1**: I ENJOY THE AMAZEMENT OF MY FRIENDS WHEN I TELL THEM WHAT I AM ABLE TO DO.

<table>
<thead>
<tr>
<th>CNTX: IRP</th>
<th>WHO: DARYL</th>
<th>CELL: 1</th>
<th>CLASS1: ENJOY</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: Feb 24</td>
<td>SRC: IRP</td>
<td>CLASS2:</td>
<td></td>
</tr>
</tbody>
</table>

**COMM1**: Another reason I enjoy this class is because you are able to use your own ideas and you can express yourself through your work.

<table>
<thead>
<tr>
<th>CNTX: INT2</th>
<th>WHO: ERIC</th>
<th>CELL: 6</th>
<th>CLASS1: ENJOY</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: May 13</td>
<td>SRC: INT2</td>
<td>CLASS2:</td>
<td></td>
</tr>
</tbody>
</table>

**COMM1**: T: What are your impressions of online telecommunications?

**COMM2**: E: I'm in love.
C. **EASY**: These comments reflected the students' sense that a particular activity was readily mastered and not difficult. They addressed the issues of whether or not secondary students can, in fact, competently handle online technology and whether or not they can be expected to master and potentially integrate more than one type of service. Simple to spot, "Easy" positive comments looked like this:

Report: CONTEXT/DATE ORDER  
Selection: CLASS1 contains EASY  
-----------------------------------------------------------------------------------  
CNTX: LCS-RP WHO: DARYL CELL: 1 CLASS1: EASY  
DATE: Apr 16 SRC: LCS-RP CLASS2:  
COMM1: It was hard to believe that a system that holds so much information  
COMM2: and can do so many things is so easy to use.  
-----------------------------------------------------------------------------------  
CNTX: LCS-RP WHO: JEFF CELL: 1 CLASS1: EASY  
DATE: Apr 16 SRC: LCS-RP CLASS2:  
COMM1: Using LCS was a piece of cake. I was surprised to see how easy it was  
COMM2: to use but I guess that is the way it should be.  
-----------------------------------------------------------------------------------  
CNTX: LCS-RP WHO: JEFF CELL: 1 CLASS1: EASY  
DATE: Apr 16 SRC: LCS-RP CLASS2:  
COMM1: They just made a huge easy-to-use data base program that any idiot  
COMM2: could use.  

**INT.Q1**: (Evaluating the Library Control System)  
-----------------------------------------------------------------------------------  
CNTX: INT2 WHO: WARREN CELL: 10 CLASS1: EASY  
DATE: May 13 SRC: INT2 CLASS2:  
COMM1: T: Okay, what would you do to LCS (to improve it)?  
COMM2: W: The system is easy to use. I really couldn't change it.
D. **SYSTEM SATISFACTION**: These comments, while still positive were relatively laid-back approvals of a particular online service. They didn’t carry any heavy emotional baggage, but rather, implied a quiet satisfaction, a contentment with the way a system operated. Examples include:

Report: CONTEXT/DATE ORDER
Selection: CLASS1 contains SYSTEM SATISFACTION

<table>
<thead>
<tr>
<th>CNTX: INT2</th>
<th>WHO: ERIC</th>
<th>CELL: 9</th>
<th>CLASS1: SYST SAT</th>
<th>CLASS2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: May 13</td>
<td>SRC: INT2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMM1**: T: What about LCS? **E**: I think for its purpose it serves it well. I mean,

**COMM2**: you wanna look up a book that they have bang, it’s in there.

**INT. Q1**: Any suggestions to improve LCS?

<table>
<thead>
<tr>
<th>CNTX: INT2</th>
<th>WHO: ERIC</th>
<th>CELL: 9</th>
<th>CLASS1: SYST SAT</th>
<th>CLASS2:</th>
</tr>
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<td>DATE: May 13</td>
<td>SRC: INT2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMM1**: Okay, how about Bulletin Boards? **E**: They pretty much serve their purpose

**COMM2**: they’re bulletin boards place messages and read messages.

**INT. Q1**: Asked for improvements for BBS’s.

<table>
<thead>
<tr>
<th>CNTX: LCS-RP</th>
<th>WHO: WARREN</th>
<th>CELL: 1</th>
<th>CLASS1: SYST SAT</th>
<th>CLASS2:</th>
</tr>
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<tr>
<td>DATE: Apr 16</td>
<td>SRC: LCS-RP</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMM1**: I was completely satisfied with the system.

<table>
<thead>
<tr>
<th>CNTX: INT2</th>
<th>WHO: WARREN</th>
<th>CELL: 11</th>
<th>CLASS1: SYST SAT</th>
<th>CLASS2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: May 13</td>
<td>SRC: INT2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMM1**: T: Okay, is there anything that you would tell KI? (for improvement)

**COMM2**: L: No.
E. IMPRESSIVE: An interesting, clearly present category, "Impressive" was filled by students' talk that related awe or sheer amazement at something. Often punctuated with typically teenage hyperbole, "Impressive" was the category used when it was clear that students were taken aback, taken totally unaware of the size, complexity, speed, power, etc. of something that they had seen and were almost at a loss to describe. Other synonyms might be "riveting" or "astounding". With telecommunications being a high-technology endeavor, these comments were not at all uncommon. Examples include the following. (Note: boldfaced words were contextualizing clues highlighted by the author to demonstrate the rationale for the statement's classification):

Report: CONTEXT/DATE ORDER
Selection: CLASS1 contains IMPRESSIVE
-----------------------------------------------
CNTX: LCS-RP WHO: BECKY CELL: 1 CLASS1: IMPRESS
DATE: Apr 16 SRC: LCS-RP CLASS2:

COMM1: I enjoyed the system and was very impressed with the fact I did not
COMM2: have to go looking through the card catalog for a book.

INT.Q1: Evaluating her experience with LCS
-----------------------------------------------
COMM1: It's like, wow, we're pioneers in communication, so to speak. And, all
COMM2: the wealth of information available to me.

INT.Q1: You mentioned having access to "masses of info". Do you like that?
INT.Q2: E: YEA! Why? Why do you like it? (Discussing Knowledge Index)

COMM1: All in all, the entire library system is beyond imagination, but,
COMM2: reaching the materials one is looking for is relatively easy.

INT.Q1: Commenting on her field trip to see OSU's Library System

COMM1: Just the idea of robotics and the immensity of the system left me
COMM2: standing in awe.

INT.Q1: Warren, on visiting the OSU libraries and seeing the Randtriever.

F. VALUE: "Value" talk was that which implied a worth or need or desirability to something held in esteem or position of regard. These statements were generally made about online services or experiences that the participants thought had a lasting significance to them or from which they had derived benefit. Value statements were often closely liked with another category to be discussed later, "Change". Examples include:
Report: CONTEXT/DATE ORDER
Selection: CLASS1 equals VALUE

CNTX: IRP WHO: BECKY CELL: 1 CLASS1: VALUE
DATE: Feb 24 SRC: IRP CLASS2:

COMM1: It really would have been helpful in finding my research for my
COMM2: Advanced Composition paper.

INT.Q1: Becky, stating her initial reactions for telecommunications
INT.Q2: technology

CNTX: IRP WHO: DARYL CELL: 1 CLASS1: VALUE
DATE: Feb 24 SRC: IRP CLASS2:

COMM1: I think the course I am experiencing in telecommunications could be
COMM2: one of the most useful courses I could take.

INT.Q1: Daryl, in his Initial Reaction Paper

CNTX: IRP WHO: ERIC CELL: 1 CLASS1: VALUE
DATE: Feb 24 SRC: IRP CLASS2:

COMM1: Others might not realize that they have nearly the whole world at
COMM2: their feet, and not take advantage of those resources.

INT.Q1: Eric, on telecommunications in his Initial Reaction Paper

CNTX: IRP WHO: ERIC CELL: 1 CLASS1: VALUE
DATE: Feb 24 SRC: IRP CLASS2:

COMM1: The educational value of what we are doing is readily apparent. Using
COMM2: outside databases to instantly retrieve information on nearly anything.

INT.Q1: Eric, commenting on the apparent value of telecommunications
INT.Q2: in his Initial Reaction Paper
G. **SIZE POSITIVE**: Closely linked to "Impressive", a common, recurrent theme in the students' talk, communicated appreciation of sheer increased size, whether it be library size, number of searchable journals, database size, or some other large thing (even the robotic Randtriever in the OSU Health Sciences Library). Most students were positively moved by exposure to sources of information of great magnitude. To be scored in this category, the statement had to focus on enormity, expansiveness, vastness or, perhaps the underlying meaning, an increased number of available options.

Examples include:

---
Report: CONTEXT/DATE ORDER
Selection: CLASS1 contains SIZE POSITIVE
---

---
CNTX: LCS-RP WHO: BECKY CELL: 1 CLASS1: SIZE POS
DATE: Apr 16 SRC: LCS-RP CLASS2:

COMM1: Just in the one small section of the medical library the randtriever
COMM2: stored over 100,000 books. That is more books than I have seen.

INT.Q1: Becky, upon seeing OSU's Health Sciences Library
I was mostly impressed with the size of the main library and the number of books contained in it.

Which do you think, of the four, is the most useful to you?

There are floors and even rooms in OSU's main library that are larger than the Whitehall Public Library.

H. TEACHER IMPRESSION: The last subset of the "Positive" statement domain contains personal comments directed toward the teacher that were judged of a positive nature. Taken as some indicator of the classroom environment, these comments included:
NEGATIVE TALK

6. NEGATIVE: Sharply contrasted with the preceding classifications of positive talk, there was a corresponding subdomain categorizing negative talk. It too was subdivided into a number of smaller, more descriptive categories, each with its own set of descriptive, delineating rules. In the negative subdomain, a total of seven categories were identified. Often they were just the mirror-image of a previously
described positive category. In other cases, they had no clear positive counterpart, or, in some cases, the counterpart might have existed, but no comments were recorded under it. To elaborate via example, consider the negative category of "Discipline" (as in a problem with a student's behavior). There was no recorded counterpart since the researcher did not find it necessary (or helpful) to record such comments as, "Warren was really on his best behavior today." The negative aspect was primarily included to document cases of class cutting, excessive absence, failure to turn in required data, etc., which might lead to a student's not being considered a good candidate for an in-depth case study relevant to the parameters of the study. In another case, there was no counterpart for the unexpectedly all-positive "Teacher Impression" category, since, fortunately, no instances of negative teacher talk were, at least, recorded. Therefore, a general breakdown of the positive vs. negative categories appears as follows:
AFFECTIVE CATEGORIES OF THE TAXONOMY

POSITIVE
"Like"
"Easy"
"Value"
"Size Positive"
"System Satisfaction"
"Impressive"
"Teacher Impression"
"Enjoy"

NEGATIVE
"Dislike"
"Hard/Difficult"
"Not Useful"
"Size Negative"
"System Dissatisfaction"
"Technical Problem"
"Discipline" (problem)

A. DISLIKE: Comments under the "Dislike" category were statements that expressed some measure of distaste, disagreement, aversion, antagonism or repugnance. These comments were generally directed at some feature of an online service, or about the way the group members were accustomed to conducting research prior to the start of the project. Sample "Dislike" comments included:

Report: CONTEXT/DATE ORDER
Selection: CLASS1 equals DISLIKE
-----------------------------------------------
CNTX: SOURCE-M WHO: MATT CELL: T238 CLASS1: DISLIKE
DATE: Apr 14 SRC: SS CLASS2: 
COMM1: I DON'T LIKE SOLID SCREENS OF TEXT "KILLS THE EYES"
COMM2: (TEACHER: WHAT WERE THE DISADVANTAGES OF THE
ENCYCLOPEDIA)
B. HARD: Comments under the "Hard" category expressed students' sense of difficulty with something. Perhaps some feature of an online service was judged, by them, as arduous, too complex or perplexing. On the other hand, some students related how hard they found it to conduct library-based research. These two subclasses of "hardness" were considered separately in the final analysis, but in the present, they stayed filed together as general statements of difficulty with something. Typical comments include:
C. **SYSTEM DISSATISFACTION**: This low-key, laid-back counterpart to "System Satisfaction" captured students' relatively mild, yet still negative, reactions to their experiences. Students were not investing a lot of emotional energy in these types of statements, but dissatisfaction was still communicated. Sample comments would include:
D. NOT USEFUL: Comments in this category had to convey a lack of perceived inherent value, benefit, advantage, helpfulness or profitability. These comments were occasionally offered spontaneously, but generally came in response to the researcher's direct questions during the interviews. For example, in one instance, the researcher asked each student, "Which of the four online services that you've studied do you find to be the least useful?". Other comments of this nature came out during group meetings when students were recounting their online exploits by describing their contact's best and worst features. Examples include:
Report: CONTEXT/DATE ORDER
Selection: CLASS1 contains NOT USEFUL

CNTX: INT2  WHO: ERIC  CELL: 7  CLASS1: NOT USE
DATE: May 13  SRC: INT2  CLASS2:

COMM1: You're saying it doesn't do you any good to know the stuff because you
COMM2: couldn't get there. E: Right.

INT.Q1: (Relating why LCS was least useful service to him)

CNTX: INT2  WHO: ERIC  CELL: 8  CLASS1: NOT USE
DATE: May 13  SRC: INT2  CLASS2:

COMM1: BBS, I mean, you can post messages and ask people, but most of the time
COMM2: you probably aren't going to get a whole lot of information from them

INT.Q1: responding, without prompt as to why he believes BBS's are weak.

CNTX: INT2  WHO: ERIC  CELL: 11  CLASS1: NOT USE
DATE: May 13  SRC: INT2  CLASS2:

COMM1: There's not a whole lot to them. You've got post message, maybe a game,
COMM2: maybe an upload, a download and that's it. What else can you do with it?

INT.Q1: What were the weak points of BBS's?

CNTX: INT2  WHO: WARREN  CELL: 15  CLASS1: NOT USE
DATE: May 13  SRC: INT2  CLASS2:

COMM1: T: How come? W: In terms of researching, I don't feel there's a strong
COMM2: possibility there with a BBS.

INT.Q1: Which service has the least potential for secondary education?
E. **SIZE NEGATIVE**: These comments were rare, but were made consistently by one participant in particular. They all indicated a sense of intimidation, dislike or discomfort with the very large online computer systems, databases and research libraries experienced. Often cloaked in humor, these comments appeared much like this:

Report: CONTEXT/DATE ORDER
Selection: CLASS1 contains SIZE NEGATIVE

---

**CNTX:** LCS-RP  **WHO:** ERIC  **CELL:** 1  **CLASS1:** SIZE NEG
**DATE:** Apr 16  **SRC:** LCS-RP  **CLASS2:**

**COMM1:** Go getting the actual material is another matter. How many floors were there? 1,000? Like I said, it’s just too big for my blood.

---

**CNTX:** LCS  **WHO:** RAY  **CELL:** R248  **CLASS1:** SIZE NEG
**DATE:** Apr 16  **SRC:** SS  **CLASS2:**

**COMM1:** IT’S TOO BIG, IT HAS AN ELEVATOR!
**COMM2:** (TEACHER: WHAT WERE YOUR IMPRESSIONS OF LCS?)

---

**CNTX:** LCS-RP  **WHO:** RAY  **CELL:** 1  **CLASS1:** SIZE NEG
**DATE:** Apr 16  **SRC:** LCS-RP  **CLASS2:**

**COMM1:** Yes, even being the size that I am, I found the size of the building to be a tad intimidating.

---

**CNTX:** LCS-RP  **WHO:** RAY  **CELL:** 1  **CLASS1:** SIZE NEG
**DATE:** Apr 16  **SRC:** LCS-RP  **CLASS2:**

**COMM1:** If you ask me a library thirteen floors and an elevator is not my idea
**COMM2:** of a library but a museum of facts.
F. TECHNICAL PROBLEM: These comments were restricted to situations in which a participant was having technical difficulties that were generally out of his or her control. Most everyone experienced some form of a technical problem during the many online hours. These problems ranged from damaged disks and phone disconnections to disk drive failures or simply jammed printers. Typically comments included:

Report: CONTEXT/DATE ORDER
Selection: CLASS1 contains TECHNICAL PROBLEM

CNTX: BBS WHO: DEB CELL: J16 CLASS1: TEC PROB
DATE: Mar 4 SRC: SS CLASS2:

COMM1: HAVING TROUBLE LOGGING ONTO FCC BOARD
COMM2: (AS IT TURNS OUT, THE FCC BOARD WAS RUNNING "BUGGY" SOFTWARE

INT.01: The FCC (Franklin County Consortium) had its own BBS for computer
INT.02: educators that was always down due to old, defective software.

CNTX: SOURCE TOWHO: ERIC CELL: AD11 CLASS1: TEC PROB
DATE: Mar 18 SRC: SS CLASS2:

COMM1: ERIC DISCOVER EOF (END OF FILE) IN APPLEWRITER ARE STOPPING LISA'S
COMM2: LOAD INTO APPLEWRITER. SUGGESTS COPY II PLUS TO EDIT OUT CHARS.

INT.01: AppleWriter insert a "EOF" End of File control character prematurely
INT.02: into Lisa's download stopping it from loading into AppleWriter.
INT.01: What were the weak points of BBS's?

G. DISCIPLINE: Due to the intensive, student-orientation of the project, in-class discipline problems were exceedingly rare. There simply was too much for students to do to allow them the luxury of inattentiveness and/or disruption. The teacher/researcher took notes of these instances, however, since the information was judged useful in determining whether or not a candidate was qualified for in-depth case study.

Good classroom behavior, though, was not the actual criterion for further study, but rather were their regular attendance and the completion of class "assignments" (which constituted the researcher's data). Two of the three types of "discipline" problems encountered during the class were unrelated to the actual classroom. A female student, with reportedly low regard for school in general, began missing many days of school. The experience for her, therefore, was mainly one of playing "catch-up ball". In the second instance, a male student apparently contracted a severe case of so-called "senioritis". He reasoned that since he didn't need this
elective "class" to graduate and there was only a week or so left in the semester, he'd just leave the class taking all of his records, logs, papers, disks, etc., with him.

In the final case, there was a single student who, like the girl described earlier, missed a great deal of school and was disruptive to others in class. None of these three individuals met all the requirements of the class (particularly that of turning in all of their data) and thus were removed from consideration for in-depth study. Most of the "talk" in this category came from the teacher/researcher's comments to himself recorded on tape when disruptive incidents occurred: Examples include:

Report: CONTEXT/DATE ORDER
Selection: CLASS1 equals DISCIPLINE

CNTX: SOURCE  WHO: BECKY  CELL: AL125  CLASS1: DISCIP
DATE: Mar 20  SRC: SS  CLASS2:

COMM1: DEBBIE DOESN'T LIKE SCHOOL MUCH AND WILL BE ABSENT OFTEN
COMM2: (BECKY AND DEBBIE ARE GOOD FRIENDS)

INT.01: (Becky volunteers why Debbie is absent so often)

CNTX: FINAL  WHO: MATT  CELL: F555  CLASS1: DISCIP
DATE: Jun 4  SRC: SS  CLASS2:

COMM1: MATT HAS LEFT FOR THE YEAR WITHOUT NOTICE AND WITHOUT TURNING IN REQUIRED MATERIALS.
COMM2: REQUIRED MATERIALS.

INT.01: (Matt was a senior who didn't "need" the class for graduation)
7. **SEARCH**: The domain of "Search" proved to be the broadest
(and hence, most subdivided) of all the talk divisions.

It pertained to comments, largely generated from the pre-
and post interviews, that yielded information on the
following topics:

A. **Prior to the study**, how did students search for
   information in response to the demands of school
   projects, papers or presentations?

B. **After the study**, how did students search for
   information in response to the demands of school
   projects, papers or presentations?

C. **Prior to the study**, what were students' affective
   responses to the ways in which they sought said
   information?
D. After the study, what were students' affective responses to the new ways in which they were shown to search information?

The first dichotomy in the Search domain was into: A. "Entry-Search" and B. "Exit-Search". Entry-Search comments were those primarily gleaned from the entry-point interview concerning how students had searched for information in the past and how they felt about it. Exit Search comments were largely obtained from the exit-point interview concerning how students now sought information and how they felt about it. Four typical entry-search and four exit-search category comments are below:

Report: CONTEXT/DATE ORDER
Selection: CLASS1 contains ENTRY SEARCH

CNTX: INT1 WHO: ERIC CELL: 12 CLASS1: ENT SRCH
DATE: Feb 28 SRC: INT1 CLASS2: 

COMM1: Yes, but I for the most part ignored it.
COMM2:

INT.Q1: Has anybody actually given you nuts and bolts information
INT.Q2: on how to search for information in a library?

---------------

CNTX: INT1 WHO: LISA CELL: 3 CLASS1: ENT SRCH
DATE: Feb 28 SRC: INT1 CLASS2: 

COMM1: To find a way to attack something and find out just how it works. Your
COMM2: plans to get your goals.

INT.Q1: What is meant by a "search strategy?"
COMM1: How do you feel about using libraries to hunt for information?
COMM2: I don’t like it very much.

COMM1: You watch your friends to a certain extent, but most of it was your own
COMM2: imagination, your own idea.

INT.Q1: How did you learn how to search for information?

Report: CONTEXT/DATA ORDER
Selection: CLASS1 contains EXIT SRCH

COMM1: The way you go about looking for something. It’s your method of going
COMM2: someplace, looking for info, and based on what you find, what you do next

INT.Q1: What is meant by "search strategy"?

COMM1: Like, hey, I can go to KI psychology and type Hiroshima and probably
COMM2: get almost everything I needed.

INT.Q1: (in response to teacher’s statement concerning if he had free access
INT.Q2: to online sources, his search strategy changes dramatically)
COMM1: T: What determines your choice of library?
COMM2: Well, distance really, first. And then after that how many books.

INT.01: Several students made comments about driving age making a difference.

Both the Entry-Search and Exit-Search categories were further subdivided equally into five subcategories:

A. Search Successful
B. Search Unsuccessful
C. Hiroshima Search 1 & 2
D. Beatles’ Search 1 & 2
E. Misuse

A. SEARCH SUCCESSFUL: This category indexed comments that directly related to a student performing a search for information in response to the information-seeking demands of the study having been successful in that endeavor. Almost invariably, these searches were conducted online only using LCS, CBBS’s, The Source, Knowledge Index or some combination of the four. Some of the comments were actually verbalized talk. Others were transcribed from student-produced written accounts, while still others were gleaned from actual “screen-shots” of the students’ monitors while they were online seeking information. The decision was made that both a students’
verbal descriptions of successful search attempts as well as the researcher's transcripts of films of students' monitors as they actually keyed-in ultimately successful searches were considered "talk" on the basis of functional equivalence. To better convey the essence of this category, consider the actual "Search Successful" database entries below that were taken from five differing contexts as cited in the upper left corner of each type.:

Report: CONTEXT/DATE ORDER
Selection: CLASS1 contains SEARCH SUCCESSFUL

1. Classroom talk from one student to another.

CNTX: FINAL-G WHO: ERIC CELL: AD480 CLASS1: SRCH SUC
DATE: May 22 SRC: SS CLASS2:

COMM1: (EXCITEDLY TO WARREN): WHOA, WARREN. I'M FINDING HITS EVERY PLACE I
COMM2: LOOK, ABSOLUTELY EVERYPLACE.

INT.01: Eric, telling Warren how he was successful searching info on
INT.02: "hacking" in all the databases he chose to search.

CNTX: FINAL WHO: BECKY CELL: AT565 CLASS1: SRCH SUC
DATE: Jun 5 SRC: SS CLASS2:

COMM1: "I'M GOING TO HAVE A HELL OF A BIBLIOGRAPHY!"
COMM2: (FOR HER FINAL, BECKY HAS A GREAT MANY "HITS")

INT.01: Becky is searching for current info on world leaders.
2. Actual "Screen Shots" of student searches.

CNTX: SEARCH WHO: DEB CELL: AT301 CLASS1: SRCH SUC
DATE: Apr 23 SRC: SS CLASS2:

COMM1: GOES TO "FOCUS" THEN "NEWSBYTES" THEN "MEMBER INTERESTS" AND SEARCHED
COMM2: "APPLEWORKS". GOT 5 NAMES AND ADDRESSES FOR SOURCEMAIL.

INT.Q1: Deb is trying to locate information on a new (at the time)
INT.Q2: software package, AppleWorks. Trying Source's Member Directory

CNTX: FINAL WHO: ERIC CELL: N508 CLASS1: SRCH SUC
DATE: May 27 SRC: SS CLASS2:

COMM1: SEARCHING KI'S BOOKS IN PRINT UNDER "CRIM?" AND "COMPUT?" AND "HACK?"
COMM2: AND "SECURITY". HE GETS 9 BOOKS.

INT.Q1: Eric is searching for info on "hacking" via the "Books in Print"
INT.Q2: database on knowledge Index

CNTX: FINAL WHO: LISA CELL: AH460 CLASS1: SRCH SUC
DATE: May 20 SRC: SS CLASS2:

COMM1: LISA HAS CORRECT NAME FOR SDI AND IS USING THE "AND" OPERATOR TO LINK
COMM2: ALL THREE WORDS. ("STRATEGIC" AND "DEFENSE" AND "INITIATIVE".)

INT.Q1: Lisa is searching for info on SDI (Strategic Defense Initiative)
INT.Q2: After wrongly searching "Star Wars" she is successful.

CNTX: KI-G WHO: DEB CELL: P439 CLASS1: SRCH SUC
DATE: May 16 SRC: SS CLASS2:

COMM1: FINDS MORE HITS ON "APARTHEID" IN NEWS1. SHE ADDED THE DESCRIPTOR
COMM2: "VIOLENCE" AND GETS 2000 HITS.

INT.Q1: In response to an assignment, Deb is searching Knowledge Index
INT.Q2: In the "NEWS1" database for "APARTHEID" AND "VIOLENCE".

3. "Casting one's net". Inductively searching for someone "out there". The next four entries are sequential.

CNTX: FINAL-G WHO: ERIC CELL: T484 CLASS1: SRCH SUC
DATE: May 22 SRC: SS CLASS2:

COMM1: DOING "HACKERS" VS "HACKEES". SEARCHED MEMBER DIRECTORY ON SOURCE UNDER
COMM2: "PRIVACY(0), PHONE PHREAKING(12), COMPUTER SECURITY(16)"

INT.Q1: Eric searches for assistance with his project on "hacking"
INT.Q2: by searching The Source's Member Directory which lists interests.

CNTX: FINAL WHO: ERIC CELL: AF470 CLASS1: SRCH SUC
DATE: May 20 SRC: SS CLASS2:

COMM1: ERIC DOING PROJECT ON HACKING. GOT SOURCE MAIL FROM COMPUTER SECURITY
COMM2: ADVISOR TO SEVERAL INTERNATIONAL COMPANIES.

INT.Q1: Eric locates a computer security advisor (serendipitously) via
INT.Q2: The Source's Member Directory which lists members interests.

CNTX: FINAL WHO: ERIC CELL: AH470 CLASS1: SRCH SUC
DATE: May 20 SRC: SS CLASS2:

COMM1: CONTACTED BY MEMBER OF EDITORIAL STAFF OF THE
COMM2: COMPUTER FRAUD AND SECURITY BULLETIN. DOESN'T WANT TO HELP ERIC (COULD BE HACKER HIMSELF)

INT.Q1: Eric's new find is unsure whether he can trust Eric, as he
INT.Q2: might be a computer hacker himself.

CNTX: FINAL WHO: ERIC CELL: AH477 CLASS1: SRCH SUC
DATE: May 20 SRC: SS CLASS2:

COMM1: ADVISOR REQUEST LETTER ON SCHOOL STATIONERY TO CONFIRM ERIC'S LEGITIMATE
COMM2: REQUEST.

INT.Q1: To ultimately receive a thick packet of information on computer
INT.Q2: security, Eric must send regular mail on school letterhead.
4. In a group meeting, students share how they searched info. COMM2 is the teacher’s topic. COMM2 is the group’s consensus response.

**CONTEXT:** KI-G  
**WHO:** GROUP  
**CELL:** AD435  
**CLASS1:** SRCH SUC  
**DATE:** May 15  
**SRC:** SS  
**CLASS2:**

**COMM1:** ERIC (Education database)  
**COMM2:** (TEACHER: USE OF MICROS IN SECONDARY ED.?)

**INT.01:** (All of these questions are of the, "Which database(s) would you search to answer the teacher’s question?"

**INT.02:** -type.)

**CONTEXT:** KI-G  
**WHO:** GROUP  
**CELL:** AF431  
**CLASS1:** SRCH SUC  
**DATE:** May 15  
**SRC:** SS  
**CLASS2:**

**COMM1:** COMP1, NEWS1, MAGA, INSPEC (PHYSICS DATABASE).  
**COMM2:** (TEACHER: NEWLY REMEASURED SIZE OF THE MILKY WAY?)

**CONTEXT:** KI-G  
**WHO:** GROUP  
**CELL:** AF434  
**CLASS1:** SRCH SUC  
**DATE:** May 15  
**SRC:** SS  
**CLASS2:**

**COMM1:** AGRI (AGRICULTURE DATABASE)  
**COMM2:** (TEACHER: TREE RINGS AND DROUGHT?)

**CONTEXT:** KI-G  
**WHO:** GROUP  
**CELL:** AH431  
**CLASS1:** SRCH SUC  
**DATE:** May 15  
**SRC:** SS  
**CLASS2:**

**COMM1:** NEWS1, WHO’S WHO.  
**COMM2:** (TEACHER: JIMMY STEWART?)

5. **Search Success via search integration (KI to LCS to Library)**

**CONTEXT:** FINAL  
**WHO:** WARREN  
**CELL:** X514  
**CLASS1:** SRCH SUC  
**DATE:** May 28  
**SRC:** SS  
**CLASS2:**

**COMM1:** SEARCHING KI UNDER "COMP?" AND "CRIME?". HE JOINS THAT WITH "LAW?" OR "LEGIS?". FINALLY ADDS "PROTECT?" AND GETS 42 HITS.

**CONTEXT:** OVERALL  
**WHO:** WARREN  
**CELL:** AF580  
**CLASS1:** SRCH SUC  
**DATE:** Jun 6  
**SRC:** SS  
**CLASS2:**

**COMM1:** SPENT SATURDAY AT OSU. WAS VERY SUCCESSFUL. ACTUALLY LEAVING WITH 40 SOURCES TO WRITE HIS PAPER WITH.
B. SEARCH UNSUCCESSFUL: Comments or filmed activities that fell under this category were the exact opposite of that just described in "Search Successful". The student was attempting to locate information on a given topic and was, for any number of reasons, unsuccessful at it. The causes of search failure ranged from simply not understanding enough about the topic for a search to succeed, all the way down to misspellings and accidental typographical errors. Other causes were, using too generalized a descriptor, (i.e. using "results" as a search descriptor) and using a slang expression for a topic indexed under a more technical heading. For example, one student interested in the nuclear defense system, "SDI" (Strategic Defense Initiative), tried searching "Star Wars", its moniker in the popular press. While she did, in fact, get many appropriate "hits" on SDI, she also wound up with movie reviews of "The Empire Strikes Back" and interviews with Carrie Fisher ("Princess Leia") of Star Wars trilogy fame. Excerpts from the talk database that illustrate the "Search Unsuccessful" category are listed below:
Report: CONTEXT/DATE ORDER
Selection: CLASS1 contains SEARCH UNSUCCESSFUL

-----------------------------------------------
CNTX: KI-G  WHO: BECKY  CELL: AJ436  CLASS1: SRCH UNS
DATE: May 16  SRC: SS  CLASS2:

COMM1: BECKY UNSUCCESSFUL IN 2 BASES ON SEARCHING MICHAEL DEAVER UNTIL SHE
COMM2: REALIZES SHE IS MISSPELLING HIS LAST NAME "DEEVER"

INT.01: Becky learns that computer are very literal and a minor misspelling
INT.02: will result in search failure.

-----------------------------------------------
CNTX: KI-G  WHO: DEB  CELL: R429  CLASS1: SRCH UNS
DATE: May 15  SRC: SS  CLASS2: TOO BROAD

COMM1: I SEARCHED "APARTHEID" AND "RESULTS" IN NEWS1. GOT 144 HITS ON
COMM2: "APARTHEID", 2065 ON "RESULTS", BUT 0 INTERSECTION.

INT.01: Deb is conducting a faulty search through using the excessively broad descriptor, "results"

-----------------------------------------------
CNTX: FINAL  WHO: ERIC  CELL: R503  CLASS1: SRCH UNS
DATE: May 27  SRC: SS  CLASS2:

COMM1: TRIES TO SEARCH ("COMPUTER?" AND "CRIME?") AND NOT "SECURITY" (AND NOT
COMM2: OPERATOR IS WRONGLY USED) GETTING HITS ON CONCEPT OF "(NOT SECURITY)"

INT.01: Eric is incorrectly using the "not" boolean operator in
INT.02: conjunction with the "and" operator giving faulty search.

-----------------------------------------------
CNTX: KI-G  WHO: LISA  CELL: N433  CLASS1: SRCH UNS
DATE: May 15  SRC: SS  CLASS2:

COMM1: SEARCHED PSYCH 1 & 2. FIRST GAVE OVER 2000 HITS ON
COMM2: EX-CON, 29 FOR
EX-CON, 29 FOR
MISDEMEANOR, AND 0 FOR BOTH.

INT.01: Lisa doesn't realize that the term "ex-con" is
INT.02: reference to felons, not those who commit
misdemeanors
C. MISUSE: "Misuse" was the label chosen to categorize those instances where the students' talk or activities were related to not properly using an online service. This category was filled primarily in the very beginning of the online contacts and then again at the beginning of each successive class of service (LCS, The Source and KI). For example, if a student's monitor was clearly requesting input "X" and they were repetitively entering "Y" then misuse was called. If a student asked a question or commanded an operation of an online system that it was unable to answer or to perform, then, again, misuse was cited. Misuse was used only when a mistake caused a student to waste observably significant time on the system in frustration or when he or she vocalized a problem. Everyone made mistakes throughout the project. It was the inability and or time needed to correct them that constituted misuse for the purposes of classification here. Some actual examples of misuse from the talk database are below.
Report: CONTEXT/DATE ORDER
Selection: CLASS1 contains MISUSE

CNTX: SRC-TOUR WHO: BECKY CELL: Z101 CLASS1: MISUSE
DATE: Mar 17 SRC: SS CLASS2:

COMM1: LOST IN SOURCE TUTORIAL. TRIES TYPING "HELP" WHICH DOESN'T HELP SINCE
COMM2: DOESN'T REALIZE SHE IS NOT ACTUALLY IN SYSTEM. QUILS AND STARTS AGAIN.

INT.Q1: Screen shot of Becky during first day of The Source. Taking online
INT.Q2: "tour" which is not "real" Source. Thinks normal commands should work.

CNTX: SOURCE WHO: BECKY CELL: F216 CLASS1: MISUSE
DATE: Apr 10 SRC: SS CLASS2:

COMM1: SEARCHES ENCYCLOPEDIA UNDER EXTREMIST, LEFT-WING, AND DISK DRIVE. GETS
COMM2: NO INFORMATION (TEACHER: 2 OF 3 PROBABLY ARE DICTIONARY TERMS)

INT.Q1: Apparently does not realize that most of her search terms are
INT.Q2: not typical encyclopedic subject headers.

CNTX: BBS WHO: DEB CELL: AJ16 CLASS1: MISUSE
DATE: Mar 4 SRC: SS CLASS2:

COMM1: RESPONDING INAPPROPRIATELY TO A BBS MENU
COMM2: (NOT PAYING ATTENTION TO WHAT THE SYSTEM "WANTS" FOR A RESPONSE)

INT.Q1: This is only the second day of Deb's online contact and she is unaccustomed to responding to often rigid computer "menus"

CNTX: KI-G WHO: RAY CELL: T429 CLASS1: MISUSE
DATE: May 15 SRC: SS CLASS2:

COMM1: FRUSTRATING, COULDN'T GET SCREEN TO SCROLL (DID NOT SET "VO")
COMM2: R: OTHERWISE NO PROBLEM FINDING STUFF.

INT.Q1: Ray simply forgot (or never learned) a system command on KI.
INT.Q2: "SET V0" causes the screen to scroll.
D. **HIROSHIMA 1 AND HIROSHIMA 2**: These categories of talk were spawned by a segment of videotape that occurred during the entry-point and exit-point interviews. In an attempt to learn more about how students were currently seeking academic information (their entry-point search strategy) and how they felt about same, the teacher/researcher focused each student’s attention on two hypothetical school assignments requiring a search for information. The rationale for the selection of the two topics, *The Effects of the Bombing of Hiroshima During The Second World War* and *The Impact of The Beatles on Popular Music*, were presented in Chapter Three. A videotape record of each student as he or she described and drew a search diagram in response to the two search questions. The transcript of their talk about the bombing of Hiroshima from the first interview constitutes the category "HIRO 1". The same conversation, held during the second (exit) interview was
transcribed into the talk database and recorded as "HIRO 2." The goal was to examine the entry- and exit-point Hiroshima searches for evidence of change. The same process was followed concerning the information search on The Beatles' impact on pop music. Those comments made up the categories, "BEATLES 1" and "BEATLES 2." Samples of the students' comments related to each are listed below:

Report: CONTEXT/DATE ORDER
Selection: CLASS1 contains HIRO 1

CNTX: INT1  WHO: ERIC  CELL: 5  CLASS1: HIRO 1
DATE: Feb 28  SRC: INT1  CLASS2:

COMM1: The first thing I would do is get on down to the main library and look
COMM2: under Hiroshima first. (In) Encyclopedias.

INT.Q1: How would you search out the topic, "The Effects of the Bombing
INT.Q2: of Hiroshima during the Second World War".

CNTX: INT1  WHO: ERIC  CELL: 6  CLASS1: HIRO 1
DATE: Feb 28  SRC: INT1  CLASS2:

COMM1: From there I would look under other references...maybe other volumes of
COMM2: encyclopedia or a different brand, like Funk and Wagnalls, maybe Collier'

INT.Q1: How would you search out, "The Effects of the Atomic Bombing of
INT.Q2: Hiroshima during the Second World War"?

CNTX: INT1  WHO: LISA  CELL: 5  CLASS1: HIRO 1
DATE: Feb 28  SRC: INT1  CLASS2:

COMM1: I'd look for books on science about atomic bombs.
COMM2: Check out the encyclopedias, see if they have anything.

INT.Q1: "The Effects of the Bombing of Hiroshima During the
Second World War"
The effects of the Bombing of Hiroshima during the Second World War?

First, would at home--find information there from encyclopedias.

And then I'd go to the local BBS's and I'd read public messages for any intellects out there who know about this.

Well, that would probably be in INSPEC on the physics database. That's for the physical information about bombs.

I'd look--there might be something under government info (GOVE2).

From here I could check out OSU's LCS and see what kinds of books and magazines they have.

(going to LCS to search out KI "hits")
COMM1: Mostly thinking of hooking up to the Source
COMM2: And looking up people who have an interest in history.

INT.Q1: (using the member directory to locate historians, war buffs, etc.)
INT.Q2: (Hiroshima)

Report: CONTEXT/DATE ORDER
Selection: CLASS1 contains BEATLES 1

COMM1: I don't know if you don't find anything in Whitehall about Beatles.
COMM2: First of all, you could check out the school library, but chances are...

INT.Q1: "The Impact of The Beatles on Popular Music"

COMM1: Well, encyclopedia, our good friend, but they don't go very far. So,
COMM2: you'd look for it under the card catalog for Beatles or rock music.

INT.Q1: "The Impact of The Beatles on Popular Music"

COMM1: And maybe I could possibly even talk to like older brothers--people who
COMM2: experienced their music while they were still here working together.

INT.Q1: "The Beatles Impact Upon Pop Music"
COMM1: Then I possibly would check the library, like late almanacs, COM2: books that have been written about them maybe, and possibly magazines.

INT.Q1: "The Beatles Impact Upon Pop Music"?

COMM1: I'd probably talk to my friends and what they know about them.

INT.Q1: "The Beatles Impact Upon Pop Music"?

INT.01: (Beatles)

COMM1: And then I'd go to something like the LCS and look through books on the
COMM2: Beatles. I could search subject, Beatles.

INT.Q1: (Beatles)

COMM1: And then I'd go on--I might send some--I might search the Source members
COMM2: for Beatles, rock music . . . I like mail.

INT.Q1: (Beatles)
8. **Discovery**: Since the project was conducted in a regular classroom, the "Discovery" domain was large as it indexed talk or activities related to discovering or learning something not previously known. Many of the other domains in this taxonomy categorized talk of an affective, emotional nature. In contrast, "Discovery" talk is focused not so much on feelings or attitudes, but rather on simply learning the telecommunication curriculum.
presented daily by the projects. As different kinds of student learning were encountered, the "discovery" domain was subdivided into four categories.

A. D-FACT KNOWL: The first category, coded as "D-FACT KNOWL", (Discovery - Factual Knowledge) centered on talk related to the acquisition of simple factual knowledge. This could have included computer operation, file downloading and uploading skills, or mastery of the operation of an online system. Other instances of factual-knowledge increase were noted when students used the system with markedly increased proficiency, perhaps developing a novel approach or technique in operating a certain system which indicated growth in factual knowledge as well as insight. Examples from the talk database are below.

Report: CONTEXT/DATE ORDER
Selection: CLASS1 contains D-FACT KNOWL

CNTX: SRC-TOUR WHO: BECKY CELL: AH101 CLASS1: D-FACT K
DATE: Mar 17 SRC: SS CLASS2:

COMM1: DISCOVERS "LOCAL" VS "GLOBAL" COMMANDS (THOSE WHICH ACT DIFFERENTLY IN
COMM2: ONE AREA THAN ANOTHER OR DON'T EVEN EXIST.

CNTX: LCS WHO: BECKY CELL: AP268 CLASS1: D-FACT K
DATE: Apr 18 SRC: SS CLASS2:

COMM1: READS AP BULLETIN TO CLASS THAT REMAINS OF LAST
CHALLENGER ASTRONAUT
COMM2: HAVE BEEN IDENTIFIED
B. D-SERENDIP: The second category was called "D-SERENDIP" (Discovery - Serendipity) and grouped together talk and activities which produced some positive, fortuitous, or fruitful outcome via accidental means. In a project of this size and often relatively unstructured nature, it was to be expected that "surprises" would occur along the way. One might have viewed these events as unplanned "spin-offs" of the project's mainline curriculum. In
touring the four classes of large online services, many discoveries were made by students, unintentionally, that laid outside the planned curriculum, but nonetheless produced some pleasant or interesting increase in knowledge.

These types of learning discoveries often occurred when students were searching for "A", but as they moved from menu to menu deeper into the online systems, they noted the existence of, and often explored, other system offerings that were not on the class' experiential agenda. Other types of serendipitous discoveries were made when unforeseen events happened to a student or the entire group. For example, on occasion, outside computers would call the group rather than visa-versa, or in one case, a student was working on The Source's news service when suddenly she was interrupted with a "Chat" request from a subscriber in Paris, France. Examples of serendipitous discoveries are below.

Report: CONTEXT/DATE ORDER
Selection: CLASS1 contains D-SERENDIP

CNTX: SOURCE WHO: BECKY CELL: AL216 CLASS1: D-SEREN
DATE: Apr 10 SRC: SS CLASS2:

COMM1: GETS REQUEST FROM OUTSIDE TO "CHAT". SHE MAKES CONNECTION WITH TEACHERS
COMM2: ASSISTANCE.

INT.Q1: Someone from outside the class wishes to have a conference with Becky
INT.01: As news of the project spread through BBS's, other schools began
INT.02: to call the lab during class.

INT.01: Lisa was contacted for a "Chat" by a frenchman
INT.02: living in Paris and
INT.02: working for Apple/France. They exchanged time,
weather, etc.

INT.01: Dayna Duncan with The Dept. of Education saw the
INT.02: project's students
INT.02: on other BBS's and invited them to contact him.
C. D-EXPERIMENT: The third category under the domain "discovery" was D-EXPERIMENT (Discovery-Experiment). In these instances, talk and/or filmed activity focused on experimenting with the systems, doing something just to see what would happen. A relatively wide range of activities demonstrated experimentation by either a student, several students, or the entire group. For example, when confronted with a restricted subset of The Source called The Source Tour, one student was perplexed that all of the systems' regular commands didn't work in the tightly handholding tour. In response, she started trying all of the system's commands, in sequence, to see what the response would be. In this fashion she taught herself what a "tour"-type program was and what one could expect to do within it.

In another case, one student discovered the "Red Bone Inn" a local BBS that offered teleconferencing. He shared this information with the group which then explored the system until it was able to link the entire class in a localized teleconference. A third case involved two students who stated that they selected the topic for their final project not through personal interest, but rather just to see if the systems would work for them, providing the information they sought. "Testing-out" the system was cited as the primary goal,
not the actual subject matter of the final topic chosen.

Examples of talk/activity indexed as D-EXPERIMENT were:

Report: CONTEXT/DATE ORDER
Selection: CLASS1 contains D-EXPERIMENT

-----------------------------
CNTX: SOURCE TOWHO: BECKY CELL: T111 CLASS1: D-EXPER
DATE: Mar 18 SRC: SS CLASS2:
COMM1: INQUIRES ABOUT TOUR'S "HANDHOLDING" CAPABILITY.
EXPERIMENTS WITH
COMM2: DELIBERATELY ERRONEOUS ANSWERS TO SEE EFFECT

-----------------------------
CNTX: SOURCE WHO: GROUP CELL: AD143 CLASS1: D-EXPER
DATE: Mar 24 SRC: SS CLASS2:
COMM1: GROUP MEMBERS MAIL IS CIRCULATING TO OTHER MEMBERS IN LAB. MESSAGES ARE
COMM2: GENERALLY HUMOROUSLY INSULTING.

-----------------------------
CNTX: SOURCE WHO: GROUP CELL: AH163 CLASS1: D-EXPER
DATE: Mar 26 SRC: SS CLASS2:
COMM1: GROUP SEARCHING MEMBER DIRECTORY BY GEOGRAPHIC AREA AND BY NAME.
COMM2: THEY ARE PLEASED TO FIND EACH OTHER AS WELL AS THEMSELVES.

-----------------------------
CNTX: SOURCE WHO: JEFF CELL: H157 CLASS1: D-EXPER
DATE: Mar 25 SRC: SS CLASS2:
COMM1: JEFF IS TRYING OUT ERIC'S PERSONAL BBS WHILE GROUP WATCHES

D. D-POWER: Comments which fell under the category of
"D-POWER" (Discovery - Power) were those which conveyed
that the discovery of telecommunications technology had
imparted a sense of power, mastery or strength
particularly in the context of command or control over
large amounts of information. Sometimes the comments
were straightforward pronouncements of power, "Having
this much information at my keyboard makes me feel
powerful." Other examples, generally shown collectively by the group, included stories of their outside friends' envy at their new-found capabilities. Teacher recognition also figured in as one female student became the chief supplier of up-to-the-minute news for her Current Events teacher by tying into The Source's AP News service immediately prior to the class's meeting time. In still other instances of power acquisition, students would deride small libraries, offline searching techniques and articles on telecommunications in the popular press that they deemed below them, often making sounds of pseudo-amazement. Power seemed to be a major recurrent theme throughout the project and it was closely tied to the next domain in the taxonomy, "Change".

Report: CONTEXT/DATE ORDER
Selection: CLASS1 contains D-POWER
-----------------------------------------------
CNTX: IRP  WHO: DARYL  CELL: 1  CLASS1: D-POWER
DATE: Feb 24  SRC: IRP  CLASS2:

COMM1: Telecommunications has made me aware of the real power that you have
COMM2: with a computer.
-----------------------------------------------
CNTX: IRP  WHO: DARYL  CELL: 1  CLASS1: D-POWER
DATE: Feb 24  SRC: IRP  CLASS2:

COMM1: I think that telecommunications is one of the most powerful things I
COMM2: have ever experienced.
-----------------------------------------------
CNTX: IRP  WHO: ERIC  CELL: 1  CLASS1: D-POWER
DATE: Feb 24  SRC: IRP  CLASS2:

COMM1: I've been doing computer-related stuff for over five years, and I
COMM2: realize the extent of all the power that we have at our fingertips.
9. **CHANGE**: Change was perhaps the cornerstone of this taxonomy in terms of assessing the overall effect of the project on its participants. The CHANGE domain indexed student talk that related a shift or alteration in attitudes, perceptions, feelings, practices, techniques, or future expectations as a direct consequence of participating in the project. For the most part, change-related comments were made in the present tense, however, some students stated that something in the future would change as an outcome of the project, often something dealing with how they would search information when they reached college. For that reason, two categories were subdivided off from Change, that of "Change: Present" and "Change: Future Expectations". Change comments often related disappointment at the project's conclusion as students stated that they did not want to lose the online access that it provided. Many
stated that they did not wish to return to conventional offline search strategies. Examples from "Change" and its derivative, "Future Expectations" are below.

Report: CONTEXT/DATA ORDER
Selection: CLASS1 contains CHANGE

CNTX: OVERALL WHO: BECKY CELL: AP581 CLASS1: CHANGE
DATE: Jun 6 SRC: SS CLASS2:

COMM1: I FOUND MYSELF USING MORE JOURNALS AND LESS BOOKS.
COMM2: AS A RESULT OF THE PROJECT

CNTX: OVERALL WHO: BECKY CELL: AZ575 CLASS1: CHANGE
DATE: Jun 6 SRC: SS CLASS2:

COMM1: YES, I COULD NOT HAVE DONE THIS PAPER AS CURRENTLY AS IT IS, NOR AS
COMM2: SPECIFIC. (T: HAVE YOU CHANGED YOUR SEARCH STRATEGY OVER THE SEMESTER?)

CNTX: OVERALL WHO: BECKY CELL: T580 CLASS1: CHANGE
DATE: Jun 6 SRC: SS CLASS2:

COMM1: BECKY IS UPSET ABOUT DOING FUTURE WORK OFFLINE. DOESN'T WANT TO GO BACK
COMM2: TO CARD CATALOGS (WHEN PROJECT ENDS).

CNTX: OVERALL WHO: DARYL CELL: CD579 CLASS1: CHANGE
DATE: Jun 6 SRC: SS CLASS2:

COMM1: NOT ANY MORE...
COMM2: (T: ONCE UPON A TIME YOU SAID THEY (ENCYC.) WERE A PRIMARY SOURCE.)

CNTX: INT2 WHO: WARREN CELL: 9 CLASS1: CHANGE
DATE: May 13 SRC: INT2 CLASS2:

COMM1: W: I thought about using telecom. to replace the method I've been
COMM2: formerly using. T: You feel that strongly about it?
W: Yes.
Report: CONTEXT/DATE ORDER
Selection: CLASS1 contains FUTURE EXPECTATION

--------------------------------------------------------
CNTX: LCS-RP WHO: DEB CELL: 1 CLASS1: FUT EXP
DATE: Apr 16 SRC: LCS-RP CLASS2: 

COMM1: I now feel comfortable with using such a large library. I also feel it
COMM2: will benefit my further use of lib’s ‘cause I now understand how to use them

--------------------------------------------------------
CNTX: IRP WHO: LISA CELL: 1 CLASS1: FUT EXP
DATE: Feb 24 SRC: IRP CLASS2: 

COMM1: I expect that is a skill that will help me in college next year.

--------------------------------------------------------
CNTX: IRP WHO: ROB CELL: 1 CLASS1: FUT EXP
DATE: Feb 24 SRC: IRP CLASS2: 

COMM1: I hope that in the future all students will have the opportunity to
COMM2: gain a hands on experience with telecom. and other applications areas.

--------------------------------------------------------
CNTX: IRP WHO: WARREN CELL: 1 CLASS1: FUT EXP
DATE: Feb 24 SRC: IRP CLASS2: 

COMM1: I hope that after completing the course, I will be able to inform
COMM2: others about telecommunications.

--------------------------------------------------------
CNTX: OVERALL WHO: WARREN CELL: AJ581 CLASS1: FUT EXP
DATE: Jun 6 SRC: SS CLASS2: 

COMM1: (ON THE ENTIRE EXPERIENCE): I HOPE TO CARRY OVER THIS SKILL TO COLLEGE.

--------------------------------------------------------

10. MISCELLANEOUS: A relatively small number of comments were placed in the "Miscellaneous" domain of talk and were confined to four areas: A. Technical system questions, B. Questions about the project itself, C. Advice to either the various online services on ways to improve or to future student searchers and D. Comments
of naivete made at the project's inception that were never repeated and were noted here because they confirmed the lack of knowledge that the group possessed concerning microcomputer telecommunications at the project's onset.

The clustering of these four minor areas of comments under "Miscellaneous" was not meant to imply that they were interrelated, but rather only that they were infrequent comments judged not to belong elsewhere in this taxonomic arrangement. "Miscellaneous" was hence subdivided into four smaller categories dubbed, CONCERNS (questions/comments about the project), TECHNICAL QUESTIONS, ADVICE (suggestions for improvement or suggestions for other students) and naive comments, NEWNESS. Examples of each type from the talk database are below:

Report: CONTEXT/DATE ORDER
Selection: CLASS1 equals CONCERNS

---------------------------------------------
CNTX: SOURCE WHO: BECKY CELL: BD217 CLASS1: CONCERNS
DATE: Apr 10 SRC: SS CLASS2: 

COMM1: BECKY IS CONCERNED ABOUT TEACHERS CASSETTE RECORDER
AT HER STATION AND
COMM2: WANTS TO KNOW WHY TEACHER HAS IT THERE

INT.Q1: Teacher/researcher has placed a small cassette recorder near
INT.Q2: Becky to catch her comments and see calls attention to it.

---------------------------------------------
CNTX: SEARCH WHO: BECKY CELL: AH252 CLASS1: CONCERNS
DATE: May 1 SRC: SS CLASS2: 

COMM1: BECKY INQUIRES ABOUT THE NATURE OF FINAL PROJECT.
WANTS TO KNOW
COMM2: WHAT THEY HAVE TO DO. (TEACHER: STILL WORKING OUT DETAILS)
Report: CONTEXT/DATE ORDER
Selection: CLASS1 contains TECHNICAL QUESTION
--------------------------------------------------------
CNTX: SRC-TOUR WHO: BECKY CELL: Z90 CLASS1: TECH QST
DATE: Mar 14 SRC: SS CLASS2:

COMM1: HOW DOES ONE KNOW WHEN A DOWNLOAD FILE IS TOO BIG FOR
APPLEWRITER?
COMM2: (HOW MUCH ONLINE TIME = A FULL FILE LOAD FOR
APPLEWRITER?)
--------------------------------------------------------
CNTX: SOURCE TOWHO: ERIC CELL: V111 CLASS1: TECH QST
DATE: Mar 18 SRC: SS CLASS2:

COMM1: IS SOURCEMAIL COMPATIBLE WITH OTHER NATIONAL MAIL
SYSTEMS?
COMM2: (HE WANTS TO KNOW IF IT CAN CONNECT TO MCI, ETC.)
--------------------------------------------------------
Report: CONTEXT/DATE ORDER
Selection: CLASS1 equals ADVICE
--------------------------------------------------------
CNTX: INT2 WHO: ERIC CELL: 9 CLASS1: ADVICE
DATE: May 13 SRC: INT2 CLASS2:

COMM1: Source I would suggest to them, try to maybe get some
more sheer databases
COMM2:
INT.01: What would you do to improve The Source?
--------------------------------------------------------
CNTX: LCS-RP WHO: WARREN CELL: 1 CLASS1: ADVICE
DATE: Apr 16 SRC: LCS-RP CLASS2:

COMM1: I would highly recommend that the next Computer
Science 2 class
COMM2: experience the Randtriever, the LCS, and the Ohio
Union.
--------------------------------------------------------
CNTX: INT2 WHO: WARREN CELL: 10 CLASS1: ADVICE
DATE: May 13 SRC: INT2 CLASS2:

COMM1: T: Okay, what would you do to LCS (to improve it)?
COMM2: W: The system is easy to use. I really couldn't
change it.
COMM1: Well, maybe it might even be better if rather than the student using it,
COMM2: the teacher--student telling the teacher.

INT.Q1: Warren thinks that having a dedicated searcher might be better than
INT.Q2: having each student do his or her own online searching (on KI)

COMM1: What would you tell of these groups to make them better?
COMM2: Give BBS's some standardization of command structure.

INT.Q1: Doesn't like that there are many diff. BBS programs up and running.
In addressing the study’s questions concerning the students’ perceptions and affective responses to exposure to online services, further data reduction was required. Another AppleWorks spread sheet was constructed to help further distill the 1,200 entries in the talk database down to their essence. Across the "X" axis were placed all of the taxonomic categories developed during the Spradley analysis and their total frequency. Down the "Y" axis were the following:
1. **Warren's Comments** (and demographic information).

2. **Lisa's Comments** (and demographic information).

3. **Eric's Comments** (and demographic information).

4. **Related Comments** made by other members of the group.

5. **The Major Themes** of talk under each taxonomic category.

6. **The Study Question(s)** the talk addresses.

7. **The Answer** to the questions based on thematic repetition of talk in each category.

A sample of the spreadsheet is shown below for illustration of its design. It includes all of the Y axis data and the first X axis category of talk, "Prior Expectations". At the bottom, one can see the major themes of the talk and the study question(s) that they shed light upon.
REDUCTION AND FOCUS ON THREE GROUP MEMBERS

<table>
<thead>
<tr>
<th>CATEGORY AND # OF COMMENTS</th>
<th>PRIOR EXPECTATION (12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WARREN</td>
<td>T: Why did you enroll in this class? W: Generally, I'm enthusiastic about computers. The day began with very high expectations of the Randtriever and Library Control System. These expectations were met with great satisfaction. Really, there was no basic guideline from what I remember. I just knew that it was about telecom and that it was a research project. (from having you as my teacher for &quot;Software Tools&quot; last semester.)</td>
</tr>
</tbody>
</table>

| LISA                        | This course has turned out to be a real surprise. I didn't expect, or know about anything that we're doing now. At first I thought it was just more programming, like Computer I. Finding new ways to program, but I found that wasn't the case. |

| ERIC                        | T: Why did you enroll in a second computer course here at Whitehall? E: I was interested. I always wanted to learn more about it. T: Did you know what the class was about? E: No. I (thought it) was something like what we did last semester. I had no idea it would be of this magnitude. |

| RELATED TALK FROM OTHER     | Becky: At the OSU main library, it surprised me that no one asked me if I needed any help. Rob: When I signed up for this class, I had absolutely no idea what I was in for. Matt: When I signed up for this class, I did not know exactly what I was getting into. Jeff: I thought I might be able to use CompuServe, but (you the teacher) aren't even using that. (Source instead). |

| MEMBERS OF THE GROUP        | |

| MAJOR THEMES IN TALK        | 1. Enrollment based on high computing interest 2. Little or no knowledge of project nature |

| QUESTION(S) ADDRESSED AND   | 1. Establishes baseline of knowledge/experience for question 4.1 "What were the indicators of change or growth in the students' knowledge of search strategies for information?" |

| SUGGESTED ANSWER           | |

Figure 12. Sample Chart of Talk Focused on Three Students
Of the original ten participants, one (Rob) moved away. One quit (Matt). One was not considered for in-depth study due to poor attendance (Debbie). Another for general disinterest in the project (Ray). This left a pool of six: Warren, Lisa, Eric, Becky, Jeff and Daryl. Of these six, Warren, Lisa and Eric were chosen for closer examination on the following desired criteria:

1. Both male and female representation. (to have a female, one must include either Lisa or Becky).
2. A wide range or grade level. (Eric was youngest at 15, Lisa and Warren oldest at 18).
3. A wide range of academic ability. (Valedictorian Warren to erratic "A" to "C" grades of Eric).
5. A representative range of talk.
6. Complete data sets turned into the teacher/researcher. (ruled out Daryl, Jeff and Becky).

While not equally focused upon for detailed, individual analysis, all of the participants' talk was indexed and weighted equally in the talk database and subsequent overall analysis. The group turned out to be surprisingly homogeneous in their perceptions and affective responses to exposure to online services. This may be attributed, perhaps, to their common interest in computing, in general.
**FURTHER ANALYSIS FOR EVIDENCE OF CHANGE:**

Through the further reduction of the taxonomy and its focus on three participants, specific behaviors/strategies were identified and sorted according to whether they were *entry point* behaviors/strategies, or *exit point* behaviors. They were charted roughly as follows:

<table>
<thead>
<tr>
<th>Types of Entry-Point Behaviors</th>
<th>Frequency of Entry</th>
<th>Exit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Types of Exit-Point Behaviors</th>
<th>Frequency of Entry</th>
<th>Exit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
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<tr>
<td>4.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 13. Behavioral Shift Table: Entry to Exit-Point

**BAR GRAPHS OF SPRADLEY DATA:**

The talk data from the Spradley analysis was quantified and bar-graphed to show numerical relationship among opposing categories of talk. An example below, plotted with *TimeOut Graph*, illustrates the relative distribution of affective comments along several parameters and the overall contribution of each to the whole of affective talk.
The graph above shows the percentage distribution of the 338 positive affective comments. The most frequently cited comment type was "Value", followed, in descending order, by: "Like", "Enjoy", "Easy", "Size Positive", "Impressed" and "System Satisfaction".
THE FLOW CHARTS OF SEARCH:

During both the entry- and exit-point interviews, the participants' attention was focused on two theoretical searches concerning the bombing of Hiroshima and The Beatles. As he or she talked, each participant drew a flow-chart style depiction of how they would have attacked the information search relevant to the two topics. They were compared with each other at the study's conclusion and differences were noted in the following areas: A. Increased Complexity, B. Increased Branching of Search, C. Evidence of Recursion and Reflective Thinking, D. Incorporation of On- and Offline Search Techniques and Incorporation of Multiple Online Sources. A sample of one student's entry-point and exit-point flow chart are illustrated on the next two pages. This first is entry point Beatles, and second is exit-point Beatles.
Figure 15. Warren: BEATLES 1 Entry-Point Search Strategy
Figure 16. Warren: BEATLES 2 Exit Search Strategy
SUMMARY:

In summary, this chapter has endeavored to relate the following information:

1. The Purpose of the Project.
2. The Questions Investigated.
3. The Experimental Design.
4. The Class Characteristics.
5. The Population.
6. Funding Acquisition.
7. Site Acquisition.
8. The Research Timeline.
10. Data Collection.
11. A Discussion of the Multiple Sources of Data.
13. Data Reduction.

Chapter Four will present the findings of the various analyses.
CHAPTER IV
CURRICULUM AND FINDINGS

RESULTS OF THE ANALYSIS BY QUESTION

The preceding chapter outlined the four basic questions being asked by this study and the data collected to address each. In restatement, those questions are:

1.0. What was the structural organization of the innovation presented to students?
   1.1. What was the nature of time and task?
   1.2. What is the role of the student?
   1.3. What was the role of the teacher/researcher?

2.0. How do secondary students search for information needed to fulfill the requirements for school papers, projects or presentations?

3.0. What were the students perceptions of, and affective responses to, exposure to four classes of online services (Knowledge Index, The Source, LCS, and Computerized Bulletin Boards)?

4.0. Did exposure to online services alter the students' current types of search strategy?
   4.1. What were the indicators of change or growth in the students' knowledge of search strategies for information?
   4.2. Did students integrate across the four classes of services to produce searches superior to any single service?
QUESTION NUMBER 1.1:
What was the nature of time and task?

To address the structural nature of the class and illustrate the interrelationships among time and task, a social history of the class was generated primarily from the daily videotapes.

THE SOCIAL HISTORY

What follows is a narrative description of the social history of the class as it unfolded week by week. It is provided here to illustrate how the structure of the class evolved over its twenty-one week life span.

During the first week of the study, students were informed that the nature of the class was primarily that of a research project and they were told to have consent forms signed if they wished to stay. Details of the curriculum were not divulged at the time and students were told that the primary reason for the consent forms was that, as willing participants, they would be videotaped often, occasionally interviewed, and those tapes/interviews would be examined by others. The researcher answered what questions he could concerning what the study was about, how they fitted into it and what was expected of them. Afterward, the project began as would any other course.
With the exception of introductory training on how to operate the Apple IIe, a modem and a word processor, the majority of the study's curriculum was drawn from outside the walls of the laboratory, from remotely located mainframe computers via telephone lines. Broadly speaking, the curriculum consisted of learning how to maneuver through each of the four classes of online services studied and of experiencing both a wide and in-depth sample of each's offerings. Participants were made aware of the systems' basic designs, offerings, and command structures. Beyond that point, they were encouraged to explore independently or with their peers. The experience culminated in a final research paper/project that drew its information sources from online services. The figure below summarizes how time was spent during the 21 weeks of the project.
### Activity Summary

**MONTH** | **DATES** | **WEEK** | **ACTIVITIES**
---|---|---|---
Jan 6-10 | 1 | Intro Course, begin word processing
Jan 13-17 | 2 | Direct Instruction on AppleWriter
Jan 20-24 | 3 | Finish AppleWriter, begin file handling
Jan 27-31 | 4 | Finish file handling, begin telecomm.
Feb 3-7 | 5 | Fundamentals of telecomm., modems
Feb 10-14 | 6 | How to use SmartCom I (modem software)
Feb 17-21 | 7 | Practice calling. Up-download files.
Feb 24-28 | 8 | 1st interviews - practice w/modem
Mar 3-7 | 9 | Calling Computerized Bulletin Boards
Mar 10-14 | 10 | Tymnet, Intro Source No school 3/14
Mar 17-21 | 11 | Source Tour, Mail, Group meet.
Mar 24-28 | 12 | Source Chat Spr. Brk. begins

(March 28th to April 6th: No School Spring Break)

**Apr 7-11** | 13 | Source Mail, News, SIGS, encyclopedia
**Apr 14-18** | 14 | LCS field trip, LCS practice, meeting
**Apr 21-25** | 15 | 1st searches of data via computer
**Apr 28-May 2nd** | 16 | Present search results
**May 5-9** | 17 | Introduce Knowledge Index (DIALOG)
**May 12-16** | 18 | DIALOG searches, 2nd Interviews
**May 19-23** | 19 | Final projects of own choosing
**May 26-30** | 20 | Final Proj. Mem. day 5/26
**June 2-6** | 21 | Final Projects, exit group interview

*Figure 17. Summary of Activities*
Week 1-2:

As stated earlier, after completing the requisite paperwork that attends the opening of any class, the nature of the project was announced (insofar as telling the students that it was a research project) and students' questions were answered as fully as possible. Details of the curriculum were kept from them. Basic hardware and software concepts were reviewed (equipment recognition, disk handling, etc.) to ascertain at what level of computer competence the participants were functioning. All had successfully navigated the Computer Science I class in BASIC and seemed comfortable in the lab surroundings. Consequently, this section moved by very quickly.

The project then started into instruction in word processing, the electronic generation and editing text via a computer. None of the students had experienced any prior formal training in this area and it was felt necessary to give them the basic text handling skills to be able to accomplish the following tasks:

A. To be able to create and edit text electronically offline for transmission to other systems at a later time (uploading files). The primary goal here being to minimize online connect time by not composing letters while an online connect charge is being incurred by the minute.
B. To be able to edit text received from a system during a file or general session download. This would include removing or cleaning up any transmission errors (garbled text, i.e. "micro-%$comput&Qer" in place of "microcomputer"), control characters, menus repetitively presented by the system connected to, unwanted or unneeded information, etc.

C. To facilitate ready generation of papers, projects, notes, etc., in response to the demands of the class itself.

The word processing program, AppleWriter Ile (DOS 3.3 version) was chosen for instruction for two reasons. At the time of the project, AppleWriter Ile was one of the most powerful word processing packages on the market and it was already available within the district's software collection.

As a basis for developing later telecommunications skills, students were taught word processing skills, a few commands per day, as though mastery of AppleWriter was a primary goal in and of itself. Students wrote letters, typed homework assignments for other classes and occasionally wrote creative stories. The underlying goal, from the researcher's standpoint, was mastery of word processing as a prelude to more efficient telecommunications. The actual contents of the students' writing was essentially unimportant as long as it
demonstrated correct usage of the word processing software, printer, etc.

**Week 3:**

By this time, the participants were winding down their study of **AppleWriter** and were moving on to its various file-handling (utility) functions. To manage all of the data that they would eventually have on diskette, the students needed to know how to perform such tasks as deleting files, locking and unlocking them, renaming files, moving and copying files, formatting disks, etc. **AppleWriter** carries out most of these commands easily. In rare cases of disk failure, students later used the utility program **Copy II Plus** to recover lost data, "undelete" accidentally erased files and the like.

**Week 4:**

Students demonstrated their capacity to use **AppleWriter**'s various file-handling utilities midway through the fourth week and were ready to begin learning about the concepts of microcomputer telecommunications. Students were issued a copy of "**Microcomputer Telecommunications: Bringing Education Online for an Expanded Classroom**" (Schooler, 1984) and were assigned weekend readings over the text’s first chapter.
Week 5:

Lectures were presented on the science and physics behind computer telecommunications. Students were exposed to topics such as the electrical and mechanical specifics of what a modem is, how it functions, the ASCII system of information transfer, the binary numbering system, baud rates, communications protocols and other practical information. The students needed this information if they were to get the most out of their upcoming online experiences.

Week 6

In week six, students put the practices learned during the previous week to use. Each student had his or her own computer with an internal card-type modem, a Hayes MicroModem IIE and user's manual and telecommunications software called, "SmartCom I". Each student was issued his or her own copy of the software and proceeded to load it into his/her Apple IIe. The students spent most of the rest of the week offline navigating through the relatively complex menus of SmartCom I, finding where in the program they needed to adjust or modify the information that they had learned in Week Five. They practiced setting up different kinds of communication protocols and prepared to culminate their offline training with their first online experience.
Week 7:

Each student had his or her own private telephone number. Each shared his or her number with the rest of the group so that the members could call each other within the confines of the same room. Within moments, telephones were ringing and high-pitched carrier tones were heard throughout the lab as students successfully called other's computers. Once connected, the participants were linked textually to each other. What one typed appeared on the other's monitor and visa-versa. They practiced uploading and downloading letters to each other that had been composed offline with AppleWriter. They experimented with the various communications settings such as baud rate, stop and start bits, duplex settings, and so forth to see what sort of screen displays erroneous protocols would produce. Inspired by the popular movie "War Games", several participants decided to dial random, outside telephone numbers just to see, if by chance, they could hit upon a modem-answering line. Twice (that the researcher is aware of), students did, in fact, accidentally hit on two corporate computers. One belonged to AccuRay Corporation and the other belonged to Kroger's supermarket chain. In the first case, the only prompt on the screen was a "?" (question mark). There were no menus of any kind.
Week 8:

By this point, the participants were becoming relatively adept at using their modems and SmartCom I. They were about to begin exploring the outside world with their computers and it was at this time that the first one-on-one interviews were videotaped. Most of the subjects practiced their skills on their own while the researcher taped the first of two interviews in an adjacent lab.

Week 9:

By the ninth week of the project, the participants were ready to make their first outside computer contacts. Of the four classes of online services examined, it was decided that Computerized Bulletin Board Systems (CBBS's) would be the most suitable to start with. Generally speaking, CBBS's are locally situated and thus do not incur long-distance charges. Secondly, they are, for the most part, free of charge for connect time although a few multiplayer game CBBS's had a low connect charge. Thirdly, CBBS's tend to be informal, user-friendly services that do not require a lot of telecommunications expertise to operate properly. Most are run by private individuals out of basements and bedrooms and are often fly-by-night operations that are here one day and gone the next. They varied tremendously in their content ranging from serious technical advice to dating services and outright software piracy (very common).
The subjects were briefed on what they might expect to encounter and reminded to keep a written log of what experiences they had online. The researcher had located a number of local CBBS's that appeared suitable for student contact. Two students with a fairly strong computer background contributed a few other numbers. At this point, the participants were literally "turned loose" to contact whomever they pleased and interact with the systems as they saw fit. On the researcher's part, data collection consisted of videotaping the entire lab, including close-up "screen-shots" of what was transpiring on individual student's monitors.

While being both friendly and free, CBBS's were a challenge to some students because the systems were not all running the same bulletin board software and therefore, the menus and screen appearance of each system varied widely from CBBS to CBBS. Many participants left electronic mail for the owner/administrators (SYSOP's pronounced, siss'-op for "SYSTEM OPERATORS") of the various boards and many received replies. Students also quickly discovered that a common feature of CBBS's was to post a listing of telephone numbers for other systems. Our list of CBBS numbers grew into the hundreds as long-distance boards were located and contacted. Several students even made contact with some high school CBBS's in California.
Week nine was passed in this manner with students making dozens of contacts with different boards, honing their log-in skills, practicing up- and downloading of files and generally losing whatever fear they might have had concerning using a modem. Throughout the rest of the project, the subjects were encouraged to check back with their favorite bulletin boards for mail to keep up their newfound friendships.

Week 10:

Calling most bulletin boards consisted generally of placing a local, free telephone call. It was now time, however, to attempt to connect with The Source, a huge collection of mainframes located in McLean, Virginia just outside of Washington, D.C. Most participants assumed that contacting The Source would entail making some very costly long-distance calls. This was not to be the case, however, as week ten was begun with a study of the long-distance "value-added carriers", Tymnet and Telenet. Often referred to as "packet-switching networks", these services are designed expressly for computer data transfer. Voice communication is not carried over their lines. Nearly all major cities in the U.S. have a local listing for both Telenet and Tymnet. By dialing either number, a switching or "operator" computer will answer and ask to which destination system (The Source, DIALOG, CompuServe, etc.)
one wishes to have their call routed. This procedure completely bypasses a normal long-distance charge. However, Tymnet and Telenet's services are obviously not free. They build their fees into the hourly connect time charges that are levied by the service to which one's call is directed.

The participants spent a couple days dialing both Telenet and Tymnet and directing their calls all over the U.S. They quickly discovered that when one disconnects or "logs-off" a remotely located service that was reached via either carrier, one is again prompted for where one's call is to go. In other words, hanging up on the Source simply puts one back in touch with the value-added carrier used to reach it. To completely log-off, one would have to hang up twice - once on the online service and again on the carrier. In one lab session, the students made one local phone call and reached: The Source in McLean, Virginia; DIALOG, in Palo Alto, California; BRS (Bibliographic Retrieval Service) in Latham, New York; Delphi in Blackstone, Massachusetts and CompuServe in Upper Arlington, Ohio.

The week concluded with the participants making their first real connection to The Source (except as mentioned above). Each student had his or her own private password and ID number. Their ID numbers were considered public information as they doubled as students' electronic mail addresses. Passwords however, were closely guarded secrets.
Formerly a subsidiary of Reader’s Digest Association, Inc. in association with Control Data Corp., The Source was acquired by its ten-fold larger competitor, CompuServe, of Upper Arlington, Ohio in June of 1989. Until then, The Source prided itself on being "America’s Information Utility". Running 24 hours per day on a large collection of Prime Inc. mainframes, The Source offered, for a connect fee, well over a thousand different online services ranging from electronic mail, games, news, weather & sports, to shopping and electronic "clubs" or special interest groups (SIG’s).

The following is an actual download (copy of screen contents) from a student logging on to The Source via the carrier, Telenet. This information illustrates the sequence of events that each student had to perform to make a connection and also demonstrates the smooth linkage between The Source and Telenet. Items in parentheses are the author’s annotations added for clarity.

**LOGGING ONTO THE SOURCE VIA TELNET**

1. DIAL THE NEAREST TELNET NUMBER

2. AFTER YOU HEAR THE CARRIER TONE PRESS <RETURN> TWICE

(TELENET WILL RESPOND JUST AS YOU SEE BELOW, ALTHOUGH THE NUMBER "614 17B" WILL PROBABLY BE DIFFERENT SINCE IT IS THE IDENTIFIER OF THE NODE (TELEPHONE LOCATION) THAT YOUR PARTICULAR CALL IS BEING ROUTED FROM.)
TELENET
614 17B

(NEXT, YOU'LL SEE THE PROMPT "TERMINAL=". TELENET WANTS TO KNOW YOUR TERMINAL TYPE SO THAT IT CAN AUTOMATICALLY SET UP CERTAIN COMMUNICATION PARAMETERS FOR YOU. VIRTUALLY ALL COMMON MICROCOMPUTERS USE THE TERMINAL CODE "D1".)

TERMINAL=D1 (FOR NEARLY ALL MICRO'S ENTER D1)

(THEN YOU WILL SEE THE PROMPT "9". TO THIS, RESPOND "C 30124" THIS CODE NUMBER MEANS TO ROUTE THE CALL TO THE SOURCE)

9C 30124 (THE SPACE AFTER THE "C" IS NECESSARY.)

301 24 CONNECTED (YOU'RE KNOCKING ON THE SOURCE'S FRONT DOOR.)

Connected to THE SOURCE

(NOW THE SOURCE PRESENTS YOU WITH THE PROMPT ">". TYPE IN "ID", PRESS THE SPACE BAR ONCE, AND THEN TYPE IN YOUR SIX-LETTER/DIGIT ID AND PRESS <RETURN> ONCE.)

> ID AAB939
Connected to THE SOURCE

(YOU'RE ALMOST IN. NOW ENTER YOUR SECRET PASSWORD AND PRESS <RETURN>. REMEMBER, NOTHING WILL SHOW ON THE SCREEN AS YOU'RE TYPING YOUR PASSWORD. THIS IS FOR YOUR OWN PROTECTION.)

> Password? (ENTER YOUR PASSWORD AND THEN PRESS <RETURN>)

(AFTER VERIFYING YOUR ID AND PASSWORD, YOU ARE ADMITTED TO THE SOURCE)

AAB939 (user 36) logged in Sunday, 06 May 84 00:01:28.
Welcome, you are connected to THE SOURCE.

(C) COPYRIGHT SOURCE TELECOMPUTING CORPORATION 1984.
Find Someone Special on THE SOURCE? (GENERAL ANNOUNCEMENTS)
Or Learn the Latest About Micros?

For Details on These and Other New Products on THE SOURCE, Type NEW.

The Latest Election Poll is in BULLETIN.
WELCOME TO THE SOURCE (THE ENTRY MENU)

1 USING THE SOURCE (GENERAL INSTRUCTIONS)
2 TODAY (TV REVIEWS, HOROSCOPES, ETC.)
3 BUSINESS UPDATE (BUSINESS NEWS, FINANCIAL INFO)
4 THE SOURCE MAIN MENU (SOURCE'S BASIC, CORE FUNCTIONS)
5 WHAT'S NEW (CURRENT EVENTS ON THE SOURCE)
6 COMMAND LEVEL (WILL GIVE USER A "->") PROMPT

Enter item number or HELP

At this point, participants could choose any of the above six options. By selecting option, "1 Using The Source", the participants took an online "tour" of The Source set up by the system just for the purpose of orienting new users. Allowing for variations between the students, several days were allocated the tour of The Source.

Week 11:

During week 11, the participants finished the online tour of The Source and progressed on to studying its electronic mail capability, "SourceMail". A mainstay of all "information utilitities", SourceMail allows members to send messages back and forth within a matter of moments depending upon how busy the overall system is at the time. A user's "address" is his or her ID number. The students practiced sending mail to others within their own group and used SourceMail's advanced features like mail forwarding to create a chain letter that circulated among the entire group. Afterward, they used The Source's member directory which gives short descriptions of members' interests to send
letters of greeting to individuals who had similar hobbies or interests. Later in the week, a taped group meeting was held to monitor the groups' progress and share successes and failures.

**Week 12:**

Week 12 was short because of the start of spring break, (March 28th through April 6th). In the remaining time, participants experimented with The Source's "Chat" program. Essentially a computerized version of teleconferencing, Chat allows members to "page" each other throughout the system by typing "Chat", followed by the individual's ID number with whom one wishes to converse. As with SourceMail, the students first experimented with Chatting among themselves. Differing from SourceMail, Chat operates in what is termed "real time". In other words, there is no delay in message transmission from user to user. What one types at his or her terminal, the other sees instantaneously. Unlike SourceMail, both "chatters" need to be online at the same time. The system also permitted students to check to see what other ID's were currently logged on at the same time. They could then page these individuals to stop whatever they were doing and speak with them for a while. Students could refuse to be interrupted by Chat requests during future sessions by issuing the command, "NOCHAT". In one interesting case, a female subject was paged by a user in Paris, France. Quite excitedly, while the group watched,
the girl exchanged information on the relative time difference, the temperature in celcius, each other’s occupation, and so forth. Spring break began on Thursday.

**Week 13:**

During week 12, because of the relatively long spring break, the students refreshed themselves on the use of SourceMail and Chat. They then progressed on to studying The Source’s powerful news retrieval capabilities. The Source offers a direct tie-in to The Associated Press (AP) news service where students could get news, weather and sports information as up-to-date as a few minutes old. Interest in this capability expanded greatly when one student used the AP service to bring in the top news stories immediately before her Current Events class met. This led to her instructor requesting news briefs from her on a regular basis.

Next, the students experimented with using SIGS. The Source has developed a computer program establishing a number of online "SIGS", or **Special Interest Groups**. Each of the many SIGs are devoted to one general area of interest. Essentially, they are electronic "clubs" and come in a wide variety of forms. They all operate in the same manner, and each one will allow one to "talk" with individuals who share the same interests. For example, there are SIGs for sports, telecommunications, education,
music, games, family matters, cooking, and travel, just to mention a few. Basically, SIGs are divided into three major areas: teleconferencing, "bulletin-board" style message posting, and databases of downloadable programs or text files.

Like the private Computerized Bulletin Board Systems (CBBS's), all SIGs have a "SYSOP", SYSTEM OPERators who generally oversees the operation of the SIG. All SIGs allow one to leave messages that others may read and to which they can respond if they feel they have information the other might consider valuable. For example, a teacher might wish to leave a message inquiring about establishing modem "pen pals" for his or her students. That teacher need only type in the question and the SIG will automatically attach his or her name and ID number to it so other members may make contact via the same SIG or SourceMail. The SIG also prompts the user for a header, a brief description of the message's general subject matter. This also allows others to more easily respond to a questioner's needs by simply scanning the titles of messages rather than reading them in their entirety. If someone has elected to answer one's call for help via the SIG, one is automatically notified that there is at least one reply to his or her message(s) when one logs on again.
In addition to leaving and reading messages like a bulletin board, most SIGs hold online, real-time "conferences", where one can hold round-table-like meetings with those of similar interests. These conferences are generally scheduled and announced in advance to allow members to participate more fully. There are often guest speakers, or perhaps more accurately, "guest typists" of national renown who will "speak" to SIG's members.

SIGS often have programs or text files of information maintained in their "Access" databases that one may download to their system. One may also submit programs and/or text files to the SIG where the SYSOP (acting as editor) may elect to include the information in the access files for others to peruse.

Lastly, students worked with The Source's online electronic encyclopedia. As the name implies, the online encyclopedia allows one to enter a search term and the encyclopedia will scan itself searching for a match on the request. The entire text of the article is displayed on the screen along with cross-references. One drawback that students complained about was the lack of graphic illustration. The system is text-based only.
Week 14:

Week 14 brought a complete change in the online service under study. Attention was turned to The Ohio State University's Library Control System or LCS. Essentially an electronic card catalog, LCS enables OSU's students to search the library's holdings by author, title, author-title, call number, shelf position, or subject. The system catalogs not only OSU's main library but also its many departmental libraries and the downtown Columbus State Library of Ohio.

Following a teacher lecture on the operation of the system and its command structure, a field trip to OSU was made to see LCS in operation. The purpose of the trip was three-fold. Firstly, at the time of the study, LCS had only one or two 300 baud outside access lines. The ten participants could not simultaneously log onto LCS as they did The Source. This necessitated a trip to OSU where terminals are plentifully distributed throughout the libraries. Secondly, LCS was running on a different brand of terminal, at a much higher baud rate (19,200 compared to 300) and it was considered significant that students see the different hardware and experience the faster transmission. Thirdly, despite all being local residents, none of the participants had ever visited the OSU libraries. Whitehall-Yearling High School's library is the largest in
its school conference with approximately 22,000 volumes. OSU, in contrast, catalogs millions of items and experiencing the sheer enormity of the system was considered to be worthwhile. It helped to remove some of the abstraction, the lack of a physical frame of reference that many online searchers report. Each participant prepared a written impression of the trip which were transcribed and analyzed in Chapter 4.

While in the library, after taking a general tour, the students were each given several search topics and asked to operate LCS to locate sources relevant to those questions. Armed with printouts of their sources, they traveled about the main library actually locating and bringing back to the researcher, the sources that they had found.

Back at Whitehall, two Apple systems maintained contact with LCS and students took turns answering search questions that were posted at each of the two computers. The week ended with a taped group meeting discussing the entire LCS experience and the OSU library system.

Week 15:

Having experienced CBBS’s, The Source, and LCS, students were now assigned a search for information that required (or at least lent itself to) using all three types of services. The researcher made up a list of Apple
computer-related topics (i.e. AppleWorks, Mouse, ImageWriter II, LOGO, etc.). Each student selected a topic and spent the remainder of the week searching for as much information as possible about the subject by any means they could come up with. An actual paper was not required, only the search strategy and sources found. Student attacks of their individual problems were quite diverse. Some used electronic encyclopedias, some joined relevant SIGS, others searched LCS for books, while still others searched The Source's member directory for individuals who might have knowledge of their problem area. The cross-over (from service to service) search strategies were interesting to watch.

**Week 16:**

Week 16 was quite short. There was no school on either 4/30 nor 5/2. The three days that we were in session were devoted to group presentation of their search results and a group constructive critique of the same. Students shared what they did and what they found, some with flow chart-like diagrams and when each was finished, the others threw out to the group what the searcher might have done differently.

**Week 17:**

The seventeenth week brought the fourth and final online service to light as the students began to explore the subset of DIALOG known as **Knowledge Index** or simply "KI".
Whereas the information utilities like Delphi, CompuServe and The Source all appear basically quite similar, DIALOG's Knowledge Index is an entirely different sort of online service. There are no SIGS's, shopping services, or games. Recently, electronic mail has been added, but it was not available at the time of the study. What's left are mountains of factual bibliographic information on virtually any topic imaginable.

Knowledge Index is a subsidiary of DIALOG, which in turn, was a subsidiary of Lockheed Missile and Space Corporation during the project. It was recently purchased by the news service, Knight-Ridder. DIALOG has been officially online since 1972, but it is not a database in and of itself. It is a vendor, or supplier of online databases that are produced by other firms. Some refer to DIALOG, and its competitors BRS and ORBIT, as "IP's" or information providers. Others have likened them to "information department stores" (Glossbrenner, 1983). A department store rarely manufactures what it sells, rather it simply acts as a clearinghouse for a wide variety of products, adding a bit to the cost of each product so it can make a profit for itself. For example, the massive database of educational literature, ERIC, is not produced by DIALOG, but ERIC can be accessed through DIALOG, as can over 280 other electronic databases, totalling in excess of
150,000,000 indexed records of information. Some estimate that DIALOG has, online, nearly 95% of the collected body of human knowledge published in periodicals in the last fifteen years.

Because of the complexity of the system and the relatively small amount of grant time that we had (five accounts, of three hours each), the researcher held several days of lecture/discussion style classes familiarizing the participants with the mechanics of the system and its command structure. Considerable time was also devoted to an overview of each of the database's subject matter content. As the week progressed, students became increasingly adept at doing pencil and paper searches (as though they were actually typing at their keyboards) as either the researcher or other participants threw out search topics to the group. As with the search presentations given during week sixteen, students then critiqued each other's search strategies in an attempt to reach some sort of group consensus as to what the "ideal" search might have been.

To give the reader a concrete example of what the students did during this week, consider the following screen download of an actual search (parenthetical comments are the researcher's annotations for clarity). Suppose that without any further explanation, you were given an assignment to locate information on the following topic:
"Locate current research on the psychological aspects of running, with particular emphasis upon marathoners."

(Assuming KI has already been connected to through a carrier)

WELCOME TO KNOWLEDGE INDEX (ADMITTED TO KNOWLEDGE INDEX)
Accounting starting at 8:46:24 EST

For instructions on how to use Knowledge Index, enter HELP KI or ?. Otherwise enter your commands. April cost data now online.

**Type BULLETIN for KI news.

** MEDI1 IS NOT WORKING TODAY ** (MEDI1 DATABASE IS OFFLINE)

(At the time of the research, the most logical of KI's 23 databases to search would probably have been "PsycINFO", produced by the American Psychological Association (KI has since quadrupled the number of available databases). On KI this database is referred to as "PSYC1". The command "B" or "BEGIN", coupled with the database name, gets the student where he or she wants to go.)

?BEGIN PSYC1 (BEGIN SEARCH IN PSYC1 DATABASE)

4/16/84 18:06:08 EST (TRANSFERRED TO PSYC1)
Now in PSYCHOLOGY (PSYC) Section
PsycINFO (PSYC1) Database
(Copyright 1984 American Psychological Association)

?FIND DISTANCE RUNN? OR MARATHON? (SEARCH FOR DESCRIPTORS.

(Note use of "?" wildcard to match any ending and the use of logical boolean operators like "AND", "OR", & "NOT")

(KI COMPLETES SEARCH IN LESS THAN 3 SECONDS. HERE ARE RESULTS):

  28 DISTANCE RUNN?
  232 MARATHON?
  S1 258 DISTANCE RUNN? OR MARATHON? (RESULTS)
KI IS SAYING THAT IT HAS FOUND 28 MATCHES TO THE DESCRIPTOR "DISTANCE RUNN?" AND 232 MATCHES FOR THE DESCRIPTOR "MARATHON". THE OPERATOR "OR" WAS USED TO SEARCH BOTH DESCRIPTORS SIMULTANEOUSLY. KI SHOWS 258 CITATIONS CONTAINING EITHER DESCRIPTOR. IT IS HOLDING THEM IN A "SET", IN THE MATHEMATICAL SENSE, CALLED "S1"

?D 1/M/1-3 (DISPLAY SET#1/MEDIUM FORMAT/CITATIONS 1 TO 3)

1/M/1 (CITATION #1)
70-12716 Vol No: 70 Abstract No: 12716
Comparison of personalities between marathon runners and cross-country skiers.
Jerome, Wendy C.; Valliant, Paul M.
Laurentian U of Sudbury, School of Physical Education, Canada
Perceptual & Motor Skills 1983 Feb Vol 56(1) 35-38
CODEN: PMSA2
ISSN: 00315125

1/M/2 (CITATION #2)
69-05654 Vol No: 69 Abstract No: 05654
A psychological study of Finnish joggers participating in the Athens marathon of 1977.
Salmimies, Pekka; Lehvonen, Ritva
U Helsinki Central Hosp, Finland
Psychiatria Fennica 1979 115-120 CODEN: PSFNBI
ISSN: 00797227

1/M/3 (CITATION #3)
70-10282 Vol No: 70 Abstract No: 10282
Mental and emotional aspects of long-distance running.
Callen, Kenneth E.
Portland VA Medical Ctr, Psychiatry Service, OR
Psychosomatics 1983 Feb Vol 24(2) 133-151 CODEN: PSYCB
ISSN: 00333182

?LOGOFF (DISCONNECTING FROM KNOWLEDGE INDEX)
One could have downloaded all 258 citations in set 1 above, but the subset printed should serve to illustrate the basic types of activities that each participant was involved in. The students had to learn that there would nearly always be a certain amount of unrelated, useless information delivered in the search. For example, a search on the descriptor, "MARATHON" alone doesn't ensure that the system will restrict the search only to articles concerning a long foot race. It could mean an endurance contest of any kind. One might have gotten a citation concerning the psychological effects on participants of 72-hour underwater chess tournaments. If too many extraneous hits were received, the students had to realize this and plan an alternative search strategy and effect a change in their search descriptors.

Week 18:

Week 18 found the participants searching KI on their own, downloading the results and evaluating them. The atmosphere was that of a challenge where the researcher and students alike would toss out topics for searches, "defying" the rest of the group to come up with some relevant citations. Rarely, the group learned, was there any topic about which nothing could be found given a correct search strategy and database selection. In fact, more often than not, the searches produced far too many citations to be
manageable. Through this exercise, students began to realize the enormity of information available on a given topic and to make their searches increasingly narrow and succinct.

Also, during this week, on an appointment basis, the second of the two taped one-on-one interviews was held. Some classroom data is missing for 5/14 due to an unnoticed camera failure.

**Week 19:**

During this week, the participants selected topics of their own choosing for a final project that would hopefully tie together the skills learned over the past eighteen weeks. The researcher placed no restrictions upon the topics except that they be of an academic nature. The topics chosen for research were wide-ranging including, birth control, computer "hacking" (illegal entry into systems), software piracy, and fast vs. slow-twitch skeletal muscle fibers. The participants were encouraged to conduct the research in any manner that they could and prepare an actual written paper on the topic as their final exam for the class. At this point, the researcher's role was primarily that of an observer, question answerer and technical problem solver. There was little to no direct intervention into the students' progress. On any given day, some would be working with LCS, others leaving E-Mail for
experts that they had identified through contacts on CBBS's, or The Source's SIG's and member directory. Still others were composing requests for help offline with AppleWriter while still others were cleaning up downloaded files or designing a set of descriptors for an upcoming Knowledge Index search. On occasion, senior students who had early (7th period) dismissal anyway, were granted permission to go to a library of their choice and on one Saturday, a male participant ran a shuttle to the main OSU library for interested group members.

Week 20:

A continuation of the previous week, the participants worked independently on their final projects. This was a very short week. Memorial Day fell on 5/26 and the researcher attended a professional meeting on 5/29. As the videotapes of these days indicates, the activities were generally unremarkable (from a distance) as students worked very quietly on their own, needing little assistance from the researcher or others. Conversation was interesting, though, in that it was light and breezy, of seemingly little "importance". At this point, students were operating the various systems with such proficiency that they appeared able to talk about disrelated topics while working on their projects. This observation will be explored further in Chapter Four.
Week 21:

This was the wrap-up period of the study. Final projects were turned in and, while seniors were already out for the year, most returned to the lab on occasion to tie up loose ends. There was one, final group exit interview. Materials were turned in along with log books.

**STRUCTURAL TIMELINES: DISCUSSION OF TIME/TASK**

As was described earlier in the research methodology chapter, two timeline spreadsheets were developed to assist in the analysis of data related answering questions concerned with the structure of the experience and the roles of its participants. The first table, derived from carefully transcribing both word and action from approximately sixty hours of daily classroom video tape is a very large, and extensive curricular timeline which gives a complete accounting of the project’s scope and sequence on a daily basis. The second, taken from the data of the first, is smaller and expresses the date of occurrence and duration of events **by type** (online session, meeting, interview, etc.). The next few pages, contain a sample of the larger curriculum timeline, followed by the entire, smaller time-by-activity timeline. As described earlier in the Methodology, the table puts VCR tape counter position (a relative measure of time) across the X axis and plots the tape number and date vertically on the Y axis. The sample shown documents the activities of three class sessions.
<table>
<thead>
<tr>
<th>Date</th>
<th>Primary Activities</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>00:00</td>
<td>Welcome to class.</td>
<td>0-99</td>
</tr>
<tr>
<td>01:00</td>
<td>Introduce the day's topic.</td>
<td>100-199</td>
</tr>
<tr>
<td>02:00</td>
<td>Discuss the week's goals.</td>
<td>200-299</td>
</tr>
<tr>
<td>03:00</td>
<td>Review last week's activities.</td>
<td>300-399</td>
</tr>
</tbody>
</table>

**Figure 18. Curriculum Time-Line: Part A**
Lisa was extraordinarily pleased and excited with her "French Connection" as she called it. She later said, about the international experience, "I get around!"

<table>
<thead>
<tr>
<th>Lisa was extraordinarily pleased and excited with her &quot;French Connection&quot; as she called it. She later said, about the international experience, &quot;I get around!&quot;</th>
<th>Nancy Beckman of The Source (ID TCA 008) correspond with you as you get a chance.</th>
<th>&quot;Chat&quot; with each other as well as those that you don't know. Select random users who happen to be online. Also, experiment with the &quot;Member Directory - add?&quot;</th>
<th>Information for his project by geographic location! Current events class.</th>
<th>After deciding that she would like her to use Source's news link to supply up-to-the-minute news.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1580: Teacher: try to</td>
<td>760: Teacher: try to</td>
<td>1840: Becky says Mr. Angelucci would like her to use Source's news link to supply up-to-the-minute news.</td>
<td>1940: Becky says Mr. Angelucci would like her to use Source's news link to supply up-to-the-minute news.</td>
<td>1940: Becky says Mr. Angelucci would like her to use Source's news link to supply up-to-the-minute news.</td>
</tr>
<tr>
<td>400-499</td>
<td>500-599</td>
<td>600-699</td>
<td>700-799</td>
<td>800-899</td>
</tr>
</tbody>
</table>

Figure 19. Curriculum Time-Line: Part B
Figure 20. Curriculum Time-Line: Part C
The next timeline, that showing time by activity, is shown completely on the next few pages. Across its X axis are days and down the Y axis are types of classroom activities.
## Activity Time-Line: Part A

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
<th>Duration</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>Field Trip</td>
<td>1 day</td>
<td></td>
</tr>
<tr>
<td>0.1</td>
<td>Entry-Point</td>
<td>30 min</td>
<td></td>
</tr>
<tr>
<td>0.2</td>
<td>Field Tour</td>
<td>2 hours</td>
<td></td>
</tr>
<tr>
<td>0.3</td>
<td>Tour Guide</td>
<td>1 hour</td>
<td></td>
</tr>
<tr>
<td>0.4</td>
<td>Field Interview</td>
<td>1 hour</td>
<td></td>
</tr>
<tr>
<td>0.5</td>
<td>Field Observation</td>
<td>1 hour</td>
<td></td>
</tr>
<tr>
<td>0.6</td>
<td>Data Collection</td>
<td>1 day</td>
<td></td>
</tr>
<tr>
<td>0.7</td>
<td>Data Analysis</td>
<td>1 day</td>
<td></td>
</tr>
<tr>
<td>0.8</td>
<td>Report Writing</td>
<td>1 week</td>
<td></td>
</tr>
<tr>
<td>0.9</td>
<td>Presentation</td>
<td>1 hour</td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>Field Evaluation</td>
<td>1 day</td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Field Observation</td>
<td>1 hour</td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>Data Collection</td>
<td>1 day</td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>Data Analysis</td>
<td>1 day</td>
<td></td>
</tr>
<tr>
<td>1.4</td>
<td>Report Writing</td>
<td>1 week</td>
<td></td>
</tr>
<tr>
<td>1.5</td>
<td>Presentation</td>
<td>1 hour</td>
<td></td>
</tr>
<tr>
<td>1.6</td>
<td>Field Evaluation</td>
<td>1 day</td>
<td></td>
</tr>
<tr>
<td>1.7</td>
<td>Field Observation</td>
<td>1 hour</td>
<td></td>
</tr>
<tr>
<td>1.8</td>
<td>Data Collection</td>
<td>1 day</td>
<td></td>
</tr>
<tr>
<td>1.9</td>
<td>Data Analysis</td>
<td>1 day</td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>Report Writing</td>
<td>1 week</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Presentation</td>
<td>1 hour</td>
<td></td>
</tr>
</tbody>
</table>

**Total class days possible:** 30

**Total class days held:** 30

**Dog not in session due to:**
- Teacher absence: 1
- Staff meeting: 1
- School event: 1
- Field trip: 2
- Other: 1
Figure 22. Activity Time-Line: Part B
<table>
<thead>
<tr>
<th>MAY WEEK 10</th>
<th>MAY WEEK 11</th>
<th>MAY WEEK 12</th>
<th>JUNE WEEK 13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tue</td>
<td>Wed</td>
<td>Thu</td>
<td>Fri</td>
</tr>
<tr>
<td>Sat</td>
<td>Sun</td>
<td>Sat</td>
<td>Sun</td>
</tr>
</tbody>
</table>

**Activity Type (below):**

<table>
<thead>
<tr>
<th>C</th>
<th>M</th>
<th>P</th>
<th>R</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher Lecture</td>
<td>Low student participation</td>
<td>One-way information flow</td>
<td>Discussion-centered (Q&amp;A)</td>
<td>High student participation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4</th>
<th>E</th>
<th>D</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher answers student</td>
<td>One-way information flow</td>
<td>Students Online</td>
<td>Knowledge Ind</td>
<td>Team Meeting</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>F 4</th>
<th>A</th>
<th>R</th>
<th>L</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working on</td>
<td>Final Projects</td>
<td>Final</td>
<td>Final</td>
<td>Group Meeting</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S +++</th>
<th>R</th>
<th>A</th>
<th>R</th>
<th>+++</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Meeting</td>
<td>Interview</td>
<td>Organizing of materials</td>
<td>Offline reading, writing</td>
<td>Fieldtrip</td>
</tr>
</tbody>
</table>

**Figure 23. Activity Time-Line: Part C**
PERCENTAGE BREAKDOWN OF TIME AND TASK:

The percentage of overall class time devoted to any given activity was determined by dividing the total number of days in session by the number of days that the spreadsheet indicated an activity to be occurring. The totals do not add up to 100% for two reasons. Firstly, some activities occurred simultaneously with others. For example, the students were always required to maintain their online logs at the same time they were making their online contacts. Secondly, some class periods consisted of two or more activities temporally separated. For example, the first twenty minutes of a given class might have been devoted to a class discussion followed by thirty-five minutes of offline work on logbooks. Thus, simply adding up the percentages yields a meaningless 223.2% (see Figure 24 below). If one were to attempt to force the activities into their fraction of 100%, one could do so by dividing each activity’s percentage by the total (223.2%). To illustrate, one could divide the percentage of time that students were online (69.6%) by the total (223.2%) and determine that as a fraction of the whole, online contacts represented 31.2% (69.6/223.2) of the total activity time. This, however, erroneously distorts the data as it implies that students were online less than one-third of the available time, whereas in reality, they were online over two-thirds of the time.
As one can see from the spreadsheet excerpt (Figure 24) below, working on logbooks was the number one activity (76.8%) besides actually being online to one of the four classes of services examined (69.6%). One must remember in interpreting these data that logbooks and online activities always occurred simultaneously. What can be stated, however, was that students were online working independently almost seven out of every ten class days (69.6%).

Discussion-oriented teacher lecture was third in frequency (26.8%) indicating a strongly student-centered environment. Below are the activities ranked in descending order followed by a bar-graph. NOTE: The entry- and exit-point interviews which were conducted outside of class time are not considered in the overall breakdown of time and task.
Table 1. Frequency of Activities

<table>
<thead>
<tr>
<th>Rank Order of Events</th>
<th>Percent of days in which &quot;X&quot; occurred</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working on Logbooks</td>
<td>76.8%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Students Online</th>
</tr>
</thead>
<tbody>
<tr>
<td>1=BBS 2=Source 3=LCS 4=Knowledge Ind 5=Carrier</td>
</tr>
<tr>
<td>69.6%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Teacher Lecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discussion-centered (Q&amp;A)</td>
</tr>
<tr>
<td>High student participation</td>
</tr>
<tr>
<td>26.8%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Student-centered (Q&amp;A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low student participation</td>
</tr>
<tr>
<td>One-way information flow</td>
</tr>
<tr>
<td>5.4%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group Meeting</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.5%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Teacher Lecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low student presentation</td>
</tr>
<tr>
<td>One-way information flow</td>
</tr>
<tr>
<td>5.4%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Student Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Teacher Lecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low student participation</td>
</tr>
<tr>
<td>One-way information flow</td>
</tr>
<tr>
<td>5.4%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Field trip</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.8%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Included</td>
</tr>
</tbody>
</table>
Figure 24. Bar Chart of Activity Distribution

In the above bar chart, "Logs" stands for the students' keeping of online logbooks, "Onle" means students were online to remote systems, "Discuss" means class discussions, "Offline" means offline "housekeeping" (record upkeep, search planning, etc.), "Meet" means group meetings, "Presnttn" means a student's presentation to the group, "T-Lec", means teacher lecture and "Trip" indicates a field trip.
1.2. What is the role of the student?

The task timeline indicates, as the original design of the research was meant to ensure, that the classroom was student-centered. It predominantly consisted of students working independently at their computers making online connections to other systems (69.6% of class periods involved online contact; 76.8% found students working on their log books).

The student-participant's role was not unlike that encountered in a school science laboratory which tends to create an independent, problem-solving environment. Not knowing what the subject matter of the course "Computer Science II" was when they registered, the students arrived with virtually no knowledge of telecommunications and a smattering of BASIC programming.

They were introduced to four classes of online services of which most were completely naive and then encouraged to experiment and record their observations, both factually-concrete as well as affective-attitudinal. Errors were broadly tolerated and students were encouraged to seek their own solutions to problems. Socialization among the group was not discouraged so long as it did not disturb others. In fact, the casual chatter that went on in the group was felt to be one of the reasons for its success. It
appeared to have an anxiety-lowering effect on the participants and allowed better dissemination of information germane to the online services studied.

Time-limitations were rarely placed upon the students as they were allowed to interact with the systems at their own pace. Several sessions were tagged "housekeeping" days designed to allow faster students to work offline on maintaining their logs, or to experiment with unassigned topics while slower individuals caught up. The atmosphere was collaborative and non-adversarial. After approximately the first nine weeks of class, grades became an unnecessary motivator and were quietly all but dispensed with.

Many days started off with no teacher structure or contact at all except social pleasantries. All the participants, save one, showed high self-discipline skills and needed little outside motivation to work. As the upcoming taxonomic analysis of talk will confirm, the students felt proud and strongly empowered by their work and rarely missed an opportunity to flaunt their new-found skills to outsiders. Their relationship to the teacher/researcher was also demonstrated interesting as the group members appeared to hold him responsible for creating this unique environment for them. The combination of these two factors produced a positive classroom environment.
Their characteristics could be summed as follows:

1. Students were experienced, but limited, computer users.
2. Students were mostly naive to computer telecommunications.
3. Students initially were unaware of the nature of the research or even that it was research.
4. Students were expected by the teacher/researcher to want to experience the curricular innovations as there was a waiting list to get into what was simply described as "Computer Science II".
5. Students were expected to be able to work independently for long periods of time, not only within a single class session, but also extending over days.
6. Students had to be competent record-keepers of their online logs, a task quite different from the routine note-taking that they were more likely accustomed to.
7. Students were encouraged to maintain a collaborative, helping and sharing environment. Moving about to visit each other's systems and sharing new ideas was encouraged.
8. Students were encouraged to experiment, to try to find new ways of doing things and not to be concerned with time or money.
Taking the above attributes holistically paints a picture of a group of motivated explorers, willing and able to master the curriculum, who expected to both enjoy sharing the experience and work hard at meeting the expectations of the teacher/researcher.

1.1. What was the role of the teacher/researcher?

As the timeline by activity bears out, the researcher's cyclic design of the class was, in fact operational and produced a pattern like that summarized below.

A. Teacher lecture on the basic operation of an online service.
B. Independent student exploration of same.
C. An assignment (search for information).
D. More student exploration (focused on the assignment).
E. A group meeting to discuss, present findings, successes, failures, etc.
F. Cycle back to "A": Teacher lecture on the next online service.

The teacher/researcher's role was kept as close to a normal classroom teacher's as possible. He typically did routine record-keeping chores and briefed students on the target activity(ies) of the day. From that point on, however, the students worked mostly on their own, generally communicating among themselves and, for the most part, solving all but the most difficult problems. During this time, the teacher, who had now created both time and space,
stepped back and moved into the mode of the researcher, continuously circulating around the room, monitoring the students' progress. When conditions warranted, the researcher moved the video camera closer to a particular activity or placed a hand-held audio recorder near an interesting exchange. It was found that conventional field notes, in this researcher's opinion, were not conducive to the constant moving about the lab and the rapid pace at which things happened on the participants' monitors. For those reasons, field notes, when considered necessary, were quietly spoken into the videocamera's microphone. This was both faster, leaving the researcher's comments visually contextualized and less difficult.

Straight, low-student involvement lectures occurred on only 5.4% of the available class periods. These teacher-centered lectures were typically given at the start of a new online service. They were mostly mechanistic and conveyed to students important technical information needed to successfully operate the new service. These periods were also the only times when the teacher/researcher was, in fact, functioning purely as an educator, conveying information from himself to students.

Organized class discussion, the preferred means of student/teacher contact, occurred nearly 27% of the time and group meetings took up another 12.5%. These sessions were
designed to allow the group to share successes, failures, opinions, suggestions, and feelings. Most student/teacher contact, however, occurred as simple conversation in the normal, everyday course of student online exploration and sharing of information with the group.

**HOW DO STUDENTS SEARCH?**

2.0. How do secondary students search for information needed to fulfill the requirements for school papers, projects or presentations?

Question 2.0 dealt with establishing how students searched for school information at the onset of the project. Data used to explore this question included: entry-point interviews, and the search flow charts, the center of data analysis. The large structural spreadsheet serves a lesser role, primarily that of triangulation.

Several of the entry-point interview questions listed in Chapter Three were designed to probe how students searched and the beginning of the study and their affective state concerning the value, and usefulness of their current search methodology. They also determined where (physically) students' thought of going first for information and then, once there, what sources they would examine.

Later, to focus the students' attention on a particular assignment, each was asked how they would search out, "The Effects of the Bombing of Hiroshima During World War II."
The second search was, "The Impact of The Beatles On Popular Music". In each case students had to talk their way through the searches and also draw them. Most elected to use a flow-chart style of plotting their searches, ostensibly since most had just completed "Computer Science I", a course in BASIC programming that emphasizes program design via flow-charting.

Consider the reduction of the data concerning the a posteriori-derived taxonomy category "Entry-Search", "Hiroshima 1" and "Beatles 1" that follows. These comments were recorded primarily from the entry-point interviews and were quite revealing. Taking the latter two categories as a topic-focused confirmation of what students stated broadly about their pre-intervention strategy (entry-search), Warren’s, Lisa’s, and Eric’s statements indicate great homogeneity among the students sampled as they typified the entire group.

In response to the researcher’s question, "Where do you typically physically go to find information in response to school papers, projects or presentations?", the group demonstrated these characteristics:
1. Searches for information began either:

A. At home,

B. The local branch of the public library (perhaps 1/2 mile from the high school),

C. A larger, neighboring suburb's public library if there was the perception that either the assignment was heavily weighted or the student anticipated that the information sought would be difficult to find.

(Q: WHERE (PHYSICALLY) DO YOU LOOK FOR INFORMATION?)

---
CNXT: INT2 WHO: WARREN CELL: 2 CLASS1: EX SRCH
DATE: May 13 SRC: INT2 CLASS2:

COMM1: T: Where, physically, do you think of going first to find information?
COMM2: W: The Whitehall Public Library.

INT.Q1:
INT.Q2:
---
CNXT: INT2 WHO: ERIC CELL: 2 CLASS1: EX SRCH
DATE: May 13 SRC: INT2 CLASS2:

COMM1: T: Where physically do you think of looking first?
COMM2: E: Encyclopedia. Oh, my room, at the house, at home.

---
CNXT: INT1 WHO: WARREN CELL: 3 CLASS1: ENT SRCH
DATE: Feb 28 SRC: INT1 CLASS2:

COMM1: First I look in encyclopedias that I have in my house.
COMM2: Then if nothing comes up there I go to the library.

INT.Q1: Where physically, do you think of looking for info first? Where
INT.Q2: do you go?
Interestingly, the group’s searches conspicuously did not begin in the high school library. In fact, many students actively derided their own library which, paradoxically, has the largest shelf list in Whitehall’s athletic conference, which includes several of the wealthiest and most prestigious districts in the central Ohio area. Consider the following comments made by group members:

INT.01: (Besides the Whitehall branch library), where else do you look
INT.02: for information?
OK, why not our library upstairs?

T: Okay, is that the only reason, time? W: No, I don't think the quality of books in our library is that good.

INT.01: "The Impact of The Beatles on Popular Music"

I've had past experiences where I've found very quickly that they didn't have a great deal of information on subjects that I was looking for.

What about our library here and the Whitehall branch?

Whitehall, they're all right. Still, they don't seem to have what.

INT.Q1: What about our library here and the Whitehall branch?
Once it had been established that the group tended to seek out nearby public libraries and avoid their own school library, they were asked what kinds of sources they would seek out in libraries (books, periodicals, encyclopedias, etc.). The student talk below clearly indicates a short, linear search strategy that almost invariably started with Encyclopedias. While not used to the exclusion of all other sources, everyone of the participants cited encyclopedias as among the first sources they would consult. Encyclopedias were the information source of first (and sometimes only) choice regardless of the academic background, age or grade level of the student queried. Consider below:

WHAT SOURCES DO YOU LOOK IN?

---

CNTX: INT1 WHO: ERIC CELL: 5 CLASS1: ENT SRCH
DATE: Feb 28 SRC: INT1 CLASS2:

COMM1: Encyclopedias usually show up number one. Number two, usually
COMM2: books relating to the subject.

INT.Q1: What kinds of sources do you typically look for?

---

CNTX: INT2 WHO: ERIC CELL: 3 CLASS1: EX SRCH
DATE: May 13 SRC: INT2 CLASS2:

COMM1: T: What sort of sources do you typically consult first?
COMM2: E: First one is generally encyclopedia.
COMM1: The first thing I would do is get on down to the main library and look under Hiroshima first. (In) *encyclopedia*.  

INT.Q1: How would you search out the topic, "The Effects of the Bombing of Hiroshima during the Second World War".

COMM1: Well, *encyclopedia*, our good friend, but they don’t go very far. So, you’d look for it under the card catalog for Beatles or rock music.

INT.Q1: "The Impact of The Beatles on Popular Music"

COMM1: I’d look for books on science about atomic bombs. Check out the *encyclopedia*, see if they have anything.

INT.Q1: "The Effects of the Bombing of Hiroshima During the Second World War"

One member of the group showed an interesting strategy that involved using not only an encyclopedia as a primary information source, but *multiple sets* of encyclopedias produced by different publishers. This person’s search shifted in degree, not kind and never moved towards books on a given subject, periodicals, etc. He always referred to another set of encyclopedias as "another reference".
COMM1: From there I would look under other references
...maybe other volumes of the encyclopedia or a different brand, like Funk and Wagnalls, maybe Collier's

COMM2: I go from the home encyclopedia to library encyclopedias because they have different kinds, like I've got F&W's and they've got Academic American

INT.O1: The same individual showed a propensity to want to get through the process as quickly as possible, a trend that was commonplace among the group. The use of encyclopedias likely facilitated these short, very linear searches. Note the comments below and the search flow chart that follows (Figure 26). At every "stop" in the search an evaluation was performed to see if enough material had been located. The numerous potential exit points almost overshadow the search itself.
COMM1: Okay, first thing, like I said, is at home encyclopedia. If I consider
COMM2: I have enough . . . I'm done. If not, (I) go to (the) library.

INT.01: (Hiroshima)

COMM1: It depends on how much I have. If I feel I have a sufficient
COMM2: amount, I would go straight to the drafts and the formal writing.

INT.01: Eric, describing his search strategy, saying he often quits
INT.02: after using encyclopedias.
Figure 26. Eric: HIROSHIMA 2 Exit Search Strategy
Eric's search flow chart (Figure 26), is relatively short with only two physical sources. It starts with the location of greatest physical proximity (his home) and proceeds to the nearest library. More interesting though, is the number of "if-then" exit choices he drew. At every source in his search, Eric drew in a "yes-no" choice that could have led to being "done". It is apparent that \textit{finishing an assignment with the least amount judged by Eric to be sufficient was very important.}

The participants did not profess strong positive feelings for using libraries in general. The reasons varied widely among the group, but agreement was reached that the members' experiences with searching libraries for school-related information was not a positive experience. Some students pointed out, however, that "going to the library" can be done for different purposes and those different purposes could produce different affective responses to the visit. For example, as opposed to conducting research, one can visit a library to \textit{socialize or pleasure-read}, or as one male student put it, "To cruise for chicks!"

Some reasons were intrinsic to libraries themselves, others were extrinsic reasons such as sheer distance to a library. Reasons for negative feelings towards libraries included:
1. A self-professed general lack of knowledge concerning how to properly use a library.

2. Inability to physically get to a library of perceived usefulness. Students who could not drive often cited this problem.

3. A dislike of the time that it took to track down information in a library.

4. A feeling of frustration resulting from needed materials being missing and/or checked out to another patron.

5. A general dissatisfaction with libraries that have relatively small shelf lists, thus possessing fewer resources on any given topic.

HOW DO YOU FEEL ABOUT USING LIBRARIES TO HUNT FOR INFORMATION?

---------------
CNTX: INT1 WHO: WARREN CELL: 8 CLASS1: ENT SRCH
DATE: Feb 28 SRC: INT1 CLASS2:

COMM1: T: How do you feel about using libraries to hunt for info? W: It's time
COMM2: consuming to spend many hours there after school looking for books.
---------------
CNTX: INT1 WHO: WARREN CELL: 8 CLASS1: ENT SRCH
DATE: Feb 28 SRC: INT1 CLASS2:

COMM1: It's a long process going to the card catalog then going and looking for
COMM2: the book and then if you don't find it going to the librarian.

INT.Q1: How do you feel about using libraries to look for info?
---------------
COMM1: I don't like it because it takes too much of my time.

INT.Q1: (Using libraries to look for info)

COMM1: How do you feel about using libraries to hunt for information?
COMM2: I don't like it very much.

COMM1: I could rate it much better. I haven't gotten that much information
COMM2: that I really could have used.

INT.Q1: How do you feel about the quality of the info you've been able
to get from the sources they you've talked about?

COMM1: I could have gotten more information, say, if I had more places to go
COMM2: things to look up.

INT.Q1: How do you feel about the quality of the info you've been able
to get from the sources they you've talked about?

COMM1: Are you saying that you could do better if you had better sources?
COMM2: L: "Right".
COMM1: More towards the *negative* side.

INT.01: What has been your previous experience with libraries?

COMM1: I'd say more *towards the negative* unless you're just browsing through.

INT.01: Have you had mostly positive or negative experiences with libraries?

COMM1: T: What bothers you the most?
COMM2: L: *Not finding what you were looking for.*

INT.01: What is the most negative thing about using libraries to search
INT.02: for information?

COMM1: L: *I'm not too good at using the library* either though. T: Why not?
COMM2: L: *Because you get lost.*

INT.01: (Elaborating on the negative nature of library searches.)
Because some of the negative feelings expressed toward library research were directed at a feeling of being unable to properly use a library, the students were asked how they originally learned to search out school-related information. The results point to a possible gap in the educational process. Students unanimously stated that the only formal training they had ever received in proper library usage was in elementary school and consisted primarily of being instructed in how to use a card catalog. None reported further training at the intermediate or secondary level. Some developed their own strategies from watching others. Some were instructed by their parents in using home resources, often the family set of encyclopedias. Still others were never taught at all (by their recollection), but merely convinced by others that "everybody" goes to the library and they should too, even if they don't know what to
do when they get there. Consider these representative comments:

**HOW DID YOU FIRST LEARN TO FIND INFORMATION?**

---

**CNTX:** INT1  **WHO:** ERIC  **CELL:** 12  **CLASS1:** ENT SRCH

**DATE:** Feb 28  **SRC:** INT1  **CLASS2:**

**COMM1:** Yes, but I for the most part ignored it.

**COMM2:**

**INT.Q1:** Has anybody actually given you nuts and bolts information

**INT.Q2:** on how to "work" a library?

---

**CNTX:** INT1  **WHO:** ERIC  **CELL:** 11  **CLASS1:** ENT SRCH

**DATE:** Feb 28  **SRC:** INT1  **CLASS2:**

**COMM1:** Well, back in class they would tell you, "Now here's how you go about finding what you want." And I usually just snored through most of that.

**INT.Q1:** How did you learn to find info in the first place?

---

**CNTX:** INT1  **WHO:** ERIC  **CELL:** 11  **CLASS1:** ENT SRCH

**DATE:** Feb 28  **SRC:** INT1  **CLASS2:**

**COMM1:** And probably the other half is just my own experience, saying

**COMM2:** "I found it, I can look here too because it's told me so,

**INT.Q1:** How did you learn to find info in the first place?
COMM1: You watch your friends to a certain extent, but most of it was your own
COMM2: imagination, your own idea.

INT.Q1: How did you learn how to search for information?

COMM1: In elem. they taught us a little about using a card cata if you want to
COMM2: find a book on a certain subject.

INT.Q1: Where you ever formally taught how to do a search strategy?

COMM1: They've tried to train me but to no avail.

INT.Q1: What degree of formal search training have you had in school in
INT.Q2: recent years?

COMM1: Even though we've been taught the card catalog and all that, I usually
COMM2: don't find it very well.

COMM1: But that was about all you could say about searching for reports.
COMM2: (we learned a little in elementary school only...)

INT.Q1: Where you ever formally taught how to do a search strategy?
COMM1: We've got like four sections of encyclopedias at home and they'd
COMM2: (parents) tell me to check out those first.

INT.Q1: How did you learn to find information in the first place?

COMM1: It wasn't taught to me formally—how to find info. I basically picked it
COMM2: up from my friends and put them together in my own system how I do things

INT.Q1: Where you formally taught how to do a search strategy in libraries?

COMM1: T: But you don't remember being taught formally about this sort of thing?
COMM2: W: Well, some elem. tchrs. might tell you to go to lib. for better info

COMM1: T: Have you had any further training like in middle or high school?
COMM2: W: No.
CNTX: INT1  WHO: WARREN  CELL: 9  CLASS1: ENT SRCH
DATE: Feb 28  SRC: INT1  CLASS2:

COMM1: T: So you've developed your strategy pretty much yourself?
COMM2: W: Yes.

CNTX: INT2  WHO: LISA  CELL: 9  CLASS1: EX SRCH
DATE: May 13  SRC: INT2  CLASS2:

COMM1: T: But, nothing in recent history?  L: No.

INT.Q1: RESPONDING TO QUESTION ABOUT RECEIVING TEACHING ON LIBRARY USE
INT.Q2: AND WHETHER SHE THINKS IT'S NECESSARY IN HIGH SCHOOL.

CNTX: INT1  WHO: ERIC  CELL: 11  CLASS1: ENT SRCH
DATE: Feb 28  SRC: INT1  CLASS2:

COMM1: Partly be my parents I'd go to them asking for help, saying, "I didn't"
COMM2: listen in class, what can I do?" They'd direct me to the library.

INT.Q1: How did you learn to find info in the first place?

CNTX: INT1  WHO: ERIC  CELL: 12  CLASS1: ENT SRCH
DATE: Feb 28  SRC: INT1  CLASS2:

COMM1: Most of the teachers emphasize library, library, library.
INT.Q1: In what sources?  In what areas?
INT.Q2: (Teachers direct him to library - but w/o instruction.)

CNTX: INT1  WHO: LISA  CELL: 10  CLASS1: ENT SRCH
DATE: Feb 28  SRC: INT1  CLASS2:

COMM1: You know, like everybody goes to the library, you should go to the
COMM2: library.

INT.Q1: How did you learn how to search for information?
Ignoring early search training was not uncommon and consequently developing unusual personalized search strategies was prevalent. Students often learned how to use libraries by watching their peers and piecing together a style of their own, often showing little regard for logical search techniques. In several instances though, students realized that they could make positive use out of additional search training. Clearly, teaching the use of a card catalog in the elementary grades was not enough according to these students.

Next, students were asked to state what modifications they would have effected on their search strategies if they were coming up empty-handed and being unsuccessful in their quest for information. Interestingly, consulting the librarian or trying a different search approach, moving for example, away from looking for books and more toward periodicals, was not the normal response. One student even said that he considered asking for help as a last resort. Cited more frequently were three general responses to a stymied search:

1. Visit someone.
   A. Friends
   B. Parents
   C. Teachers

2. Consult home libraries.

3. Change your subject.
WHAT DO YOU DO WHEN YOU CAN’T FIND INFORMATION?

CNTX: INT2  WHO: LISA  CELL: 9  CLASS1: EX SRCH
DATE: May 13  SRC: INT2  CLASS2:

COMM1: T: What if you’re still not finding anything?
COMM2: L: You see if you can change your subject.

INT.Q1: (Pressing Lisa on what she would do if her library search fails.)

CNTX: INT1  WHO: LISA  CELL: 9  CLASS1: ENT SRCH
DATE: Feb 28  SRC: INT1  CLASS2:

COMM1: You go and you ask your friends if they have any books. You know, some
COMM2: people have big libraries at home of their own.

INT.Q1: What do you do when you can’t find the info you need in a library?

CNTX: INT1  WHO: ERIC  CELL: 10  CLASS1: ENT SRCH
DATE: Feb 28  SRC: INT1  CLASS2:

COMM1: I’d probably do something that I don’t like to do, and that’s
COMM2: go get help.

INT.Q1: What do you do in a library when you can’t find information?

CNTX: INT1  WHO: LISA  CELL: 9  CLASS1: ENT SRCH
DATE: Feb 28  SRC: INT1  CLASS2:

COMM1: You can always ask your parents, they might know something on it.
COMM2:

INT.Q1: What do you do when you can’t find the info you need in a library?

CNTX: INT1  WHO: LISA  CELL: 9  CLASS1: ENT SRCH
DATE: Feb 28  SRC: INT1  CLASS2:

COMM1: And if you can’t get any help from your parents,
tough luck.

INT.Q1: What do you do when you can’t find the info you need in a library?
Since most of the participants espoused negative feelings towards their own 20,000 volume school library, a follow-up question was asked to shed light on what factors influenced their choice of library to use. The responses centered around three issues: increased library size (large shelf list), ease of use, and physical proximity to the student. The problems inherent in having to find a way to get to a larger library and back home placed serious restrictions on some of the students. Particularly plagued by this problem were younger students who had not yet begun to drive.

**WHAT INFLUENCES YOUR CHOICE OF LIBRARY?**

---

**COMM1:** I think it has to do with size.

**COMM2:** Knowledge - how much they've got in there.

**INT.01:** Because "size" of the library implies what?

---

**COMM1:** Yes, because I'm basically a lazy person.

**INT.01:** So there are basically two things you look for in a library,

**INT.02:** size and ease of use.
COMM1: T: What determines your choice of library?
COMM2: Well, distance really, first. And then after that how many books.

INT.Q1: Several students made comments about driving age making a difference.

COMM1: The worst things are that you may not have the time to go or the
COMM2: transportation to go wherever you want.

INT.Q1: What is/are the worst aspects of the way you currently use to seek

INT.Q2: information?

COMM1: Whitehall is closer anyway and if you feel you have enough at Whitehall
COMM2: and you're just gonna say, "this is just a good report."

INT.Q1: "The Impact of The Beatles on Popular Music"

COMM1: If you really want to make it better, then you go to Bexley and they'll
COMM2: have, you know, huge reference books.

INT.Q1: "The Impact of The Beatles on Popular Music"

COMM1: T: Do you think as a rule that bigger is better?
COMM2: W: No, not necessarily.

INT.Q1: "bigger" = bigger libraries
As students described their searches for information in response to the two hypothetical topics, "The Effect of the Bombing of Hiroshima During the Second World War" and "The Impact of The Beatles On Popular Music" during the entry-point interviews, they also drew flow-chart style diagrams of how they would lay out their searches. There are nine representative samples reproduced on the following pages. That are included here to illustrate the search strategies employed by students at the project’s inception. The shapes of the figures, text enclosed, connecting arrows, etc., were all drawn by each student. They were redrawn, by the researcher, for presentation herein, but nothing was added or deleted to each student’s original work. Note the flow charts’ brevity, linearity, reliance on encyclopedias, and often unusual (non-scholarly) sources of information.
Figure 27. Becky: BEATLES 1 Entry Search Strategy
Figure 28. Warren: BEATLES 1 Entry Search Strategy

MY FEELINGS

LIBRARY

FRIENDS

OLDER BROS & SISTERS OF PEERS
Figure 29. Warren: HIROSHIMA 1 Entry Search Strategy
Figure 30. Eric: BEATLES 1 Entry Search Strategy
Figure 31. Eric: HIROSHIMA 1 Entry Search Strategy
Figure 32. Lisa: BEATLES 1 Entry Search Strategy
Figure 33. Lisa: HIROSHIMA 1 Entry Search Strategy
Figure 34. Debbie: BEATLES 1 Entry Search Strategy
Figure 35. Debbie: HIROSHIMA 1 Entry Search Strategy
The entry-point flow charts were very revealing. One of the most striking features of them was their linearity. Students appeared to say, in effect, "I do 'A', then 'B', then 'C' and I'm done." There was, save one male student, little graphic evidence of recursion, reflection, or interconnected branching among the sources the students cited.

The students confirmed, through their drawings that:
A. Searches generally started at home or the closest branch of the public library.
B. The school library was not considered a primary source by most.
C. Encyclopedias were the text of choice.

Interesting to note, the two searches drawn by any given student were often near mirror-images of each other despite the very different nature of the two topics presented to them. When questioned about the similarity some students immediately acknowledged the point and stated flatly that they had always searched the same way regardless of the nature of the information sought. One student said he had an "M.O." (modus operandi) that always worked well enough and he didn't see any reason to alter a strategy that was functioning. Below is a discussion with him concerning the similarity of his searches and the reasoning behind it.
COMM1: I would say they are pretty much mirror images.

COMM2:

INT.01: Concerning your two searches, (Hiroshima vs. The Beatles)
INT.02: how would you compare them?

COMM1: I think the answer to that is a definite "no."

COMM2:

INT.01: Have the ways in which you search for new info changed much
INT.02: over the past few years?

COMM1: I am stubborn. This has worked for me and I have no intention of
COMM2: changing it unless circumstances tell me to do so.

INT.01: Have the ways in which you search for new info changed much
INT.02: over the past few years? (No?, Why?)

COMM1: "Hey, I'm gonna go with this (strategy). Nobody's gonna change me."

INT.01: Why have you stuck with the same basic search strategy ("MO")
INT.02: even when the info sought is radically different?
COMM1: I've used the same modus operandi for years and years, and I always end up doing the same thing.

INT.Q1: Why have you stuck with the same basic search strategy ("MO") even when the info sought is radically different?

COMM1: That's because... I'm stubborn. I've probably when I first tried it, that particular combination, it proved successful.

INT.Q1: Why have you stuck with the same basic search strategy ("MO") even when the info sought is radically different?

COMM1: As far as bad things about it, I'm not flexible. I've done the same thing over and over.

INT.Q1: What are the worst aspects of the search strategy that you currently use?
Eric clearly recognized the history behind his search strategy and made no apologies for its rigidity. It was, after all, working to his satisfaction and, presumably, to those who evaluated his work. In contrast, consider Lisa’s comments in regard to the differences between her two searches. She saw a difference in the search strategy required to solve each problem, based primarily, in this case, on the relative timing of the two events.

INT.01: Why were your two search strategies not identical?
INT.02: (Timing of the two events is a critical difference.)
Then consider Warren's explanation of the dissimilarity between his two searches. He, like Lisa, perceived a required difference in search strategy to attack the two search topics presented. His basic distinction between the two topics was the relative age of the events (1945 vs. the late 60's and early 70's) and, interestingly, his belief that one topic was academic (Hiroshima) while the other was not (The Beatles). He also, like Eric, went on to state that his search strategy had not changed much over the past few years because teachers graded his work well enough and therefore, there simply wasn't sufficient impetus to evolve or modify his current strategy.

On the differences between the two strategies:

CNTX: INT1 WHO: WARREN CELL: 6 CLASS1: ENT SRCH
DATE: Feb 28 SRC: INT1 CLASS2:

COMM1: T: What differences do you see between them and how do you explain it?

INT.Q1: (differences between search strategies presented)

CNTX: INT1 WHO: WARREN CELL: 6 CLASS1: ENT SRCH
DATE: Feb 28 SRC: INT1 CLASS2:

COMM1: I was thinking that teachers have--they've studied history.
COMM2:

INT.Q1: (differences between search strategies presented)
COMM1: **Young people**, mostly in their twenties and thirties, they had more experience with Beatles than older parents.

INT.Q1: (differences between search strategies presented)
INT.Q2: Also perceives relative age of the events to be crucial to search.

COMM1: T: Okay, do you see this (The Beatles) then as a less academic subject
COMM2: here than over there with the bombing? W: Yea.

INT.Q1: (differences between search strategies presented)

COMM1: T: Diff. types of topics will produce diff. kinds of search strategies?
COMM2: W: Yes, I think so.

INT.Q1: (differences between search strategies presented)
COMM1: Possibly even my interest in the subject too may have something to do
COMM2: with it. Okay, so another factor will be pers. involve. in the project.

INT.01: (differences between search strategies presented)

COMM1: T: Would the academ. weight of the work impact on your src. strat.?
COMM2: W: No, I do the same amt. of work for less proj. as I do for more proj.

On why there has been not change in search strategy over recent years:

COMM1: It's been an effective system for me, papers I turn in to teachers, they
COMM2: grade them well.

INT.01: Why has your basic search strategy system not changed much over the
INT.02: past few years?

COMM1: They say that I find out information on that topic. If something works I
COMM2: stay with it.

INT.01: Why has your basic search strategy system not changed much over the
INT.02: past few years?
These data indicate that students are not being formally taught sufficient library skills to allow them to get the most information on a given topic easily and expeditiously. Secondly, as a possible consequence of their relatively poor library skills, students carry over into high school the dependency upon encyclopedias that they developed in much lower grades. Thirdly, compounding the damage, and placing students in a holding pattern is the apparent fact that all of these students are progressing through school. Their teachers are accepting the quality of their work from its currently derived sources which, in the end, cyclically reinforces the students' arrested search strategies. Their work is judged satisfactory; encyclopedias are easy to use; many assignments can be accepted completed using only encyclopedias as a resource; students are cognizant of these facts and therefore see no need to change. The external pressure simply wasn't there.

In perceiving that the The Beatles search problem was qualitatively different than the Hiroshima problem, some students created rather unorthodox search strategies when compared to scholarly, library-based research standards. It was clear from the interviews that students were taken somewhat aback by the search for information on The Beatles. All appeared to be surprised that this could be a possible assignment for school and many were frustrated by their
realization that an encyclopedia was not going to provide the information sought, even though some still mentioned them in their search strategies. Several students visibly struggled with the topic saying such things as, "Beatles, Beatles... I just don't know...".

COMM1: First I'd start ... on the reference section under "Music". It could
COMM2: be classified under "Pop." I don't know. Beatles, Beatles.

INT.Q1: How would you search out, "The Impact of The Beatles on Pop Music"?

COMM1: "Pop" maybe, "Soft Rock." I really don't know.
COMM2:

INT.Q1: How would you search out, "The Impact of The Beatles on Pop Music"?

COMM1: I don't know if you don't find anything in Whitehall about Beatles.
COMM2: First of all, you could check out the school library, but chances are.

COMM1: Or you could always try—and then—or, I really don't know... you
COMM2: could ask like an older brother or sister.
Perhaps in response to realizing that encyclopedias were not a likely source, many invented rather novel searches that included sources quite outside the realm of the ordinary library search. Unusual, though certainly not wrong sources included:

1. One's self (personal feelings)
2. A music store
3. Interviewing older relatives or friends
4. Interviewing a disk jockey ("DJ")
5. Contacting an (unspecified) Beatles Fan Club

For example, follow the discussion below concerning how "The Impact of The Beatles On Popular Music" was approached, in part, by Warren and Eric:

---

CNTX: INT1 WHO: WARREN CELL: 6 CLASS1: BEAT 1
DATE: Feb 28 SRC: INT1 CLASS2:

COMM1: Okay, so you would start with yourself as a source?
COMM2: Yes, from what I know of them.

---

FRIENDS AS A SOURCE
---

CNTX: INT1 WHO: WARREN CELL: 6 CLASS1: BEAT 1
DATE: Feb 28 SRC: INT1 CLASS2:

COMM1: I'd probably talk to my friends and what they know about them.

---
OLDER SIBLINGS OR PARENTS

COMM1: And maybe I could possibly even talk to like older
brothers—people who
COMM2: experienced their music while they were still here
working together.

COMM1: Or you could always try—and then—or, I really don’t
know.
COMM2: ...you could ask like an older brother or sister.

MUSIC INDUSTRY PROFESSIONALS AS A SOURCE

COMM1: Maybe at home, because we’ve got a lot of old records
and lots of old
COMM2: books and stuff, maybe look up my Dad—was interested in music awhile back
UNLIKELY CHOICE OF SOURCE
----------------------------------------
CNTX: INT1      WHO: WARREN    CELL: 6    CLASS1: BEAT 1
DATE: Feb 28   SRC: INT1      CLASS2:

COMM1: Then I possibly would check the library, like late
almanacs.
COMM2: books that have been written about them maybe, and
possibly magazines.
----------------------------------------

This section has provided baseline information in
response to the second of four questions posed by the study:

2.0. How do secondary students search for information needed
to fulfill the requirements for school papers, projects
or presentations?

In summary, the analysis of the data from the talk
database, coupled with the entry-point flow charts has
created a profile of a high school searcher with these
characteristics and search strategies:

1. Many students have negative feelings about library
research for a variety of reasons including:
   A. Library research consumes too much time.
   B. Libraries, particularly school libraries, have
      insufficient shelf lists.
   C. Transportation to and from libraries is difficult to
      arrange.
   D. Some feel poorly trained to use a library.
   E. Some are frustrated by needed materials being
      unavailable (missing or checked out).
2. Students display search strategies that are relatively shallow and linear.

A. Students tend to focus their search strategies upon encyclopedias regardless of their own academic background and/or abilities.

B. Some students indicated a propensity toward getting the assignment done as rapidly as possible, by the easiest means available.

3. Students were disturbed and confused when confronted with a search for material that was non-encyclopedic in nature.

A. When frustrated by the failure of standard library-based research, students tended to employ unlikely, or unscholarly sources of information such as their own personal feelings, the ideas of friends, or parents.

B. When severely frustrated by a failed search, some students attempted to cope by changing their subject altogether.

4. Students indicated that the formal learning of search concepts was restricted to learning how to use a card catalog in elementary school.
A. Students professed a need for additional training at the secondary level.

B. Students developed their own search strategy over the years, by watching their friends and experimenting until they found a method, on their own, that seemed to work.

C. Students uniformly denied that their search strategies had altered significantly over the past few years.

D. Many took the attitude, in essence, that, "If it isn't broken, don't try to fix it". Students felt that since their searches were producing papers their teachers accepted and graded satisfactorily, there was no need or incentive to change. This produced a cyclical setting of expectation followed by counter-expectation between teacher and student.

5. No students indicated that they would have attempted to use any online means of searching for information.
STUDENTS' PERCEPTION OF ONLINE SERVICES

3.0. What were the students' perceptions of, and affective responses to, exposure to four classes of online services (Knowledge Index, The Source, LCS, and Computerized Bulletin Boards)?

The preceding section established a baseline of information concerning their search strategy prior to exposure to online search services. In this section will be a presentation of the students' perceptions of, and affective responses to, four different types of online service.

Student talk relevant to this question was garnered from a wide variety of sources in an attempt to broadly triangulate itself. Comments taken from interviews, student reaction papers, group meetings, and daily videotapes were compiled into the talk database and then classified into affective categories via a Spradley-style taxonomy. A corpus of 402 affectively-oriented comments were identified.

In the taxonomy, the subdomains of Positive talk and Negative talk were extracted from the data. From these two subdomains, fifteen (15) categories were further derived from comments in the talk database. Generally, the categories were diametrically opposing in nature (i.e. "Like" vs. "Dislike") but occasionally, a positive or negative category was extrapolated that had no recorded counterpart. For example, in the negative domain was the
category, "Technical Problem". The reverse would be the lack of a technical problem, which was the norm, therefore instances of routine, "non-problems" were not recorded. In review, the fifteen derived categories were:

<table>
<thead>
<tr>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Like&quot;</td>
<td>&quot;Dislike&quot;</td>
</tr>
<tr>
<td>&quot;Easy&quot;</td>
<td>&quot;Hard/Difficult&quot;</td>
</tr>
<tr>
<td>&quot;Value&quot;</td>
<td>&quot;Not Useful&quot;</td>
</tr>
<tr>
<td>&quot;Size Positive&quot;</td>
<td>&quot;Size Negative&quot;</td>
</tr>
<tr>
<td>&quot;System Satisfaction&quot;</td>
<td>&quot;System Dissatisfaction&quot;</td>
</tr>
<tr>
<td>(no recorded counterpart)</td>
<td>&quot;Technical Problem&quot;</td>
</tr>
<tr>
<td>&quot;Impressive&quot;</td>
<td>(no recorded counterpart)</td>
</tr>
<tr>
<td>&quot;Teacher Impression&quot;</td>
<td>(no recorded counterpart)</td>
</tr>
<tr>
<td>&quot;Enjoy&quot;</td>
<td>(no recorded counterpart)</td>
</tr>
<tr>
<td>(no recorded counterpart)</td>
<td>&quot;Discipline&quot; (problem)</td>
</tr>
</tbody>
</table>

In assessing the students' perceptions and affective responses to online services, individual types of comments were important but also was their quantification. Assessing the overall total of comments in each affective/perception category demonstrated the degree to which students were expressing any given feeling or emotion. For example, consider these two examples of affectively-oriented talk from the talk database. The first is classified "Positive: Value" and the second is its opposing counterpart, "Negative: Not Useful".
In the two instances above, the topic was the Library Control System (LCS). In the first case, Lisa stated her belief that LCS was quite useful to her. Negating her comment is Eric, who indicated that LCS was not useful to him because of limited access and some time/money issues. For almost any positive comment from a student, a negative counterpart could generally be found.

Thus, largely due to a small population (n=10), little progress was made towards assessing students' individual impressions of telecommunications technology on a comment-by-comment basis. The question, therefore evolved to, "What was the overall group feeling towards these four classes of online services?". For that reason, quantification of the comments in the various categories was
performed and then graphed, generally in bar- or stacked-bar format. These graphs help to better reduce the volume data contained in the talk database and visually demonstrate the relative frequencies of talk types.

The graphs had a limitation, though, in that while they could clearly illustrate the relative frequencies of "Like" vs. "Dislike" talk, they do not indicate what the object of the talk was (i.e. what was liked or disliked). That discussion will follow the presentation of the graphs. Thus, further analysis was needed to determine these specific objects of affective response.

On the next page is a pie graph (Figure 41) that illustrates the overall breakdown of positive versus negative affective talk. Of the 402 affective comments, 338 (84.1%) were positive and 64 were negative (15.9%).
The graph above shows the percentage distribution of the 338 positive affective comments. The most frequently cited comment type was "Value", followed, in descending order, by: "Like", "Enjoy", "Easy", "Size Positive", "Impressed" and "System Satisfaction".
The graph above shows the percentage distribution of the 64 negative affective comments. The most frequently cited comment type was "Hard", followed, in descending order, by: "Dislike", "Not Useful", "Size Negative" and "System Dissatisfaction".
This chart demonstrates the percentage distribution of positive vs. negative talk for three opposing affective categories: "Like vs. Dislike", "Easy vs. Hard" and "Value vs. Not Useful". The total number of affective comments was 402, broken down into 338 positive and 64 negative.
Continuing in the same vein as the preceding chart, this graph plots the percentage distribution of positive vs. negative talk for the two remaining opposing affective categories: "System Satisfaction vs. System Dissatisfaction" and "Size Positive vs. Size Negative". As before, the positive comments heavily outnumber the negative.
Presenting the same data in a different light, the above "stacked-bar" graph shows the relative frequency of all the positive vs. negative comments with opposing pairs stacked on top of one another illustrating their contribution to the whole.
Figure 41. Overall Distribution of Affective Talk

Summarizing the overall percentage of positive vs. negative talk, the above pie graph shows that positive comments occurred almost six times as frequently as negative comments.
Figure 42. Distribution of All Talk

This chart plots, in descending order, the percentage distribution of all talk recorded during the project, an "n" of slightly over 1,200 comments. The key to its categories is below:

- 0 Search Successful
- 1 Value
- 2 Entry Search
- 3 Fact Knowledge
- 4 Change (Present and Future)
- 5 Exit Search
- 6 Like
- 7 Enjoy
- 8 Easy
- 9 Legal
- A Serendipity
- B Size Positive
- C Beatles 2
- D Impressive
- E Sys. Satisfaction
- F Experiment
- G Prior Computing
- H Hard
- I Teacher Instruction
- J Hiroshima 2
- K Hiroshima 1
- L Beatles 1
- M Cost
- N Power
- O Tech. Problem
- P Dislike
- Q Search Unsuccessful
- R Advice
- S Not Useful
- T Misuse
- U Discipline
- V Prior Expectation
- W Teacher Impression
- X Newness
- Y Technical Question
- Z Size Negative
- a Sys. Dissatisfaction
- b Concerns
The graph illustrates some interesting points:
1. The top ten categories (out of 38) comprise almost 60% of the talk recorded (59.5%).
2. Of the top ten categories, none were negative and four of the positive affective ones were present [positions 1 (Value), 6 (Like), 7 (Enjoy) and 8 (Easy)].
3. All positive affective talk occurred in positions 15 or above and all negative affective talk was found in positions 18 or lower.
4. Topping all categories of talk, was perhaps the functionally most important, "Search Successful" comprising 8.6% of all talk.

Having graphically demonstrated the lopsided relationship between positive and negative talk, the author summarizes the objects of each type of affective talk in an alternating positive then negative manner.

**POSITIVE: LIKE VS. NEGATIVE: DISLIKE**

<table>
<thead>
<tr>
<th>Category</th>
<th>N</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIKE</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>DISLIKE</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>RATIO OF POSITIVE TO NEG.</td>
<td>3.6:1</td>
<td></td>
</tr>
</tbody>
</table>

**POSITIVE: LIKE**

By consensus, students "liked" the following things. The comments are representative samples from the talk database that represent a thread of thought shared by more than one group member. To be included, each thread had to occur numerous times. Single, isolated comments, not backed
up by the group are not reported. These items, therefore, represent the distilled list of objects that students "liked".

1. All Four Services Studied
   A. LCS
   B. CBBS's
   C. The Source
   D. Knowledge Index
2. A Sense of Increased Options
3. Large Amounts of Resources
4. Computers in General
5. Telecommunications Technology
6. The Project Itself
7. Serendipitous Discovery of Information

1. The Library Control System (LCS)
   CNTX: LCS WHO: MATT CELL: H252 CLASS1: LIKE
   DATE: Apr 16 SRC: SS CLASS2:
   COMM1: SURE BEATS THE HECK OUT OF CARD CATALOGS!
   COMM2: (TEACHER: WHAT WERE YOUR IMPRESSIONS OF LCS?)

2. Computerized Bulletin Board Systems (CBBS's)
   CNTX: BBS-G WHO: DARYL CELL: BD68 CLASS1: LIKE
   DATE: Mar 11 SRC: SS CLASS2:
   COMM1: MODEM MANIA WAS THE BEST. EASY TO USE AND WELL ORGANIZED
   COMM2: (DARYL'S APPRAISAL OF BBS'S)
3. The Overall Project

<table>
<thead>
<tr>
<th>CNTX: OVERALL</th>
<th>WHO: DEB</th>
<th>CELL: X582</th>
<th>CLASS1: LIKE</th>
<th>CLASS2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: Jun 6</td>
<td>SRC: SS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COMM1: (ON THE ENTIRE EXPERIENCE): IT WAS REAL NEAT! IT SAVED TIME AND
COMM2: PROVIDED MORE CURRENCY OF INFORMATION.

4. Telecommunications Technology

<table>
<thead>
<tr>
<th>CNTX: INT2</th>
<th>WHO: WARREN</th>
<th>CELL: 8</th>
<th>CLASS1: LIKE</th>
<th>CLASS2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: May 13</td>
<td>SRC: INT2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COMM1: T: What are your impressions of online telecommunication?
COMM2: W: I like it, for one thing.

5. Large Amounts of Available Information

<table>
<thead>
<tr>
<th>CNTX: INT2</th>
<th>WHO: WARREN</th>
<th>CELL: 16</th>
<th>CLASS1: LIKE</th>
<th>CLASS2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: May 13</td>
<td>SRC: INT2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COMM1: T: What else makes it fun?
COMM2: W: Well, just being here. Being around this much information.

6. Increased Sense of Options Available:

<table>
<thead>
<tr>
<th>CNTX: OVERALL</th>
<th>WHO: DARYL</th>
<th>CELL: JS80</th>
<th>CLASS1: LIKE</th>
<th>CLASS2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: Jun 6</td>
<td>SRC: SS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COMM1: I LIKED ALL THE DIFFERENT INFO. SO MANY THINGS THAT YOU CAN PUT TOGETHER
COMM2: (TEACHER: WHAT DID YOU THINK OF THE ENTIRE PROJECT?)
7. Accidental Discoveries (Serendipitous Information)

CNTX: BBS-G
WHO: BECKY
CELL: BJ73
DATE: Mar 11
SRC: SS
CLASS1: LIKE
CLASS2:

COMM1: I LIKE THE ACCIDENTAL (SERENDIPITOUS) INFO. FROM THE BBS
COMM2: (BECKY SEES THINGS IN THE BBS'S THAT SHE DIDN'T EXPECT)

8. Computers

CNTX: INTI
WHO: ERIC
CELL: 1
DATE: Feb 28
SRC: INTI
CLASS1: LIKE
CLASS2:

COMM1: I love them.
COMM2: I could not live without them, to tell you the truth.

INT.Q1: How do you feel about computers?

9. The Source

CNTX: SOURCE-M
WHO: ROB
CELL: Z239
DATE: Apr 14
SRC: SS
CLASS1: LIKE
CLASS2:

COMM1: IT'S BETTER THAN PRINTED SOURCES LIKE THE "DISPATCH", WHICH IS
COMM2: "YESTERDAY'S NEWS"

INT.Q1: (Discussing the AP news service on The Source)

10. Knowledge Index (KI)

CNTX: INT2
WHO: WARREN
CELL: 7
DATE: May 13
SRC: INT2
CLASS1: LIKE
CLASS2:

COMM1: Having KI search titles and keywords for you.
COMM2: And it's a lot easier just sitting in one place.

INT.Q1: T: Warren, contrast off with online search.
NEGATIVE: DISLIKE

In contrast, students expressed dislike of the following things with examples below:

1. Online Encyclopedia
   A. No Pictures.
   B. Must read articles linearly.
   C. Solid, dense displays of text was hard on the eyes.

2. Inferior Quality of Bulletin Boards (they examined a great many and perceived that they varied widely in quality).

3. Limitations of Relatively Primitive Communications Software.


5. Conventional Library Searching.

6. Weak Communications Software.


1. Online Encyclopedia

CNTX: SOURCE-M WHO: MATT CELL: T240 CLASS1: DISLIKE
DATE: Apr 14 SRC: SS CLASS2:

COMM1: NO PICTURES, CAN'T SEE WHAT A "WOMBAT" LOOKS LIKE
COMM2: (TEACHER: WHAT WERE THE DISADVANTAGES OF THE ENCYCLOPEDIA)
2. Inferior Bulletin Boards

CNTX: SOURCE-M WHO: ROB CELL: AF240 CLASS1: DISLIKE
DATE: Apr 14 SRC: SS CLASS2:

COMM1: SAYS HE DIDN'T LIKE "PLINK". HAD A BBS "FEEL" TO IT.
SMALL AND
COMM2: AMATEURISH.

3. Limitations of Relatively Primitive Communications Software

CNTX: IRP WHO: WARREN CELL: 1 CLASS1: DISLIKE
DATE: Feb 24 SRC: IRP CLASS2:

COMM1: I can only find one fault with Smartcom. One cannot continue to
COMM2: download a file after returning to the main menu.

4. Personal Comfort in Using LCS

CNTX: LCS-RP WHO: WARREN CELL: 1 CLASS1: DISLIKE
DATE: Apr 16 SRC: LCS-RP CLASS2:

COMM1: My greatest gripe with the terminals is the lack of chairs for people
COMM2: who use the LCS for an extended period of time.

5. Wasting Time on Systems With Numerous Menus To Navigate

CNTX: INT2 WHO: WARREN CELL: 10 CLASS1: DISLIKE
DATE: May 13 SRC: INT2 CLASS2:

COMM1: T: How about the Source?
COMM2: W: There were too many menus and wastes your time.

INT.01: (suggestions for improvement?)
6. Offline, Conventional Library Searching

---

CNTX: INT2  WHO: WARREN  CELL: 7  CLASS1: DISLIKE
DATE: May 13  SRC: INT2  CLASS2:

COMM1: T: How do you feel about searching for information for school?
COMM2: W: It's a hassle to go and get the books and spend time at the library.

---

7. Multiplicity of Bulletin Board Appearances

---

CNTX: INT2  WHO: WARREN  CELL: 9  CLASS1: DISLIKE
DATE: May 13  SRC: INT2  CLASS2:

COMM1: What would you tell of these groups to make them better?
COMM2: Give BBS's some standardization of command structure.

INT.Q1: Doesn't like that there are many diff. BBS programs up and running.

---

POSITIVE: VALUE VS. NEGATIVE: NOT USEFUL

VALUE  N = 101
NOT USEFUL N = 14
RATIO OF POSITIVE TO NEG. = 7.2:1

POSITIVE: VALUE

In group consensus, the following items were considered to have "value":

1. Value in Other Classes.
2. Value to Faculty.
3. Value in Currency of Information.
5. Value in Speed of Retrieval.
6. Value in Locating Obscure Information.
7. Value in Active Physical Participation in Project.

8. Value in Visiting a Very Large Library System (OSU).

9. Value in All Four Classes of Online Services.

10. Value in Undirected Online Questioning.

11. Value in College.


15. Value Monetarily.


EXAMPLES:

Value In Other Classes:

CNTX: IRP WHO: BECKY CELL: 1 CLASS1: VALUE
DATE: Feb 24 SRC: IRP

COMM1: I think I will help the ad comp. classes in finding the research for
COMM2: their reports.

Value In Locating Obscure Information

CNTX: IRP WHO: BECKY CELL: 1 CLASS1: VALUE
DATE: Feb 24 SRC: IRP

COMM1: I will try to find information for the people which otherwise would be
COMM2: difficult to find.
Value To Teachers

CNTX: SOURCE  WHO: BECKY  CELL: V167  CLASS1: VALUE
DATE: Mar 26  SRC: SS  CLASS2:

COMM1: SAYS MR. ANGELOU WOULD LIKE HER TO USE SOURCE’S NEWS CAPABILITIES TO
COMM2: SUPPLY CURRENT EVENTS CLASS WITH LATEST NEWS

Value In Active Physical Participation in Project

CNTX: IRP  WHO: DARYL  CELL: 1  CLASS1: VALUE
DATE: Feb 24  SRC: IRP  CLASS2:

COMM1: Classes that you are involved in doing something, it seems that you
COMM2: become more interested in and do better work.

Value In Visiting The OSU Libraries

CNTX: LCS-RP  WHO: DEB  CELL: 1  CLASS1: VALUE
DATE: Apr 16  SRC: LCS-RP  CLASS2:

COMM1: The trip to OSU and use of the LCS system was beneficial and worthwhile.

Value in Amount of Available Information

CNTX: IRP  WHO: ERIC  CELL: 1  CLASS1: VALUE
DATE: Feb 24  SRC: IRP  CLASS2:

COMM1: Others might not realize that they have nearly the whole world at
COMM2: their feet, and not take advantage of those resources.
Value in Increased Speed and Accuracy of Information Retrieval

**CNTX**: IRP  **WHO**: ERIC  **CELL**: 1  **CLASS1**: VALUE
**DATE**: Feb 24  **SRC**: IRP  **CLASS2**: 

**COMM1**: School reports could be prepared quicker, with the latest and most accurate information.

Value in Knowledge Index

**CNTX**: INT2  **WHO**: ERIC  **CELL**: 8  **CLASS1**: VALUE
**DATE**: May 13  **SRC**: INT2  **CLASS2**: 

**COMM1**: KI. It's just so massive. I mean, you can look up practically anything
**COMM2**: in the world there.

**INT.Q1**: Which do you think, of the four, is the most useful to you?

Value in Bulletin Boards

**CNTX**: INT2  **WHO**: ERIC  **CELL**: 11  **CLASS1**: VALUE
**DATE**: May 13  **SRC**: INT2  **CLASS2**: 

**COMM1**: They (BBS's) provide you with an outlet for other people. It's a lot more personal than using one of the online systems.

**INT.Q1**: What were the strong points of BBS's?

Value in Information Currency

**CNTX**: INT2  **WHO**: ERIC  **CELL**: 13  **CLASS1**: VALUE
**DATE**: May 13  **SRC**: INT2  **CLASS2**: 

**COMM1**: Plus it gives you a lot of up-to-date information which would be really useful.

**INT.Q1**: elaborating on why having KI in the schools would be beneficial...
Value in Undirected Questioning Online

CNTX: BBS-G  WHO: JEFF  CELL: BD74  CLASS1: VALUE
DATE: Mar 11  SRC: SS  CLASS2:

COMM1: GENERAL UNDIRECTED QUESTIONING. ASKING A QUESTION OF MANY PEOPLE W/ONE
COMM2: LETTER. (TEACHER: WHAT ARE THE EDUCATIONAL USES OF BBS'?S?)

Value in Independence

CNTX: IRP  WHO: LISA  CELL: 1  CLASS1: VALUE
DATE: Feb 24  SRC: IRP  CLASS2:

COMM1: While I don’t always succeed, it helps me be more self-reliant and in
COMM2: control. I’m looking forward to the rest of the class.

Value for College

CNTX: INT2  WHO: LISA  CELL: 13  CLASS1: VALUE
DATE: May 13  SRC: INT2  CLASS2:

COMM1: T: Do you think they ought to? L: I think it would be good especially
COMM2: for when you’re going on to college.

Value in Searching Without Physically Moving

CNTX: INT2  WHO: WARREN  CELL: 12  CLASS1: VALUE
DATE: May 13  SRC: INT2  CLASS2:

COMM1: T: What are the strong points of LCS?
COMM2: W: Finding all their books and magas w/out having to go look for them.
Value in LCS

CNTX: INT2  WHO: WARREN  CELL: 13  CLASS1: VALUE
DATE: May 13  SRC: INT2  CLASS2:

COMM1: The different ways you can find something--author, subject, title,
COMM2: author/title, serial. I like that. That was easy.

INT.Q1: Anything else that makes it particularly good besides the fact that
INT.Q2: It indexes all those things (book, journals, etc.)

-----------------------------------------------

Valuable Monetarily

CNTX: INT2  WHO: WARREN  CELL: 14  CLASS1: VALUE
DATE: May 13  SRC: INT2  CLASS2:

COMM1: T: Do you think this would be really useful to the average H.S.?
COMM2: W: Yea, I think it's worth the money.

-----------------------------------------------

Value in Exposure to New Technology

CNTX: INT2  WHO: WARREN  CELL: 15  CLASS1: VALUE
DATE: May 13  SRC: INT2  CLASS2:

COMM1: I think it'd be a positive effect on students considering the new
COMM2: technology that we're progressing toward in the world today.

INT.Q1: (Warren commenting on the advisability of having online search
INT.Q2: available in high schools)

-----------------------------------------------

Value in Changing Earlier Search Strategies

CNTX: INT2  WHO: WARREN  CELL: 8  CLASS1: VALUE
DATE: May 13  SRC: INT2  CLASS2:

COMM1: Also enjoying finding information through LCS, KI, or Source.
COMM2: It's quicker, easier, less time consuming, and I don't have to move.

INT.Q1: What are your impressions of online telecommunications?
COMM1: Like I said before, it's easier and it's quicker than the method I used.

COMM2: to do before.

INT.Q1: Why is telecommunications so much better, according to you?

-------------------------------

POSITIVE: VALUE VS. NEGATIVE: NOT USEFUL

NEGATIVE: NOT USEFUL

In contrast to the preceding section describing the attributes of the project that students found valuable, below is a summary of those that they did not find to be useful. Often, the items cited were either small, annoying problems with a service or statements to the effect that, "Overall I liked The Source, but I didn't think that SIGS were very useful". In addition, as a group, Computerized Bulletin Board Systems were enjoyed but not seen as very useful from an educational viewpoint, so that fact is noted here, even though earlier sections of this chapter demonstrated how students liked CBBS's. Liking something and perceiving it to be useful were clearly two different things.
1. Access Problems (can't get to library, etc.)
2. Lack of Perceived Educational Value in CBBS's.
3. Potential Non-Usefulness if systems were abused in school (ex. students just "fooling around" with the systems.)
4. Non-Usefulness if students can't perform their own searches (students felt there might be excessive search requests for a librarian to handle).
5. Non-Usefulness of a particular feature of a system that is liked as a whole (which particular feature varied widely among the participants).

EXAMPLES

Access Problems

CNTX: INT2  WHO: ERIC  CELL: 7  CLASS1: NOT USE
DATE: May 13  SRC: INT2  CLASS2:

COMM1: LCS. I mean, sure, it lists all the books in the OSU libraries, but
COMM2: access to them, is rather limited also time and money.

INT.Q1: Why is LCS the least useful online service to you?
Educational Non-Usefulness of CBBS's

CONTEXT: INT2  WHO: WARREN  CELL: 15  CLASS1: NOT USE
DATE: May 13  SRC: INT2  CLASS2:

COMM1: T: How come?  W: In terms of researching, I don’t feel there’s a strong
COMM2: possibility there with a BBS.

INT.Q1: Which service has the least potential for secondary education?

Potential Non-Usefulness via Misuse or Excessive Demand

CONTEXT: INT2  WHO: ERIC  CELL: 14  CLASS1: NOT USE
DATE: May 13  SRC: INT2  CLASS2:

COMM1: Well, if it were to be installed and it wouldn’t be open to the students,
COMM2: it might be flooded with everybody saying “Will you look this up for me?”

INT.Q1: elaborating on why installing KI WOULD NOT be beneficial. He
INT.Q2: anticipates a logjam of search requests.

CONTEXT: INT2  WHO: LISA  CELL: 12  CLASS1: NOT USE
DATE: May 13  SRC: INT2  CLASS2:

COMM1: People just playing around it that don’t need it or people that aren’t
COMM2: serious about making a good report just—you know, wasting time on it.

INT.Q1: In what way? (could it be abused)

A Particular Offering Of A Service That Was Liked As A Whole:

CONTEXT: INT2  WHO: LISA  CELL: 11  CLASS1: NOT USE
DATE: May 13  SRC: INT2  CLASS2:

COMM1: T: What could you most easily do without?
COMM2: L: The news. The up-to-date...is not useful to me.

INT.Q1: Discussing AP News on The Source.
POSITIVE: EASY VS. NEGATIVE: HARD/DIFFICULT
EASY N = 43
HARD/DIFFICULT N = 24
RATIO OF POSITIVE TO NEG. = 1.79:1

POSITIVE: EASY

Students showed a great capacity to learn the command structures of the online services explored. Despite the fact that they are all quite different from each other and possess radically different command sets, the students moved among them with considerable ease and skill. Despite the fact that teaching online searching to secondary students is still relatively uncommon, one could perhaps, have predicted that they would say that the systems are easy to operate. That is, after all, the point of these consumer-oriented systems. They had, as Becky succinctly stated, "better be".

The major threads seen in the talk database were:

1. LCS is Easy.
2. CBBS's Were Easy.
3. The Source is Easy.
4. The Hardware and Software is Easy.
5. Moving Among Systems is Easy.
6. Library Use is Now Easier.
7. Online Searching Overall is Easy.

LCS was Easy

CNTX: LCS-RP   WHO: JEFF   CELL: 1   CLASS1: EASY
DATE: Apr 16   SRC: LCS-RP   CLASS2:

COMM1: Using LCS was a piece of cake. I was surprised to see how easy it was
COMM2: to use but I guess that is the way it should be.
Online Searching Overall Was Easy

CNTX: OVERALL  WHO: BECKY  CELL: V576  CLASS1: EASY
DATE: Jun 6  SRC: SS  CLASS2:

COMM1: IF I CAN DO THIS ANYBODY CAN IF THEY WANT TO.
COMM2: (ONLINE SEARCHING)

CBBS's Were Easy

CNTX: BBS-G  WHO: DARYL  CELL: BD68  CLASS1: EASY
DATE: Mar 11  SRC: SS  CLASS2:

COMM1: MODEM MANIA WAS THE BEST. EASY TO USE AND WELL ORGANIZED
COMM2: (DARYL'S APPRAISAL OF BBS'S)

The Source was Easy

CNTX: INT2  WHO: LISA  CELL: 16  CLASS1: EASY
DATE: May 13  SRC: INT2  CLASS2:

COMM1: Well, most of it's really pretty easy to use.
COMM2:

INT.Q1: Okay, anything else? (Implied Question: do you have anything more
INT.Q2: to say about The Source?

The Hardware and Software was Easy

CNTX: IRP  WHO: MATT  CELL: 1  CLASS1: EASY
DATE: Feb 24  SRC: IRP  CLASS2:

COMM1: I find that the use of the modem and its software is the least difficult
COMM2: of the things I've done thus far.
Moving Among Systems was Easy
-----------------------------------------------
CNTX: INT2 WHO: WARREN CELL: 16 CLASS1: EASY
DATE: May 13 SRC: INT2 CLASS2:

COMM1: T: Do you think it's unduly difficult to learn more than one system?
COMM2: W: No. I know commands on several so it's not hard for me to remember.
-----------------------------------------------

Library Use Became Easier
-----------------------------------------------
CNTX: INT2 WHO: WARREN CELL: 7 CLASS1: EASY
DATE: May 13 SRC: INT2 CLASS2:

COMM1: But we've been introduced to in this class has made things seem easier.
COMM2: Without having to spend all that time in the library without moving.

INT.Q1: How do you feel about searching libraries for information?
-----------------------------------------------

There was little consensus among the group members as to what was "hard" or "difficult". One of the few threads that emerged from this group of comments was initial anxiety over the curriculum of the project and fear by some that they would have difficulty keeping up with others in the class who were perceived by them as "whiz kids". These comments were made early in the project and dissipated quickly. Another thread was the sense that even though LCS was easy to learn, physically finding the sources in a library as large as OSU's main library was difficult.

Each person expressed some difficulty with some aspect of each service, but there was no group agreement as to what those things were. Often "hard" comments were made at the
beginning of each new online cycle and were likely a reaction to the temporary newness of each service. Below is a sample of the disrelated range of the relatively few comments classified as "hard/difficult".

CNTX: IRP    WHO: BECKY    CELL: 1    CLASS1: HARD
DATE: Feb 24    SRC: IRP    CLASS2:

COMM1: Computer Science has been difficult so far because it is all new.

CNTX: IRP    WHO: BECKY    CELL: 1    CLASS1: HARD
DATE: Feb 24    SRC: IRP    CLASS2:

COMM1: It is difficult to keep up with all the reading and the other people in the class who understand and have worked with computers.

CNTX: IRP    WHO: DEBBIE    CELL: 1    CLASS1: HARD
DATE: Feb 24    SRC: IRP    CLASS2:

COMM1: It is difficult for me sometimes because it has been awhile since I've worked with a computer.

CNTX: LCS    WHO: ERIC    CELL: N253    CLASS1: HARD
DATE: Apr 16    SRC: SS    CLASS2:

COMM1: ERIC COMPLAINS IT IS DIFFICULT TO RETURN TO EARLIER SEARCH SCREENS
COMM2: (TEACHER: WHAT WERE YOUR IMPRESSIONS OF LCS?)

CNTX: SOURCE-M    WHO: GROUP    CELL: L242    CLASS1: HARD
DATE: Apr 14    SRC: SS    CLASS2:

COMM1: GROUP SAYS ENCYCLOPEDIA EASY BUT FILE DOWNLOADING HARD
COMM2: (TEACHER: WHAT ARE YOUR IMPRESSIONS WITH THE SOURCE SO FAR?)
COMM1: It was a little hard to get used to communications programs as they have
COMM2: their own special terminology that's different from programming in BASIC.

COMM1: I, while looking for books, found it hard to find a book that has a
COMM2: call number that is longer than some German names I know.

"Size Positive" comments were commonplace and generally directed at one of two things: A. a positive appreciation of the enormous size of The Ohio State University's Library or, B. a similar regard for the amount of information that can be obtained by online searching. The participants were clearly taken aback by the size of OSU's main library. None had seen it before and all had previously believed that some of the surrounding suburban libraries and the downtown Columbus Public Library were huge (by their school's standard) and were as big as libraries got. The experience put their own choice of library into an entirely different light as they immediately realized the vast amount of new information that was available to them.
Size negative comments, in contrast, were restricted to two individuals who both expressed the feeling that the OSU library was too large. These two students, however, did not react negatively to the vast holdings of Knowledge Index. These contrasts suggest, that the size of the information holdings wasn’t the problem. Rather, the problem was the physical enormity of the building used to house it.

The change in attitudes is particularly striking in the condensed comments below made by Jeff and Matt. Jeff immediately perceived the additional information gathering options that OSU library presented to him and stated how he wished he had this kind of a choice always available to him. A sense of empowerment was evident. Matt quickly saw the limitations of the libraries that he had been using in the past and the new opportunities that awaited him.

It was interesting that all of these students were native to the Columbus, Ohio area, yet they had never seen the OSU library, by far the largest in the area. That was somewhat ironic, since most indicated that OSU would be their eventual choice of college. To expect students to move literally overnight from encyclopedias and a 20,000 volume school library to LCS and millions of books and dozens of specialized campus libraries is perhaps a prescription for failure or problems.
COMM1: When I saw how much had been written on the heart in one month I knew that our library was a joke. I could do a lot better reports if I had all this information. I'd love to have to decide which books would be most helpful and get more than one view on a subject.

COMM1: There are floors and even rooms in OSU's main library that are larger than the Whitehall Public Library. This demonstrates how limited most public libraries really are. In fact, the "smaller", specialized libraries of OSU's campus are larger than any of the public libraries that I've ever been in. I remember when I used to think of the Bexley Public Library as a "big" library.

COMM1: Just in the one small section of the medical library the randtliever stored over 100,000 books. That is more books than I have seen.

COMM1: With all that information available, you won't even be able to drag me away from the monitor. K.I. It's just so massive. I mean, you can look up practically anything in the world there.
COMM1: Go getting the actual material is another matter. How many floors were there? 1,000? Like I said, it's just too big for my blood.

COMM1: IT'S TOO BIG, IT HAS AN ELEVATOR!
COMM2: (TEACHER: WHAT WERE YOUR IMPRESSIONS OF LCS?)

COMM1: Yes, even being the size that I am, I found the size of the building to be a tad intimidating.

COMM1: If you ask me a library thirteen floors and an elevator is not my idea
COMM2: of a library but a museum of facts.
SYSTEM SATISFACTION VS. SYSTEM DISSATISFACTION

SYSTEM SATISFACTION N = 27
SYSTEM DISSATISFACTION N = 5
RATIO OF POSITIVE TO NEG. = 5.4:1

As defined in Chapter Three, these two categories related quiet, low emotional involvement statements that a system was working as the student thought it should, (or was not). An example of a "system satisfaction" comment would be, "Yes, LCS did what I expected of it." In contrast, a "system dissatisfaction" comment resembled this, "I thought the system was slow and the command structure clumsy". These comments were what one might expect to read in a journal review of a particular online service and were devoid of any teenage hyperbole or fiery, "I love this! / I hate that!"-type of speech. It is mentioned here only as a triangulation of what has been stated about the relative frequencies of positive subdomain vs. negative subdomain talk. Totaled together, these categories comprised only 8% of the total affective talk and system satisfaction comments outstripped dissatisfaction by a ratio of more than 5:1 (27 satisfaction to 5 dissatisfaction). It's apparent that these four classes of online services were performing as the students thought they should.
The remaining affective categories did not have diametrically opposed counterparts like "easy" vs. "hard". They were, however, considered significant categories in assessing the attitudes and perceptions of the group toward online services. These categories included, "Enjoy", "Impressive" and "Teacher Impression". Totaled, they made up 22.3% of the total affective talk, 26.6% of the total positive talk and ranked, in frequency, 8th, 14th, and 33rd respectively among all categories of student talk. Therefore, even though they have no direct recorded negative counterparts it was important to note that just under a quarter of all affective talk was derived from these positive categories. See the table below.

Table 2. Non-Opposed Positive Affective Comments

<table>
<thead>
<tr>
<th>Category</th>
<th>Freq.</th>
<th>% Affective</th>
<th>% Positive</th>
<th>Total Talk Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enjoy</td>
<td>54</td>
<td>13.4%</td>
<td>16%</td>
<td>8</td>
</tr>
<tr>
<td>Impressive</td>
<td>28</td>
<td>7.0%</td>
<td>8.3%</td>
<td>14</td>
</tr>
<tr>
<td>Teacher Imp.</td>
<td>8</td>
<td>2.0%</td>
<td>2.3%</td>
<td>33</td>
</tr>
<tr>
<td>Totals</td>
<td>90</td>
<td>22.3%</td>
<td>26.6%</td>
<td>n/a</td>
</tr>
</tbody>
</table>

ENJOYMENT:

It was not enough to merely quantify the figures in these categories. What were the students enjoying? What were they impressed with? And what kinds of impressions did they develop about the researcher/instructor?
First, enjoyment. Derived from the category "Like", "enjoy" was judged to convey a greater sense of having fun than did simply liking something. As was stated in Chapter III, when the rules of the taxonomy were laid out, both "Like" and "Enjoy" probably pointed in similar directions, but were separated out according to a difference in emotional strength. Students "enjoyed" a wide range of project attributes. Upon examining the 54 comments classified as "enjoy" in the talk database, these threads were identified as commonplace and representative of student consensus.

1. Enjoy Sharing of New Abilities With Friends Outside Class.
2. Enjoyment of CBBS's.
3. Enjoyment of LCS.
4. Enjoyment of Working Independently.
5. Enjoyment of Seeing Much Larger Library Facilities. (OSU).
6. Enjoyment of Accidental (Serendipitous) Online Occurrences.
7. Enjoyment of Project Itself.
8. Enjoyment of Telecommunications Technology.
9. Enjoyment of Buying Own Modem As Result of Class Exposure.
10. Enjoyment of Being Shown Online Searching Alternative.

EXAMPLES:

Enjoyment of friends' reaction

CNTX: OVERALL WHO: BECKY CELL: BJ581 CLASS1: ENJOY
DATE: Jun 6 SRC: SS CLASS2: 

COMM1: I ENJOY THE AMAZEMENT OF MY FRIENDS WHEN I TELL THEM WHAT I AM ABLE TO
COMM2: DO.
Enjoy Telecommunications Technology Itself

CNTX: INT2  WHO: ERIC  CELL: 6  CLASS1: ENJOY
DATE: May 13  SRC: INT2  CLASS2:

COMM1: T: What are your impressions of online telecommunications?
COMM2: E: I'm in love.

Enjoyment of LCS

CNTX: LCS-RP  WHO: ERIC  CELL: 1  CLASS1: ENJOY
DATE: Apr 16  SRC: LCS-RP  CLASS2:

COMM1: I personally had a good time. Using LCS is fun.

Enjoyment of Being Shown Superior Library Facilities

CNTX: INT2  WHO: ERIC  CELL: 5  CLASS1: ENJOY
DATE: May 13  SRC: INT2  CLASS2:

COMM1: The OSU library which it was just that brief experience that we went
COMM2: through but it seemed like a lot of fun.

INT.G1: How do you like using libraries?

Enjoyment of CBBS's

CNTX: BBS-G  WHO: GROUP  CELL: BP74  CLASS1: ENJOY
DATE: Mar 11  SRC: SS  CLASS2:

COMM1: YES, ESPECIALLY CHATTING WITH SYSOPS AND ELECTRONIC FRIENDS
COMM2: (TEACHER: DID YOU ENJOY THE EXPERIENCE WITH BBS'S?)
Enjoyment With the Project Itself

CNTX: INT2 WHO: ERIC CELL: 15 CLASS1: ENJOY
DATE: May 13 SRC: INT2 CLASS2:

COMM1: T: Are you enjoying yourself in this project?

Enjoyment of Accidental (Serendipitous) Online Occurrences

CNTX: SOURCE WHO: LISA CELL: J163 CLASS1: ENJOY
DATE: Mar 26 SRC: SS CLASS2:

COMM1: LISA TELLS STORY ABOUT PARIS CHAT W/FRANCOIS BEN VENISTE. VENISTE WORKS
COMM2: FOR APPLE-FRANCE. LISA VERY EXCITED ABOUT CONTACT.

CNTX: SOURCE WHO: LISA CELL: N163 CLASS1: ENJOY
DATE: Mar 26 SRC: SS CLASS2:

COMM1: LISA IS EXTRAORDINARILY PLEASED WITH HER "FRENCH CONNECTION" AS
COMM2: SHE CALLED IT. ABOUT THE EXPERIENCE SHE SAID "I GET AROUND"

Enjoy Working Independently

CNTX: IRP WHO: WARREN CELL: 1 CLASS1: ENJOY
DATE: Feb 24 SRC: IRP CLASS2:

COMM1: I enjoy the independence because working alone allows me to
COMM2: concentrate better.

Enjoyment Resulting In Modem Purchase

CNTX: IRP WHO: WARREN CELL: 1 CLASS1: ENJOY
DATE: Feb 24 SRC: IRP CLASS2:

COMM1: In fact, I enjoyed these weeks so much that I purchased a modem
COMM2: for my Atari computer.
Enjoyment of Having An Alternative Means of Searching Information.

CNTX: INT2   WHO: WARREN   CELL: 8   CLASS1: ENJOY
DATE: May 13   SRC: INT2   CLASS2: 

COMM1: Also enjoying finding information through LCS, KI, or Source.
COMM2: It's quicker, easier, less time consuming, and I don't have to move.

INT.Q1: What are your impressions of online telecommunications?

In regard to comments tagged as "Impressive", a sense of astonishment or awe was clearly demonstrated. Often laced with teenage hyperbole, these comments were very closely tied to the positive category, "Size Positive" as it turned out that when students expressed impression, it was generally linked with great size. Students were most often "impressed" with: A. the physical enormity of the OSU library system, B. the information holdings of an online service or, C. the raw computing power that giant mainframe computers display.

Aside from being impressed with things external, many students clearly stated their impression with themselves as self-perceived new masters of online technology and superior searching capabilities. As the upcoming discussion of the categories "Change" and "Power" will confirm, students internalized a sense of personal power from exposure to the online services. Thus, "Impressive" comments gathered around these themes (with specific examples following):
1. Impression With LCS Program.
2. Impression With OSU Library.
3. Impression With Huge Online Information Holdings.
4. Impression With Self.
5. Impression With College-level References.

EXAMPLES:

Impressed With The Library Control System Program
-------------------------------------------------------------
CNTX: LCS-RP WHO: BECKY CELL: 1 CLASS1: IMPRESS
DATE: Apr 16 SRC: LCS-RP CLASS2:

COMM1: I enjoyed the system and was very impressed with the fact I did not
COMM2: have to go looking through the card catalog for a book.

-----------------------------------------------------------------------------

Impressed With Large Amounts of Online Information
-------------------------------------------------------------
CNTX: INT2 WHO: ERIC CELL: 6 CLASS1: IMPRESS
DATE: May 13 SRC: INT2 CLASS2:

COMM1: You know, online, it's like calling the outside world. But, just having
COMM2: access to the masses of information . . .

INT.Q1: (yes, go on...)  
INT.Q2: (about why you're "in love")

-----------------------------------------------------------------------------

Impressed With College/Professional-level References
-------------------------------------------------------------
CNTX: LCS WHO: GROUP CELL: X248 CLASS1: IMPRESS
DATE: Apr 16 SRC: SS CLASS2:

COMM1: GROUP IMPRESSED WITH PRINTED INDEX MEDICUS AND RELATED INDICES.
COMM2: LIKENDED SIZE TO "PHONE BOOKS"
Impressed With Self

CNTX: LCS  WHO: GROUP  CELL: AP263  CLASS1: IMPRESS
DATE: Apr 17  SRC: SS
COM M 1: GROUP IMPRESSED WITH THEMSELVES "WE'RE BAD!" AND "SHAZAM!"
COM M 2: (MAIL RECEIVED FROM SOURCE WANTING GROUP ANECDOTES FOR PUBLICATION)

Impressed With Size of Library

CNTX: LCS-RP  WHO: MATT  CELL: 1  CLASS1: IMPRESS
DATE: Apr 16  SRC: LCS-RP
COM M 1: I found the Ohio State University to be ominous in size and content.
COM M 2: I was amazed at the number of books stored on the third floor alone.

Impressed With Robotic Book Retrieval (The Randtriever)

CNTX: LCS-RP  WHO: WARREN  CELL: 1  CLASS1: IMPRESS
DATE: Apr 16  SRC: LCS-RP
COM M 1: The Randtriever takes one's breath away upon viewing it for the first time.
Impressed With Computer Power

COMM1: By watching the actual retrieval of the books, I was amazed at the system's accuracy and control at finding them.

The category, "Teacher Impression" was created from the data as it shed light on the manner in which students perceived the researcher/instructor. In designing this curriculum research, one goal was that students would find the experience a positive one. "Teacher Impression" helped document the success of that design construct by identifying positive feelings for its creator. If nothing else, "Teacher Impression" serves as yet another triangulation of the data analysis that indicates that the project was an enjoyable one for a wide cross-section of students. The statements below, represent the written comments of four of the project's students gathered primarily from student-written reaction papers of various sorts. There were no recorded negative comments.
COMM1: You have done well, sir, and I appreciated the trip.

COMM2: The companies that invested in Mr. Schooler's little "scheme" are really going to get their money's worth, if not a lot more than they expected.

COMM1: Without the competency of "Doc's" knowledge, I'd quickly be as skepticism about the whole thing as Bell was when Captain Yeager tested the X-1.

COMM1: Mister Schooler has been a big help to the ten of us, and without him, we would have been out in the streets.

COMM1: Mister Schooler is unlike any other teacher I have met, and I have the feeling that I won't meet another like him for awhile.
In summary, the preceding section has served to answer question number three:

3.0. What were the students' perceptions of, and affective responses to, exposure to four classes of online services (Knowledge Index, The Source, LCS, and Computerized Bulletin Boards)?

The analysis of representative examples of common thematic issues and the numerical quantification of the affective categories has demonstrated that students overwhelmingly showed positive feelings for online services across the entire spectrum of identified positive and negative taxonomic categories. In no case did negative responses outstrip positive ones and this set the stage for the final step in the analysis. At this point, three things were known:

A. The structural nature of the project and its use of time and task.
B. The baseline, entry-point search techniques employed by students.
C. Their perceptions of, and affective responses to, exposure to four classes of online services.
ALTERATION OF STUDENTS' SEARCH STRATEGY

The next and final analytical section deals with determining the effect that exposure to online services had on students and how it altered their search strategies. Question set four was as follows:

4.0. Did exposure to online services alter the students' current types of search strategy?

4.1. What were the indicators of change or growth in the students' knowledge of search strategies for information?

4.2. Did students integrate across the four classes of services to produce searches superior to any single service?

In approaching questions 4.0/4.1 concerning whether (and in what ways) the students' current types of search strategies were altered by the exposure to online services, data was analyzed from exit-point interviews, exit-point flow charts, student self-description of how they searched information for their final projects, group meetings and daily videotapes. From the talk database, the relevant categories of talk were judged to be, "Exit-Search", "Hiro 2", "Beatles 2", "Discovery", "Change", "Search Successful/Unsuccessful" and "Future Expectations".

The key issue here was change, a shift from a former position. Having established earlier that all members of the group were formulatores of short linear searches, it is suggested that any curriculum intervention that moves them
toward a more broadly dimensional and productive search for information is a positive intervention.

Students entered the experiment naive to its curriculum and with little to no prior knowledge of online computerized searching. They were intensely exposed to the technology and then queried many different ways about its effect, if any, upon them. Change can be both demonstrated and measured by the answers provided by thematic analysis of comments in categories of the taxonomy that address different types of change. Thus, the questions 4.0 and 4.1 were attacked both individually and collectively by student talk classified throughout a range of categories.

**STUDENTS' MASTERY OF THE CURRICULUM:**

Firstly, were students able to master the curriculum from an academic standpoint? Could they operate a modem and telecommunications software? Could they successfully navigate through the four classes of online services? One can point back to the analysis of positive vs. negative affective talk for triangulation of the affirmative answer to these technical questions.

Overwhelmingly, students cited, very high affective responses to all four services presented. The high affective response is one indicator of mastery of the technology. Students would not have given such responses if they were
unable to technically master the systems. However, additional data was obtained knowledge acquisition that would verify the students' affective comments. Consider the taxonomic domain, "Discovery". It was derived from the talk data to index comments that conveyed learning of four basic types: the planned acquisition of Factual Knowledge, learning via Experimentation with the systems, Serendipitous (unplanned, accidental learning), and gaining an expressed sense of personal Power from the online experiences. The graph on the next page shows a breakdown of the relative frequencies of talk that fell into the "Discovery" domain.
Figure 43. Distribution of "Discovery" Talk

In regard to the knowledge gained by the students, the graph above illustrates a percentage breakdown of the four categories of "Discovery". Most discovery comments were of the "Factual Knowledge" type trailed by, "Serendipity", "Experimentation" and "Power".
Examined as a part of all student talk, Factual Knowledge contributed 88 comments placing it 4th in overall talk (out of 38 categories). Since this category indexes correct statements or activities, their sheer number lend support to the contention that the necessary technical learning did occur. Serendipitous discoveries of knowledge made accidentally, usually through exploration, occurred 31 times and ranked 12th overall in frequency. Experimentation with the systems was indexed 26 times and ranked 17th and Power was recorded 17 times, ranking 26th overall.

Taken as a whole domain, "Discovery" classified 162 comments representing about 13.2% of all talk.

Table 3. Percentage Distribution of Discovery Talk

<table>
<thead>
<tr>
<th>Category</th>
<th>Freq</th>
<th>% Discovery</th>
<th>% All Talk</th>
<th>Talk Rank</th>
<th>Overall Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fact Knowl.</td>
<td>88</td>
<td>54.3%</td>
<td>7.2%</td>
<td>4th</td>
<td></td>
</tr>
<tr>
<td>Serendipity</td>
<td>31</td>
<td>19.1%</td>
<td>2.5%</td>
<td>12th</td>
<td></td>
</tr>
<tr>
<td>Experiment.</td>
<td>26</td>
<td>16.0%</td>
<td>2.1%</td>
<td>17th</td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>17</td>
<td>10.5%</td>
<td>1.4%</td>
<td>26th</td>
<td></td>
</tr>
</tbody>
</table>
The "Factual-Knowledge" category of the "Discovery" domain presented examples of student technical learning that confirm that students were able to master online technology.

**DEVELOPMENT OF NEW TECHNICAL SKILLS**

The comments below served to illustrate different kinds of factual knowledge acquisition as a result of the project’s curriculum. These self assessments or descriptions of videotaped activities serve to confirm that basic telecommunications skills such as file uploading/downloading, file repair, and electronic mail, etc., were mastered.

---

**General increase in overall knowledge**

CNTX: IRP  WHO: WARREN  CELL: 1  CLASS1: D-FACT K  
DATE: Feb 24  SRC: IRP  CLASS2:  

COMM1: After several weeks in the course, my knowledge of the operation of modems and telecommunication programs has definitely increased.

---

**File downloading and repair**

CNTX: SOURCE  WHO: ERIC  CELL: J206  CLASS1: D-FACT K  
DATE: Apr 9  SRC: SS  CLASS2:  

COMM1: Downloads a file that makes the Apple 80-col. card into RAM card.
Demonstration of Advanced Telecommunications Knowledge

----
CNTX: SOURCE WHO: WARREN CELL: AF206 CLASS1: D-FACT K DATE: Apr 9 SRC: SS CLASS2: 

COMM1: WARREN DOWNLOADS AND CONVERTS GAME FROM TEXT TO BASIC-BOOTS DISK. IT CRASHES
COMM2: HE FINDS AND REPAIRS ERROR WITH APPLEWRITER. GAME IS LIKE SNAKEBYTE

----

Demonstration of Advanced Telecommunications Knowledge

----
CNTX: SOURCE WHO: WARREN CELL: R143 CLASS1: D-FACT K DATE: Mar 24 SRC: SS CLASS2: 

COMM1: SHARES WITH GROUP. MAIL RECEIVED ON HOW TO DISABLE "CALL WAITING" FEATURE
COMM2: OF TOUCH TONE TELEPHONE'S WITH A SERIES OF KEY PRESSES.

----

Group success with electronic mail.

----
CNTX: SOURCE WHO: GROUP CELL: F159 CLASS1: D-FACT K DATE: Mar 25 SRC: SS CLASS2: 

COMM1: YES
COMM2: (TEACHER: WERE YOU SUCCESSFUL WITH SOURCE MAIL YESTERDAY?)

----

Demonstration of mastery via system operation with no menus, only prompt.

----
CNTX: INT2 WHO: WARREN CELL: 10 CLASS1: D-FACT K DATE: May 13 SRC: INT2 CLASS2: 

COMM1: T: Did you work mostly at command level or through the menus?
COMM2: W: I worked mostly at command level.

INT.Q1: (trying to gauge level of competence - command level is considered
INT.Q2: for experienced users)
DISCOVERS "LOCAL" VS "GLOBAL" COMMANDS (THOSE WHICH ACT DIFFERENTLY IN ONE AREA THAN ANOTHER OR DON'T EVEN EXIST.

DEVELOPMENT OF NEW METHODS OF DOING THINGS

ERIC IS USING 2 APPLES AT ONCE. ONE ONLINE TO LCS THE OTHER WITH APPLEWRITER SO THAT HE CAN PLAN, MODIFY, RECORD, SEARCH AS HE GOES ALONG.

ERIC WANTS TO WRITE HIS PAPER AT HOME ON HIS TIMEX SINCLAIR THEN TELECOMMUNICATE TO A WAITING APPLE IN THE LAB (INTERESTING IDEA).

THE KI LONG FORM PRINTOUTS (ABSTRACTS). SHE DIDN'T NEED THE ENTIRE ARTICLE. THE ONLINE ABSTRACT WAS ENOUGH.

BUILDING HER BIBLIOGRAPHY BY REARRANGING HER KI CITATIONS USING APPLEWRITER SO THAT SHE DOESN'T HAVE TO RETYPE THEM.
Often, students worked outside of class pursuing areas of telecommunications that particularly interested them, demonstrating knowledge attainment (and motivation) independent of the teacher/researcher. Consider Eric's independent mastery of The Source's Special Interest Groups or "SIGs" and subsequent sharing of his findings with the group:

CNTX: SOURCE WHO: ERIC CELL: F212 CLASS1: D-FACT K
DATE: Apr 9 SRC: SS CLASS2:
COMM1: ERIC LECTURES GROUP ON SIG'S (SPECIAL INTEREST GROUPS). HE HAS BEEN
COMM2: WORKING ON THEM DURING HIS LUNCH.

Besides demonstrating that they could not only learn the basic techniques of online telecommunications but even progress beyond them without teacher/researcher assistance, students showed their increase in knowledge in other ways, as well. One of the attributes of a skilled telecommunicator is his or her ability to assess an online service and develop a "feeling" of each system's characteristics. An experienced telecommunicator, for example would sight-recognize a CBBS from a bibliographic retrieval service like DIALOG almost instantly. And, to an experienced user, a library circulation program doesn't look or "feel" anything like an "information utility" such as The Source or CompuServe. Entering the project completely
naive, a good measure of knowledge increase and resultant change, was to collect comments from students that indicated they had internalized the differences between the four classes of online services and could discern among them on sight. Examples of such talk (that correctly characterized each system) included:

**DEVELOPMENT OF SYSTEM CHARACTERIZATION SKILLS**

<table>
<thead>
<tr>
<th>CNTX: BBS-G</th>
<th>WHO: GROUP</th>
<th>CELL: R72</th>
<th>CLASS1: D-FACT K</th>
<th>CLASS2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: Mar 11</td>
<td>SRC: SS</td>
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</tbody>
</table>

**COM1**: GROUP AGREES THAT MOST SYSOPS ARE IN TEENS AND TWENTIES

**COM2**: ('FEEL' OF BBS'S IS THAT THEY ARE RUN BY YOUNG PEOPLE)

<table>
<thead>
<tr>
<th>CNTX: BBS-G</th>
<th>WHO: ERIC</th>
<th>CELL: N71</th>
<th>CLASS1: D-FACT K</th>
<th>CLASS2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: Mar 11</td>
<td>SRC: SS</td>
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</tbody>
</table>

**COM1**: BBS'S ARE PRIVATE AND HAVE SHORT LONGEVITY

**COM2**: (COMMENTING ON BBS'S FLY-BY-NIGHT NATURE)

<table>
<thead>
<tr>
<th>CNTX: BBS-G</th>
<th>WHO: GROUP</th>
<th>CELL: BN67</th>
<th>CLASS1: D-FACT K</th>
<th>CLASS2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: Mar 11</td>
<td>SRC: SS</td>
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</table>

**COM1**: GROUP AGREES THAT ENCYCLOPEDIC INFORMATION IS NOT ON BBS'S BUT YOU NEVER

**COM2**: KNOW FOR SURE WITH BBS'S E-MAIL AND TELECONFERENCING.

<table>
<thead>
<tr>
<th>CNTX: BBS-G</th>
<th>WHO: MATT</th>
<th>CELL: BH72</th>
<th>CLASS1: D-FACT K</th>
<th>CLASS2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE: Mar 11</td>
<td>SRC: SS</td>
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<td></td>
</tr>
</tbody>
</table>

**COM1**: THERE IS A CHANCE OF RECEIVING INCORRECT OR MISLEADING BBS INFO.

**COM2**: (THE SYSOP, A PRIVATE INDIVIDUAL, IS THE EDITOR.)
COMM1: SEVERAL STUDENTS COMMENT THAT COMPUTER ORIENTED PAPERS WERE LIKELY TO
COMM2: BENEFIT MOST FROM USE OF BBS'S (ERIC'S AND WARREN'S)

INT.01: (SINCE MOST BOARDS CATER TO COMPUTER HOBBYISTS AND THEREFORE
INT.02: OFTEN POSSESS MUCH TECHNICAL EXPERTISE.

COMM1: ELECTRONIC MAIL COMES WHEN IT COMES (CAN'T BE PREDICTED OR RUSHED)
COMM2: (LEARNING THAT SEARCHING VIA E-MAIL IS NOT AN OVERNIGHT ACTIVITY)

COMM1: DO WE NEED THAT MUCH!? (RESPONDING TO TEACHERS WARNING TO NOT RUN OUT OF
COMM2: CONNECT TIME) (ERIC PERCEIVES HOW MUCH SEARCHING AN HOUR OF KI EQUALS)

COMM1: STUDENTS NOTICE A PAUSE AS SYSTEM CHANGES FROM ONE CONTENT AREA TO
COMM2: ANOTHER. ALSO NOTE DATE AND TIME OF DAY INFLUENCE SPEED. (LCS)
In another case below, Becky had achieved sufficient new knowledge to allow her to understand why online systems exist in the first place— to manage amounts of data that would prove unwieldy by a traditional, paper-based filing system.

RECOGNITION OF ONLINE COMPUTING POWER AND/OR NECESSITY
-----------------------------------------------------------
CNTX: LCS-RP  WHO: BECKY  CELL: 1  CLASS1: D-FACT K
DATE: Apr 16  SRC: LCS-RP  CLASS2: 
COMM1: I have been spoiled using the smaller libraries and all the help
COMM2: provided. Now I understand the importance of LCS and the computer system.

Also vitally important to successful online searching is to be able to assess the subject matter nature of a given search topic and then determine the appropriate database(s) to scan for information. There were two excellent examples of students making such determinations correctly. The first was playing "Name That Search" with the teacher. Focusing on Knowledge Index, the students were given examples of correct search strategies that incorporated all of the searching techniques common to using bibliographic retrieval services (search term synonyms, truncation with a wildcard, joining of concepts with Boolean logical operators and search delimiters). After students examined the search strategy, they had to attempt to work backward and deduce, from the search strategy, what the original search question was with as much specificity as possible.
ACQUISITION OF APPROPRIATE DATABASE DETERMINATION SKILLS

CNTX: KI   WHO: GROUP   CELL: F420   CLASS1: D-FACT K
DATE: May 13    SRC: SS   CLASS2:

COMM1: GROUP PLAYS KI "NAME THAT SEARCH". STUDENTS LOOK AT
DESCRIPTORS AND WAY THEY ARE JOINED, MODIFIED, ETC. TO
DETERMINE ORIGINAL SEARCH QUESTION. THE GROUP GIVEN LIST OF
HYPOTHETICAL SEARCHES. ASKED TO SPECULATE ON WHICH BASES
WOULD LIKELY BE BEST SEARCHED.
For example, consider the following search on Knowledge Index:

F (SOLAR AND ENERGY) AND (HOT OR HEAT?) AND (HOME? OR HOUSE? OR RESIDENTIAL) AND WATER

1. In the above search strategy, "F" stands for "FIND" citations that contain the search term(s) listed in the title, abstract or indexing descriptors.

2. The question mark truncator "?" is a "wildcard" that means "match on any characters after the root term." Therefore, "HOME?" would match on "HOME", its plural "HOMES", etc.

3. The Boolean operators employed are "AND" (all-or-none inclusivity) and "OR" (either-or inclusivity).

4. The parentheses tie together synonymous terms for better searching. "HOME", "HOUSE" and "RESIDENTIAL" were made search synonyms in this example by being tied together with the "OR" operator and parentheses.

Students were given time to examine many dozens of such examples while the teacher/researcher listened to them attack them out loud, reaching consensus on what each search strategy's original search question was. The participants demonstrated skill at such deductions as borne out in the daily videotape record.

The original question being asked by the search strategy above was:

"Find information of the home use of solar energy to produce hot water.

Lastly, students were asked which database(s) would be logical choices for executing the searches. In the particular case above, the students responded, "INSPEC", the
professional literature on physics, engineering, etc., and "MAGA" or "Magazine Index" (the popular press).

In another demonstration of database determination skills, the teacher/researcher constructed a list of hypothetical search questions and presented the list to the students who then had to determine the best database(s) to search out. After the exercise, the students were free to formulate search questions to attack each problem and execute the search online. Below are some examples with students' correct responses above the teacher/researcher's search question.

COMM1: E.R.I.C.
COMM2: (TEACHER: USE OF MICROSO IN SECONDARY ED.?)

COMM1: COMP1, NEWS1, MAGA, INSPEC.
COMM2: (TEACHER: NEWLY REMEASURED SIZE OF THE MILKY WAY?)

COMM1: AGRI
COMM2: (TEACHER: TREE RINGS AND DROUGHT?)

COMM1: MEDI1, MAGA, NEWS1.
COMM2: (TEACHER: ARTERIOSCLEROSIS AND CHOLESTEROL?)

COMM1: COMP1
COMM2: (TEACHER: APPLE LOGO?)

COMM1: NEWS1, WHO'S WHO.
COMM2: (TEACHER: JIMMY STEWART?)

COMM1: CORP1
COMM2: (TEACHER: IBM'S ANNUAL REPORT?)

COMM1: NEWS1
COMM2: (TEACHER: RYAN WHITE (AIDS VICTIM)?)
Change in knowledge base was also illustrated by the students' integration of substantial online assistance in dealing with their final projects (even though they were told that they could work on their projects by any means they liked). An examination of the group comments below indicates knowledge acquisition via incorporation in personal search strategy. Again, the teacher/researcher's question follows the response.

DEMONSTRATION OF MASTERY THROUGH INTEGRATION IN FINAL PROJECT
---------------------------------------------------------------
CNTX: OVERALL WHO: GROUP CELL: BP580 CLASS1: D-FACT K
DATE: Jun 6 SRC: SS CLASS2:

COMM1: 6 OUT OF 7
COMM2: (T: HOW MANY USED LCS IN THEIR FINAL PROJECTS? (OF THOSE PRESENT))

COMM1: 6 OUT OF 7
COMM2: (T: HOW MANY USED THE SOURCE?)

COMM1: 2 OUT OF 7
COMM2: (T: HOW MANY USED BBS'S?)

COMM1: 3 OUT OF 7
COMM2: (T: HOW MANY USED AN ONLINE ENCYCLOPEDIA?)

COMM1: RAY:2-3, WARREN: 5-6, BECKY: 2, DARYL: 5-6, ERIC: 8,
JEFF: 3
COMM2: (T: HOW MANY DATABASES DID YOU USE?)

COMM1: IN TOTAL ALL OF THE STUDENTS USED 3 OF THE 4 SERVICES AVAILABLE AND 2 STUDENTS USED ALL 4.
Two final examples of knowledge acquisition from the "Factual-Knowledge" category are cited below. The first was originally coded as "Entry-Search" and "Exit-Search", then secondarily coded as "Factual Knowledge". The passage concerns Lisa, who is being asked for some definitions of telecommunications terms, first on Feb. 28th and then again, on May 13th. Notice the increase in knowledge as formerly unknown terms are defined:

DEMOnSTRATION OF MASTERY THROUGH COMPARISON OF ENTRY- AND EXIT-POINT INTERVIEWS
---------------------------------------------------------------------
WHO: LISA
INT.Q1: T: What can you tell me about microcomputer telecommunications?

(NEAR-ENTRY Feb 28th):
L: I could have told you that they send information, and that's about it. T: And you picked that up from where? L: Just from the word (prefix) "comm...".

(NEAR-EXIT May 13):
Telecommunications enables you to dial long-distance to another computer, and you can type into your computer to someone at a computer anywhere else far away.

WHO: LISA
INT.Q1: T: Do you know the meanings of any of the following terms?

(NEAR-ENTRY Feb 28th):
DISCOVERY THAT OLDER PAPERS COULD HAVE BEEN NARROWED

The final example from the "Factual-Knowledge" category comes from Matt who wanted to rewrite an old, offline paper, using online methods to search information for it and then finally, do a comparison of the off- and online versions. He made the discovery that his former paper was much too broad. He found far too much information from online sources. He made the decision to narrow his paper by making it more specific. Originally, the paper's topic was "Running". In its final version, it was narrowed and redefined to "The Relationships Between Running and Anorexia and Cystic Fibrosis".

COMM1: My topic (Running) is too broad, working to narrow (he wants to contrast an old offline paper with same topic online). I know now more about how and where to look and how one source will lead to another.

The subdomain, "Discovery" spun off another category termed "Serendipity" which Funk and Wagnall's Standard College Dictionary defines as "The faculty of happening upon
fortunant discoveries when not in search of them." The students were exposed, within a relatively short time, to the four broadest and largest classes of online services in the world. It was hardly surprising that, in the normal course of using the systems, they made numerous discoveries of products, services, personal contacts, etc. that they deemed positive but yet unsought. This too, was a type of knowledge acquisition and its unexpected nature was often fun for students and contributed, in significant measure, to their high affective ratings of the systems.

In some cases, students discovered a sense of "Interconnectivity" - the notion that they were forming personal online networks with unseen faces throughout the U.S. and, in the one case below, the world. Sometimes these contacts led to third persons being involved. Consider the two examples below:

INTERCONNECTIVITY
---------------------------------------------
CNTX: SEARCH  WHO: ERIC   CELL: X310  CLASS1: D-SEREN
DATE: Apr 24  SRC: SS   CLASS2:

COMM1: ANNOUNCES HE WAS CHATTING WITH SYSOP OF N.I.C.E. WHO INQUIRED ABOUT LISA
COMM2: AND HOW SHE WAS.
---------------------------------------------
In the first case, Eric related to the group that he was on the CBBS, "N.I.C.E." (a Macintosh board) and chatted live with its SYSOP, Frank Nichols. In the process of the chat, Mr. Nichols asked how Lisa was doing as he realized that he was talking to yet another member of the research group. Lisa was pleased to hear that someone that she’d never seen had inquired about her to someone else.

In the second case, a Mr. Dayna Duncan, of the Dept. of Education saw the students various messages of greetings on CBBS’s around Columbus. He, in turn, left electronic mail to the teacher/researcher via CompuServe (to which both belonged). The letter invited the teacher to pass along that Mr. Duncan maintained a CBBS of his own and would be happy to correspond with students. The class was very pleased with these unplanned contacts that indicated they were becoming known to persons they would likely never meet, yet could share conversations with.
This led students to the discovery that there was considerable outside interest in the project generated largely by their sheer volume of online activity. Some outside interest was, as to have been expected, from the various funding agencies involved.

DISCOVERY OF OUTSIDE INTEREST IN THE PROJECT

CNTX: SEARCH WHO: ROB CELL: N279 CLASS1: D-SEREN
DATE: Apr 21 SRC: SS CLASS2:

COMM1: GOT MAIL FROM SOURCE WANTING HIS CONSENT TO BE INTERVIEWED

CNTX: FINAL WHO: TEACHER CELL: F545 CLASS1: D-SEREN
DATE: Jun 3 SRC: SS CLASS2:

COMM1: SHARES WITH GROUP A LETTER FROM E.C.C.O. REQUESTING A PRESENTATION ON
COMM2: WHAT WE HAVE BEEN DOING AT THEIR ANNUAL OCT. MEETING.

CNTX: SOURCE WHO: WARREN CELL: AF147 CLASS1: D-SEREN
DATE: Mar 24 SRC: SS CLASS2:

COMM1: I GOT MAIL FROM BBS USER DOUG LUCE WHO IS INTERESTED IN OUR PROJECT.
COMM2: (TEACHER: ANYONE GOT POSITIVE RESPONSES FROM LOCAL BBS'S?)

While there was a third-party involved in the cases above, mostly serendipitous online contacts were direct links between one of the students and an outsider. Consider below:
TALKING LIVE WITH SOMEONE UNKNOWN VIA KEYBOARD

CNTX: SOURCE WHO: BECKY CELL: AL216 CLASS1: D-SEREN
DATE: Apr 10 SRC: SS CLASS2:

COMM1: GETS REQUEST FROM OUTSIDE TO "CHAT". SHE MAKES
CONNECTION WITH TEACHERS
COMM2: ASSISTANCE. BECKY CHATS WITH SUBSCRIBER FROM
MARYLAND.

CNTX: BBS WHO: LISA CELL: Z16 CLASS1: D-SEREN
DATE: Mar 4 SRC: SS CLASS2:

COMM1: CHATTING WITH SYSOP OF N.I.C.E.
COMM2: (MAC BBS)

CNTX: SOURCE WHO: LISA CELL: J163 CLASS1: D-SEREN
DATE: Mar 26 SRC: SS CLASS2:

COMM1: LISA TELLS STORY ABOUT PARIS CHAT W/FRANCOIS BEN
VENISTE. VENISTE WORKS FOR APPLE-FRANCE. LISA VERY EXCITED
ABOUT CONTACT. IT WAS 11 A.M. HERE AND 6 PM TOMORROW THERE.
HE (VENISTE) IS ALSO A MEMBER OF COMPUERVE. HE WAS PLEASED
WITH OUR RAID ON LIBYA. LISA IS EXTRAORDINARILY EXCITED WITH
HER "FRENCH CONNECTION" AS SHE CALLS IT. ABOUT THE
EXPERIENCE SHE SAID, "I GET AROUND".

The sheer anonymity of online "chatting" led to some
interesting, albeit questionable discussions between two of
the females in the group and outsiders (presumably male).
On rare occasions, class was "interrupted" by persons actually calling the group rather than visa-versa. Illustrated below, a student at another local high school called Eric's system and everyone paused and gathered around to see what was going on. It turned out that Eric and the other student had met at a programming contest the previous weekend and shared modem telephone numbers.

During the CBBS cycle of the experiment, students were allowed to contact any CBBS on a provided list. It was only a short time, however, before the students used their new skills to locate hundreds more CBBS numbers all over the nation and on their own initiative, contacted them at will. For a time, it appeared to be a game to see who could come up with the biggest list of CBBS numbers. Typically,
students found these lists of numbers accidentally as they were exploring local CBBS's.

ACCIDENTAL DISCOVERY OF MORE ONLINE CONTACTS

CONTEXT: BBS  WHO: ERIC  CELL: X27  CLASS 1: D-SEREN
DATE: Mar 5  SRC: SS  CLASS 2:

COMM 1: ERIC LOCATES AND SHARES MORE BBS NUMBERS
COMM 2: (students enjoy seeking out more and more numbers to try)

CONTEXT: BBS  WHO: WARREN  CELL: H30  CLASS 1: D-SEREN
DATE: Mar 5  SRC: SS  CLASS 2:

COMM 1: TELLS CLASS ONE BBS LISTS NUMBERS FOR OTHER BBS'S
COMM 2: (MANY HUNDREDS WERE FOUND BEFORE THE WEEK WAS OUT)

CONTEXT: BBS  WHO: JEFF  CELL: BF26  CLASS 1: D-SEREN
DATE: Mar 5  SRC: SS  CLASS 2:

COMM 1: JEFF DISCOVERS EVEN MORE BBS NUMBERS AND SHARE THEM WITH GROUP

One of the major discoveries that students made accidentally occurred when they stumbled onto a "pirate board", a CBBS run for the sole purpose of distributing illegal copies of copyrighted, commercial software. Rob was one of the first to locate an exceptionally large local operation, "The Red Pavilion". (Author's note: this item was classified under "Serendipity" (a positive category since the discovery (right or wrong) was extremely exciting to Rob as well as other computer-owning students in the group.) As a result, a serious group discussion was held concerning the legal ramifications of telecommunications.)
Daryl was an explorer. At every opportunity, he delved deeper into various systems to see what he could come up with. He expressed considerable satisfaction with "blazing a trail" and then telling the group what he had found. Below are a few samples of his knowledge acquisition by a combination of exploration and accident.

A third type of knowledge acquisition, "Experiment" was separated out of the "Discovery" subdomain because it addressed those cases where learning was occurring via deliberate experimentation. It differed from comments
indexed under "Serendipity" because those discoveries were made entirely by accident. There was no plan to uncover information.

In the experimentation category, students formulated questions in their minds and then set out to see if they could obtain the answer from the various systems. One of the most powerful examples of system experimentation involved the selection of final project topics. The teacher/researcher had expected that students would select topics based upon personal interest. For two of the participants, however, sheer desire to experiment was at the root of their choice of topic. Ray and Jeff both chose their topics just to see if the systems would give them the information that they sought.

CHOOSING FINAL PROJECT NOT OUT OF PERSONAL INTEREST, BUT RATHER, AS AN EXPERIMENT TO SEE IF THE SYSTEMS WOULD PROVIDE THE INFORMATION SOUGHT

CNTX: OVERALL WHO: RAY CELL: BN576 CLASS1: D-EXPER
DATE: Jun 6 SRC: SS CLASS2: 

COMM1: I JUST WANTED TO SEE IF I COULD DO IT. TO SEE IF THE SYSTEM WOULD COME
COMM2: UP WITH WHAT I WANTED. (REASON FOR CHOOSING FINAL PROJ. TOPIC)

CNTX: OVERALL WHO: JEFF CELL: BN582 CLASS1: D-EXPER
DATE: Jun 6 SRC: SS CLASS2: 

COMM1: AGREED WITH RAY THAT HE WAS INTERESTED IN "TESTING OUT" THE SYSTEMS.
Other knowledge acquisition via experimentation was seen in Becky who seemed unable to discern between The Source (in its entirety) and its miniature, restricted familiarization program called "The Source Tour". A subset of the "real" Source, the tour is meant to take participants through an overview of the entire system, but since it is merely an overview, many commands and menu options are inactive. Frustrated by this, Becky planned to "run the keyboard" methodically trying entries she knew to be wrong in order to see how the system would respond and thus, to better understand the concept of an online "tour".

**EXPERIMENTATION WITH DELIBERATELY INCORRECT INPUT TO LEARN HOW THE SYSTEM WOULD RESPOND**

CNTX: SOURCE TOWHO: BECKY  CELL: T111  CLASS1: D-EXPER
DATE: Mar 18  SRC: SS  CLASS2:

COMM1: INQUIRES ABOUT TOUR'S "HANDHOLDING" CAPABILITY.
EXPERIMENTS WITH
COMM2: DELIBERATE ERRONEOUS ANSWERS TO SEE EFFECT

The students had much time to themselves and experimentation was encouraged. Often, when students posed a technical question to the teacher/researcher, the response was to tell them to try and determine the answer themselves, either by asking for online help from the system, sending electronic mail inquiries to customer service representatives, or sometimes, simple experimentation at the keyboard ("messing around" as the students generally called it). A wide range of examples of experimentation are below.
EXPERIMENTATION WITH GROUP'S OWN PRIMITIVE CBBS

CNTX: SOURCE WHO: JEFF CELL: H157 CLASS1: D-EXPER
DATE: Mar 25 SRC: SS CLASS2:

COMM1: JEFF IS TRYING OUT ERIC'S PERSONAL BBS WHILE GROUP WATCHES
COMM2: (ERIC WROTE, IN BASIC, HIS OWN SIMPLE CBBS)

EXPERIMENTATION WITH LARGE NUMBERS OF CBBS'S

CNTX: BBS WHO: GROUP CELL: L57 CLASS1: D-EXPER
DATE: Mar 10 SRC: SS CLASS2:

COMM1: NUMBER OF BBS'S CONTACTED
7-8, 6-9, 4-5, 7-8, 10-12, 7-8, 6-8, 7-9, 9-10
(NUMBERS ARE EACH MEMBERS APPROXIMATION OF CBBS'S CONTACTED)

EXPERIMENTATION WITH SERVICES NOT PART OF CURRICULUM

CNTX: SOURCE-M WHO: GROUP CELL: AF237 CLASS1: D-EXPER
DATE: Apr 14 SRC: SS CLASS2:

COMM1: SOME USED THEIR FREE TIME ON "PLINK" AND HAVE GOTTEN THEIR OWN ID'S ('AMERICAN PEOPLE LINK' WAS A NEW ONLINE SERVICE THAT SOME STUDENTS RECEIVED MAIL ABOUT AND A CHANGE TO TRY IT OUT FREE).

EXPERIMENTATION ON OTHER GROUP MEMBERS

CNTX: BBS WHO: WARREN CELL: AR26 CLASS1: D-EXPER
DATE: Mar 5 SRC: SS CLASS2:

COMM1: WARREN DISCOVERS THE RED BONE INN. ALLOWS TELECONFERENCING
COMM2: (BBS WITH GAMES AND FAIRLY ELABORATE "CB" CAPABILITY) WARREN SHARES INFO AND THE GROUP LEARNS THE COMMANDS FOR THE RED BONE INN AND HAS TELECONFERENCE

CNTX: SOURCE WHO: GROUP CELL: AD143 CLASS1: D-EXPER
DATE: Mar 24 SRC: SS CLASS2:

COMM1: GROUP MEMBERS MAIL IS CIRCULATING TO OTHER MEMBERS IN LAB. MESSAGES ARE
COMM2: GENERALLY HUMOROUSLY INSULTING.
EXPERIMENTATION WITH CONTACTING UNKNOWN OUTSIDERS

CNTX: BBS  WHO: LISA  CELL: AJ36  CLASS1: D-EXPER
DATE: Mar 6  SRC: SS  CLASS2:

COMM1: LEAVING ONLINE MESSAGE ABOUT GROUP’S ACTIVITIES AND REQUESTING
COMM2: CORRESPONDENCE (BLINDLY LEAVING MESSAGES)

RECOGNITION THAT SOME ONLINE SERVICES CAN BE LEARNED SIMPLY THROUGH EXPERIMENTATION.

CNTX: LCS-RP  WHO: LISA  CELL: 1  CLASS1: D-EXPER
DATE: Apr 16  SRC: LCS-RP  CLASS2:

COMM1: However, by just "exploring" the way through, it is very likely that
COMM2: one will understand what is happening.

EXPERIMENT TO FIND TECHNICAL ATTRIBUTES OF AN ONLINE SYSTEM

CNTX: SOURCE TOWHO: MATT  CELL: AF101  CLASS1: D-EXPER
DATE: Mar 17  SRC: SS  CLASS2:

COMM1: "YES, IT STORES THEM UP (KEYSTROKES)". MATT DISCOVERS THAT THERE IS A KEYBOARD BUFFER. HE DETERMINES THIS BY RAPIDLY TYPING IN A RESPONSE TO A SYSTEM PROMPT OR QUESTION WHICH HAS NOT YET BEEN DISPLAYED ON THE SCREEN. THE SYSTEM "MEMORIZES" HIS KEYSTROKES AND THEN ACTS UPON THEM AT FIRST OPPORTUNITY.
EXPERIMENT WITH VERY REMOTELY LOCATED CBBS'S

---
CNTX: LCS WHO: WARREN CELL: AH268 CLASS1: D-EXPER
DATE: Apr 18 SRC: SS CLASS2:

COMM1: CONTACTED BOTH SAN LEADRO HS AND BUFFALO, NY BBS. DISCUSSES CALL TO "OPEN CAMPUS" IN SAN LEADRO, CA. HE TALKED WITH 16YR OLD FEMALE SYSOP. SHE WAS SURPRISED WITH LONG DISTANCE CALL. HE HAS COMPLETE DOWNLOAD OF "OPEN CAMPUS" CALL. ENCOUNTERED MUCH, TYPICALLY RAUNCHY TEEN HUMOR.

---
CNTX: SEARCH WHO: WARREN CELL: N285 CLASS1: D-EXPER
DATE: Apr 21 SRC: SS CLASS2:

COMM1: DISCUSSED CONTACT WITH "ANIMAL FARM" IN BROOKLYN SAID GEARED MOSTLY COMM2: TOWARDS EDUCATORS. FRIENDLY. LEFT MAIL. SAME SOFTWARE AS MODEM MANIA.

At this point, many examples of different kinds of knowledge acquisition have been illustrated from the "Factual Knowledge", "Serendipity" and "Experimentation". In closing out this subdomain, the Francis Bacon's famous maxim, "Knowledge is Power" came to mind. One of the fundamental purposes of obtaining knowledge is also obtaining a measure of power. Power to act. Power to control. Power to answer, and so on.

A strongly expressed theme that came from many students, did, in the author's judgment, offer some of the strongest possible evidence for proving that students were profoundly changed by the experiences presented. They said telecommunications made them feel powerful. Every student in the study made the statement that they felt empowered by exposure to online technology. Consider the examples below.
COMM1: Telecommunications has made me aware of the real power that you have with a computer. I think that telecommunications is one of the most powerful things I have ever experienced.

COMM1: I've been doing computer-related stuff for over five years, and I realize the extent of all the power that we have at our fingertips. Others might not realize that they have nearly the whole world at their feet, and not take advantage of those resources.

COMM1: I realize that this is only the beginning to the world of telecommunications. Just being here. Being around this much information. I know from what I've experienced in class and from what I tell my friends, people are just amazed at what I can do through modems.
Being able to master the technology of online telecommunications has been demonstrated. The project, however, focused attention on students' ability to use the four classes of online services to perform successful searches for information. Presented next is a discussion of
the evidence that students were, in fact, highly successful online searchers.

In examining the question of search success, one must look to the taxonomic categories of "Search Successful" and "Search Unsuccessful". Consider the relative distribution of successful and unsuccessful searches pie-graphed on the next page. It illustrates that students were very successful in finding online resources to answer either their own questions (the final project) or those posed by the teacher/researcher. The data came not only from verbally expressed success, but also from videotaped "screen-shots" of the students' monitors while they were searching online.
The overall success of the project hinged, in part, on the students' ability to successfully obtain needed information from a variety of online sources. The pie chart above clearly indicates that they were successful nearly 90% of the time and some search case histories will be presented after classifying the causes for the much less numerous student search failures.
As noted in Chapter II, why students fail in online search requests is well documented. This study shows that its participants were not immune to making the same kinds of mistakes that have been documented in the library science literature. Nine classes of online search failure are reported below.

1. Failure to search within descriptors in a "closed or restricted indexing vocabulary". The information sought may be present, but under a less-than-obvious descriptor.

2. The subject was indexed under one, but not both descriptors used by the searcher. In one student's case the search for "stealth" occurring in conjunction with "bomber" produced nothing, while searching "stealth" alone was successful in linking the two terms.

3. Use of a meaningless descriptor. Searching terms like "results" are generally fruitless.

4. Incorrect use of Boolean logical operators (and, or, not).

5. Misunderstood topic. Searching for "ex-convicts" and "misdemeanors" was not useful since ex-convicts are generally associated with having committed felonies.
6. Failure to understand an online system's limitations. LCS, for example, indexes journal title, not the articles contained within them.

7. Failure to distinguish between two potential subject headers, particularly those that involve subject matter jargon. One student's search for information on the Apple ImageWriter printer failed merely because he searched under "accessories" rather than "peripherals".

8. Excessive truncation of descriptor. Searching "comp" for "computer" returned far too many disrelated citations ("company", "compass", "compile", etc.)

9. Misspelling of descriptor term(s). A fatal error since most systems do not possess the artificial intelligence to accommodate a keyword misspelling.

Examples of each type of failure are noted below.

**Failure to understand a "restricted search vocabulary"**

Indexing system.

```
CNTX: SEARCH WHO: BECKY CELL: AV279 CLASS1: SRCH UNS
DATE: Apr 21 SRC: SS CLASS2:

COMM1: BECKY PONDERS WHAT LC SUBJECT HEADERS WOULD BE APPROPRIATE FOR APPLE
COMM2: LOGO. (TEACHER SAYS THAT IT IS A BRAND NAME, CHANGE SEARCH)
```

---
Topic indexed under one, but both descriptors

---

CNTX: KI-G WHO: DARYL CELL: J429 CLASS1: SRCH UNS
DATE: May 15 SRC: SS CLASS2:

COMM1: SEARCHED "STEALTH BOMBERS" UNDER "GOVE2" WITH DESCRIPTORS "STEALTH" AND
COMM2: "BOMBER". GOT HITS ON EACH BUT NO INTERSECTION.

---

Use of functionally meaningless descriptor ("results")

---

CNTX: KI-G WHO: DEB CELL: R429 CLASS1: SRCH UNS
DATE: May 15 SRC: SS CLASS2: MISUSE

COMM1: I SEARCHED "APARTHEID" AND "RESULTS" IN NEWS1. GOT 144 HITS ON
COMM2: "APARTHEID", 2065 ON "RESULTS", BUT 0 INTERSECTION.

---

Logical Error: Incorrect use of Boolean Operators ("and not")

---

CNTX: FINAL WHO: ERIC CELL: R503 CLASS1: SRCH UNS
DATE: May 27 SRC: SS CLASS2:

COMM1: TRIES TO SEARCH ("COMPUTER?" AND "CRIME?") AND NOT "SECURITY" (AND NOT COMM2: OPERATOR IS WRONGLY USED) GETTING HITS ON CONCEPT OF (NOT SECURITY)

---

Misunderstood Topic (Ex-cons convicted of felonies, not misdemeanors)

---

CNTX: KI-G WHO: LISA CELL: N429 CLASS1: SRCH UNS
DATE: May 15 SRC: SS CLASS2:

COMM1: I EITHER GOT NOTHING OR A LOT (TOPIC: PSYCHOLOGY OF EX-CONVICTS AND MISDEMEANORS) SEARCHED PSYCH 1 & 2. FIRST GAVE OVER 2000 HITS ON EX-CON, 29 FOR MISDEMEANOR, AND 0 FOR BOTH.
Failure to understand limitations of service

CNTX: FINAL  WHO: MATT  CELL: H513  CLASS1: SRCH UNS
DATE: May 28  SRC: SS  CLASS2:

COMM1: MATT DOING AN "ATS/" (AUT/TITLE) SEARCH ON LCS FOR A MAGAZINE ARTICLE.
COMM2: (THIS IS INCORRECT AS LCS ONLY SEARCHES JOURNAL TITLES NOT ARTICLES)

Failure to distinguish between indexing terms

CNTX: SEARCH  WHO: RAY  CELL: AR279  CLASS1: SRCH UNS
DATE: Apr 21  SRC: SS  CLASS2:

COMM1: SEARCHING SOURCE'S COMPUTER DB CALLED "MICROSEARCH". UNSUCCESSFUL
COMM2: SEARCHING IMAGEWRITER UNDER "ACCESSORIES" RATHER THAN "PERIPHERALS"

Excessive use of truncation (Searching "comp" for "computer" too broad)

CNTX: KI-G  WHO: WARREN  CELL: V433  CLASS1: SRCH UNS
DATE: May 15  SRC: SS  CLASS2:

COMM1: WARREN SEARCHING "1040ST" AND "COMP?". GOT HUGE # OF HITS SCREEN
COMM2: INDICATED "PROCESSING..." MEANING SEARCH TERM BEING FOUND EXCESSIVELY

Misspelling of descriptor

CNTX: KI-G  WHO: BECKY  CELL: AJ436  CLASS1: SRCH UNS
DATE: May 16  SRC: SS  CLASS2:

COMM1: BECKY UNSUCCESSFUL IN 2 BASES ON SEARCHING MICHAEL DEEVER UNTIL SHE
COMM2: REALIZES SHE IS MISSPELLING HIS LAST NAME "DEEVER"
Realizing her mistake...

---

CNTX: KI-G WHO: BECKY CELL: AL439 CLASS1: SRCH SUCC
DATE: May 16 SRC: SS CLASS2:

COMM1: SHE RECONNECTS IN NEWS2 AFTER LOGGING OFF TO FIND
CORRECT SPELLING.
COMM2: SHE NOW FINDS 20 HITS.

---

Moments later, after more searching, Becky cries out...

---

CNTX: FINAL WHO: BECKY CELL: AT565 CLASS1: SRCH SUCC
DATE: Jun 5 SRC: SS CLASS2:

COMM1: "I'M GOING TO HAVE A HELL OF A BIBLIOGRAPHY!"

---

Returning to the discussion of successful searches, the
last question of the study is introduced, question 4.2.

4.2. Did students integrate across the four classes of
services to produce searches superior to any single
service?

To truly speak of search success, one must remember
that the design constructs of this experiment measured
success not only by a student's ability to locate materials
from a single online service, but also via the ability to
blend multiple online resources with traditional offline
resources to produce a search superior to offline alone.
Evidence that students were incorporating online searches
into their own search methodologies was seen as early as May
when second interviews occurred and students' attentions
were focused upon the Hiroshima and Beatles hypothetical
searches. It was noted that the frequency of talk from the
students increased from Hiro 1 and Beatles 1 to Hiro 2 and
Beatles 2. The frequencies are graphed on the next page.
Figure 45. Increase in Volume of Search Talk

Talk about both of the hypothetical searches concerning The Beatles and Hiroshima increased from the entry-point interview to the exit-point interview. Closer inspection of the talk data indicated that the conversations were longer because the students were citing more online sources of information with which to attack the theoretical problems.
To distill and logically present evidence supporting both that the students were successful online searchers and were able to integrate online services to mount searches superior to offline searches, consider the four final project searches from Lisa, Matt, Eric and Warren. They demonstrate both searching success and integration of both on- and offline sources to produce an overall search strategy that is superior to offline alone (or any single online service).

Eric’s final search was directed at locating information on "Hackers" and "Hackees". Its original meaning perverted over the years, today’s "hacker" is a person who, by modem, infiltrates unauthorized computer systems to erase data, damage files, steal information, install "virus" programs, or just explore. The "hackee", of course, is the owner of the assaulted computer system.

Eric’s search was multi-faceted and, like the final projects of all the others, was begun online rather than off. While several students received significant assistance from persons located through electronic mail, none was as spectacular as Eric’s fortuitous find. Through SourceMail to individuals he found in the Member Directory, he was able to attract the attention of a professional computer security advisor and editor of a computer security bulletin. Ostensibly suspecting that Eric’s plea for help was a ruse
and that he was, himself, a pirate, the security expert asked for a written letter of introduction on school letterhead stationery. Eric complied, then received another request for a letter of verification including the teacher/researcher's signature. This was done.

While Eric was waiting, he researched a number of databases on Knowledge Index and remarked to Warren that he was "finding hits absolutely everywhere he looked!". He also received a CBBS contact from a self-professed "hacker" who gave him a number to call and chat with him online. The security expert placed an unexpected long-distance voice call to the high school that resulted in the teacher/researcher being called to the principal's office to verify, once and for all, that Eric's request was legitimate and to explain to the researcher that he wished to have a copy of Eric's work when it was done. He went on to explain that the thick package of material that he was planning to send to Eric contained information that, while not classified, was kept mostly within the reach of the computer security industry. The packet did finally arrive, a few days after the call. Concluding their searches, Eric, like Lisa and Warren then searched LCS and visited the OSU libraries at the end of his search.
ERIC'S FINAL SEARCH

1. ERIC IS DOING HIS FINAL PROJECT ON "HACKERS" VS "HACKEES". HE SEARCHED THE MEMBER DIRECTORY ON THE SOURCE UNDER "PRIVACY(0), PHONE PHREAKING(12), COMPUTER SECURITY(16)".

2. ERIC COMPOSED A LETTER REQUESTING HELP AND UPLOADED TO THE PERSONAL HITS THAT HE FOUND IN THE MEMBER DIRECTORY.

3. ERIC RECEIVED SOURCEMAIL FROM COMPUTER SECURITY ADVISOR TO SEVERAL INTERNATIONAL COMPANIES.

4. ERIC CONTACTED BY MEMBER OF EDITORIAL STAFF OF THE COMPUTER FRAUD AND SECURITY BULLETIN. DOESN'T WANT TO HELP ERIC (AS ERIC COULD BE A HACKER HIMSELF).

5. SECURITY ADVISOR REQUESTS LETTER ON SCHOOL STATIONERY TO CONFIRM ERIC'S LEGITIMATE REQUEST.

6. ERIC GOT SECOND LETTER FROM ADVISOR ALSO WANTING TEACHER'S SIGNATURE.

7. ERIC WANTS SCHOOL STATIONERY TO WRITE TO HIS COMPUTER SECURITY EXPERT.

8. ERIC USES APPLEWRITER TO WRITE TO PHILLIP WEIGHTS OF WEST CHESTER, PA. ON SCHOOL STATIONERY WITH A PLACE FOR TEACHER'S SIGNATURE.

9. TEACHER TELLS GROUP ABOUT RECEIVING LONG DISTANCE CALL FROM PHILLIP WEIGHTS WANTING ONE MORE CONFIRMATION FOR ERIC.
10. ERIC ALSO SEARCHES KI IN LEGAL1 AND PSYCH2, AND GOT 11 HITS. ALSO SEARCHED DESCRIPTORS "COMPUTER" AND "CRIME" ON KI, AND GOT OVER 700 HITS.

11. (EXCITEDLY TO WARREN): WHOA, WARREN. I'M FINDING HITS EVERY PLACE I LOOK, ABSOLUTELY EVERYPLACE.

12. I GOT ANOTHER LETTER FROM A HACKER AND HE GAVE ME A BBS NUMBER TO CALL AND TALK WITH HIM ONLINE.

13. ERIC SEARCHES KI'S BOOKS IN PRINT UNDER "CRIM?" AND "COMPUT?" AND "HACK?" AND "SECURITY". HE GETS 9 BOOKS.

14. ERIC TELLS TEACHER, "I'M PUTTING IT ALL TOGETHER, IT IS HARD TO FIND SOME JOURNALS, BUT I HAVE NOT BEEN TO OSU."

In this next search, Lisa is looking for information on Star Wars, but she doesn't mean the movie, but rather former President Reagan's nuclear defense plan. After locating movie reviews and interviews with Harrison Ford, et al., she finds out from others in the group that the "Star Wars" she seeks was actually referred to as "The Strategic Defense Initiative" or "SDI". Her search employed Knowledge Index's MAGA or Magazine Index (the popular press), NEWS1 (current news), and Books in Print. She sought help from private individuals via the member directory on The Source and then searched LCS for the citations she had found. Lastly, she visited the actual library to photocopy what she already knew to be there. The statements are choppy, though in correct chronological sequence.
1. LISA: GETS 58 HITS ON STAR WARS IN "BOOKS IN PRINT" DBASE.
2. LISA: DOING PROJECT ON SDI BUT DOESN'T KNOW PROPER NAME (STRATEGIC DEFENSE INITIATIVE) SO SHE GETS HITS ON STAR WARS. (MOVIE)
3. LISA: HAS CORRECT NAME FOR SDI AND IS USING THE "AND" OPERATOR TO LINK ALL THREE WORDS. ("STRATEGIC" AND "DEFENSE" AND "INITIATIVE".)
4. LISA: GOT 20 BOOK HITS FROM SDI. LOTS OF HITS FROM NEWS1 AND MAGA. NO LACK OF INFO.
5. LISA: GETS REPLY FROM A USER WHO SAYS, "YOU SOUND LIKE QUITE A WOMAN, I AM IMPRESSED BY YOUR THIRST FOR KNOWLEDGE; IT REMINDS ME OF WAY BACK WHEN...". HE LATER MAILS HER A LIST OF SOURCES AS SDI WAS SOMETHING OF A HOBBY TO HIM.
6. LISA: "I'M GETTING SOME GREAT MAIL HERE!" (LISA TURNED OUT TO BE A GREAT FAN OF ELECTRONIC MAIL).
7. LISA: WENT TO OSU LIBRARY AND GOT BOOKS FROM LCS SEARCH. GOT MANY ARTICLES AND MICROFICHE.

Matt, who left the class without finishing, did not wish to engage in the final project. As related much earlier, he didn't "need" the course credit for graduation. As a result, he tried various tactics to minimize the amount of work needed to produce the final paper. He asked if he could redo an old paper and then compare the old, offline
version with a new, online-searched version. Assured that he could as long as it was a complete rewrite, he began to search online for information relevant to his old topic, "Running". He was quickly overwhelmed with information as "running" is a broad topic. It was then he realized that he could focus his topic not by adding just one additional search descriptor, but two, and still have sufficient resources. Instead of searching for "running", he narrowed the subject by adding the descriptor, "Anorexia" and was successful, but still overwhelmed with "hits". Going still another step, he added "Cystic Fibrosis" or "CF" and got a very tightly focused, but successful search. Matt never finished, but his drastically redefined and narrowed search was clear recognition of the power of online searching to provide more information on more specific topics than perhaps ever before.
MATT: MY TOPIC (RUNNING) IS TOO BROAD, WORKING TO NARROW (HE WANTS TO CONTRAST AN OLD OFFLINE PAPER WITH SAME TOPIC ONLINE). I DID THREE TOPICS BEFORE BUT KNOW I NEED TO NARROW IT DOWN.

TEACHER: COULDN'T YOU HAVE DONE THAT THE FIRST TIME AROUND?

MATT: NO, TOPIC SOURCES WERE FEW AND BROAD. I KNOW NOW MORE ABOUT HOW AND WHERE TO LOOK AND HOW ONE SOURCE WILL LEAD TO ANOTHER.

COMM1: I FOUND OVER 800 HITS IN "MEDI" DATABASES ALONE. (MATT DOES MOST OF HIS SEARCHING IN KI DATABASES.)

COMM1: SUCCESSFULLY SEARCHES SUBTOPIC OF OLDER PAPER NARROWED TO RUNNING AND ANOREXIA.

COMM1: FURTHER NARROWING SEARCH TO INCLUDE CYSTIC FIBROSIS. HE IS SUCCESSFUL.

Warren's search for his final project centered on computer piracy, the telecommunicated theft of commercial, copyrighted programs. His search began with an offline-composed letter requesting assistance that he then uploaded to a number of bulletin boards. Next, he searched the member directory of The Source and found that most persons interested in his topic did not care to announce that fact publicly. Only after closer examination of the directory did he discover that euphemisms were used to cloak
an interest in piracy. Terms like, "program sharing", "software trading", etc., were more commonly used. He sent blanket SourceMail to the people requesting the system itself send an electronic acknowledgement so he would know if and when the recipients had read his message. He also "blind-copied" his messages so the recipients would not know the message had been sent to many others. Out of his 120 letters, he received 44 responses. These sources would likely have been unreachable by offline, conventional searches. He also contacted The Source's customer service department and received SourceMail as to what his specific questions on piracy were. Next, he searched knowledge Index with five descriptors and got back 42 hits. After assuring the teacher/researcher that he was experiencing no problems, he searched LCS for the location of his KI hits. Then, like Lisa, he visited the library last spending a Saturday photocopying forty sources for his paper. As one can see in step nine below, Warren was very pleased with his new search strategy.

2. Warren: "Leave me a message on this board or send source mail to MKT 065." He also leaves his home address and phone number.

3. Warren: Searches member directory under "interests in piracy" and discovers members use euphemisms such as trading or trading strategies (80 ID's).

4. Warren checking results of his bulk mailing. Many acknowledgements. Still many marked "returned addressee unknown". Sent 120, back 44.

5. Warren: Searching Ki under "comp?" and "crime?". He joins that with ("law?" or "legis?"). Finally adds "protect?" and gets 42 hits.

6. Gets source email from source customer service wanting to know what specific questions he has about piracy.

7. Warren says to teacher that he's having no problem with topic. Using BBS's, Ki, and member directory on the source to find persons with interests in the area of his topic.

8. Warren: Spent Saturday at OSU. Was very successful. Actually leaving with 40 sources to write his paper with.

9. Warren says: "It's great! Usually more specific topics yield smaller bibliographies. Not the case here. I got 40 sources on a smaller topic."
Integration of Online Services for Final Project
Number of Students (n=7) Using Each Service

Figure 46. Integration of Multiple Online Services

A cornerstone of the project, the ability to form a search strategy that integrated more than one online service was considered important. Those types of searches generally produced information not readily available via traditional, offline means. The chart shows how many students used each type of service in researching their final projects. All students used at least three of the available four services, and two used all four.
INTEGRATION OF MULTIPLE ON- AND OFFLINE SOURCES

To demonstrate both search success and online/offline integration, we must consider the following flow charts that were drawn by students during the entry- and exit-point interviews in response to the two hypothetical searches, "The Effect of the Bombing of Hiroshima During the Second World War" and "The Impact of The Beatles On Popular Music".

The entry-point drawings were presented earlier in this chapter to provide information on question number two, which concerned how students searched prior to the experiment. Now, presented in pairs, the first chart (labeled "Hiro 1" or "Beatles 1") shows how the students would have initially searched out information to address each question. All of the first drawings were offline, via conventional search means. The second drawing in the pairs represents the students' search of the same topic after being exposed to online search technology. All show strong shifts towards online research and integration of multiple online services as well as a less linear and encyclopedia-oriented search.

Sometime after the project's conclusion, the author found the flow chart shown in Appendix C. It was put out by The Ohio State University Libraries and designed to assist students in performing a complete and well-rounded search for information. When compared to the exit-point flow charts of the students, there emerged some striking similarities. The dendritic pattern of the OSU search was
mimicked by the students' charts as were the basic choices of sources. But whereas OSU's search was totally offline, the students' search reproduced the same completeness online. Encyclopedias for an overview were often present. The use of LCS was present. Journal articles (via Knowledge Index) were present. And OSU's "Other Sources" were also included in the students' searches via Knowledge Index's online databases. For example, OSU's "Biographical Indexes" would roughly equal KI's "Who's Who"; "U.S. Government Documents" is much like KI's "GOVE1 & 2", and so on. One interesting difference was that the OSU search began in the library, while most of the students' searches ended in the library.
Figure 47. Becky: BEATLES 1 Entry Search Strategy
Figure 48. Becky: BEATLES 2 Exit Search Strategy
Figure 49. Warren: BEATLES 1 Entry Search Strategy
Figure 50. Warren: BEATLES 2 Exit Search Strategy
Figure 51. Warren: HIROSHIMA 1 Entry Search Strategy
Figure 52. Warren: HIROSHIMA 2 Exit Search Strategy
Figure 53. Lisa: BEATLES 1 Entry Search Strategy
Figure 54. Lisa: BEATLES 2 Exit Search Strategy
Figure 55.Lisa: HIROSHIMA 1 Entry Search Strategy
Figure 56. Lisa: HIROSHIMA 2 Exit Search Strategy
Figure 57. Debbie: BEATLES I Entry Search Strategy
Figure 58. Debbie: BEATLES 2 Exit Search Strategy
Figure 59. Debbie: HIROSHIMA 1 Entry Search Strategy
Figure 60. Debbie: HIROSHIMA 2 Exit Search Strategy
Figure 61. Eric: BEATLES 1 Entry Search Strategy
Figure 62. Eric: BEATLES 2 Exit Search Strategy
Figure 63. Eric: HIROSHIMA 1 Entry Search Strategy
Figure 64. Eric: HIROSHIMA 2 Exit Search Strategy
Of particular note were Eric's elaborate, albeit offline searches drawn during both the entry- and exit-point interviews. Being perhaps the most computer-oriented student in the study, it was interesting that no online services were mentioned in either of his searches. When questioned about the seeming anomaly, he responded like this:

Q: And an interesting thing I noted that in neither of your searches did you mention any online sources. Is there any particular reason?

A: Well, it's because, kind of at this point, access to them, other than in here, is rather limited.

Q: What if they had been broadly available or you had it at home? Would it have affected your answer at all?

A: Maybe, depends on the subject matter I was searching for. If I thought it was worth my time and money to call up CompuServe or the Source, yes, I would.

Q: What if you didn't have to foot the bill?

A: That would be a different story altogether!

Q: So, what you're saying is your search strategy in some degree is dependent upon money.

A: To some degree.

Q: In other words, you would use some things differently than what you've said if you didn't have to be concerned about the cost of it.

A: Right.

Q: Okay.

A: Like, hey, I can go to KI psychology and type Hiroshima and probably get almost everything I needed.
In concluding this analysis, the author suggests that change is the most important entity discovered in this natural experiment in curriculum intervention. When one perceives value in new knowledge, one tends to incorporate that knowledge into one's repertoire of dealing with reality and thus, change occurs as one's knowledge grows. A large body of student talk generated a final taxonomic category for analysis that was indexed as "change". These comments were so classified because they tied together a set of common thoughts widely expressed by the group that all related to a shift from a previously held position. The major areas of change were:

A. A shift away from short, linear searches that were directed primarily toward heavy reliance on the use of encyclopedias as primary sources.

B. A realization that the best use of encyclopedias was to provide an overview of topic, not exhaustive research on it.

C. A desire to change old search strategies for the combination online/offline strategy presented by the project.

D. A reluctance to return to offline searching at the project's conclusion.
E. A perception that the final projects, containing the information that they did, were not possible to produce by conventional offline means.

F. A perception that online searching expands a student's time by compressing the length of time needed to find materials, thus giving more time for synthesis and writing.

G. A positive shift in attitudes about libraries and the availability of sufficient sources for meeting the demands of school papers, projects or presentations.

Below are examples from the talk database confirming the statements above. At the end, are statements of personal change from Lisa, Warren and Eric.

Perceived expansion of time

CNTX: OVERALL WHO: BECKY CELL: AB575 CLASS1: CHANGE DATE: Jun 6 SRC: SS CLASS2:

COMM1: ACADEMIC CLASSES EXPECT AN HOUR OF STUDY/NIGHT. IT IS TOO MUCH. WHO HAS COMM2: TIME? THIS EXPANDS TIME. COMPRESSES SEARCH TIME. GIVES MORE WRITE TIME.

CNTX: LCS-RP WHO: DEB CELL: 1 CLASS1: CHANGE DATE: Apr 16 SRC: LCS-RP CLASS2:

COMM1: It saves the student time from manually searching for a book and lets the computer do the work. This allows the student more actual studying time.
Perception that final project could not have been done by offline methods.

CNTX: OVERALL WHO: BECKY CELL: A2575 CLASS1: CHANGE
DATE: Jun 6 SRC: SS CLASS2: 

COMM1: YES, I COULD NOT HAVE DONE THIS PAPER AS CURRENTLY AS IT IS, NOR AS SPECIFIC. (T: HAVE YOU CHANGED YOUR SEARCH STRATEGY OVER THE SEMESTER?)

COMM2: I HAVE INFORMATION IN MY PAPER AS RECENT AS 3 DAYS AGO.

COMM1: SAYS SHE WOULD NOT HAVE CHosen THE TOPIC THAT SHE DID IF ONLINE SEARCHING WERE UNAVAILABLe.

COMM1: IT'S JUST TOO MUCH WORK TO DO THE SAME TOPIC CONVENTIONALLY (OFFLINE).

COMM1: NODS AGREEMENT WITH BECKY'S CHANGE IN SEARCH STRATEGY. COMM2: CONCERNING ON VS. OFFLINE PROJECT "DO-ABILITY"

INTQ1: AGREING THAT PROJECT WASN'T DO-ABLE VIA CONVENTIONAL OFFLINE MEANS

COMM1: SAYS HE WOULD NOT HAVE CHosen THE TOPIC THAT HE DID IF ONLINE SEARCHING WERE UNAVAILABLe.
For all participants, there was a very strong shift away from encyclopedias for major research and the recognition that they best serve to provide a topical overview. Contrast these statements with those recorded earlier in the project from "Entry-Search", "Hiro 1", and "Beatles 1".
...NOT AS A PRIMARY SOURCE. (REFERRING TO ENCYC.)

NOT ANY MORE...
COMM2: (T: ONCE UPON A TIME YOU SAID THEY (ENCYC.) WERE A PRIMARY SOURCE.)

THE PROBLEM WITH ENCYCLOPEDIAS IS THAT THEY DON'T GIVE YOU A CHANCE TO BRANCH OUT LIKE "THE SOURCE" DOES. ENCYCLOPEDIAS PROVIDE SELF-TERMINATING SEARCHES.

COUPUT

(T: HOW DO YOU FEEL ABOUT ENCYCLOPEDIA ARTICLES FOR WRITING PAPERS?)

THEM (ENCYC.) STILL HAVE THEIR USE BUT NOT AS A PRIMARY SOURCE.
COMM2: (T: WHAT ABOUT ENCYCLOPEDIAS NOW?)

I FOUND MYSELF USING MORE JOURNALS AND LESS BOOKS. COMM2: (AS A RESULT OF THE PROJECT)

THEY'RE (ENCYC.) GOOD FOR BACKGROUND INFO. ONLY.
COMM1: EXTREMELY MEDIocre
COMM2: (T: HOW DO YOU FEEL ABOUT ENCYCLOPEDIA ARTICLES FOR WRITING PAPERS?)

COMM1: NONE OUT OF 7.
COMM2: (T: HOW MANY OF YOU USED AN OFFLINE ENCYCLOPEDIA?)

Resistance to returning to offline searches at project's conclusion.

COMM1: BECKY IS UPSET ABOUT DOING FUTURE WORK OFFLINE. DOESN'T WANT TO GO BACK
COMM2: TO CARD CATALOGS (WHEN PROJECT ENDS).

COMM1: GROUP LAUGHS, MAKES JOKES ABOUT "BEAR SKINS AND KNIVES".
COMM2: (IN RESPONSE TO BECKY'S RELUCTANCE TO GO BACK TO CARD CATALOGS)

Change in attitudes about libraries.

COMM1: I remember when I used to think of the Bexley Public Library as a "big" library. I used to think the Bexley Library was a great place, and maybe even the best place to carry out a massive research. I know now that I have more available to me than a few public libraries.
COMM1: I now feel comfortable with using such a large library. I also feel it will benefit my further use of libraries because I now understand how to use them.

Personal Change - Warren:

COMM1: Has the way in which you locate info changed much over past few years
COMM2: No, it hasn't, not until this class.

COMM1: Has telecom. exper. in any way changes the way you think about finding
COMM2: info? W: (Yes) Instead of physically going, it's easier using telecom.

COMM1: (ON THE ENTIRE EXPERIENCE): IT HAS CHANGED HOW I THINK ABOUT COMPUTERS
COMM2: AND INFORMATION, AND HOW I USE THEM/IT. (HE PURCHASED A MODEM)

COMM1: Yes, I might say to the point that this might replace what I've been
COMM2: previously doing, going to the lib. and doing-looking for books.

COMM1: W: I thought about using telecom. to replace the method I've been
COMM1: I hope that by the end of this course, I will consider dialing The
COMM2: Source for information just like a daily routine in
life.

COMM1: Yes. I hope that after completing the course, I will be able to inform others about telecommunications.
COMM1: T: So this has (project) affected your personal life in some way?

Personal Change - Lisa:

COMM1: T: Has telecommunications changed the way that you look for info?
COMM2: L: Yes. It has really changed the way I think about computers and about using them to get information.

COMM1: T: Now, why would you go to the library last? L: Because I figure I’ll probably find—if that (the lib) has anything, I’ll find it through KI. T: You’re saying you’d go to the library after you’ve done other kinds of searches that lead you to the library? L: Right. T: Instead of going to the library as your primary source first? L: Uh-huh. By doing this I’ll probably find definite books in these libraries and I can go straight there instead of looking through the library first.

COMM1: T: Has this made things easier for you or harder?
COMM2: L: I think it has made it easier.
Personal Change - Eric:

COMM1: I think so. I've realized that there are other places starting to get
COMM2: through this old, hard head of mine that they can be utilized.

INT.01: Has telecommunications, and being exposed exposed to these sorts of
INT.02: things (4 online services) changed the way you think about getting info

COMM1: Well, like in the past, I've always used encyclopedias, libraries,
COMM2: but now I realize that Source & DIALOG is open to us.

INT.01: It what ways has this experience changed how you think about
INT.02: searching for info?

COMM1: DIALOG it kind of makes you want to forget those other ones, you say
COMM2: "Hmm, nothing in there, go to KI, run twenty million citations."

INT.01: It what ways has this experience changed how you think about
INT.02: searching for info?

COMM1: Like, hey, I can go to KI psychology and type Hiroshima and probably
COMM2: get almost everything I needed.
COMM1: I know that (since) I've discovered OSU, I plan to start using it if I ever have the need to. Like, they have all these sub-libraries.

INT.Q1: Would you say that size makes any difference in your feeling about
INT.Q2: the library?

The table below serves to summarize the findings presented in this chapter. The "Change Parameter" is listed down the "Y" axis with "Entry-Point" and "Exit-Point" characteristics across the "X" axis.
<table>
<thead>
<tr>
<th>CHANGE PARAMETER</th>
<th>ENTRY-POINT</th>
<th>EXIT-POINT</th>
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<tbody>
<tr>
<td>KNOWLEDGE BASE:</td>
<td></td>
<td></td>
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<tr>
<td>TELECOMMUNICATIONS TECHNOLOGY</td>
<td>LOW TO NONE</td>
<td>HIGH</td>
</tr>
<tr>
<td>ONLINE SERVICES</td>
<td>LOW TO NONE</td>
<td>HIGH</td>
</tr>
<tr>
<td>ONLINE SEARCH TECHNIQUES</td>
<td>NONE</td>
<td>HIGH</td>
</tr>
<tr>
<td>LIBRARY USE</td>
<td>LOW TO MEDIUM</td>
<td>MEDIUM TO HIGH</td>
</tr>
<tr>
<td>SEARCH STRATEGY:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LENGTH OF SEARCH CHAIN</td>
<td>SHORT</td>
<td>LONGER</td>
</tr>
<tr>
<td>SOURCE FOCUS</td>
<td>ENCYCLOPEDIAS</td>
<td>JOURNALS</td>
</tr>
<tr>
<td>TOPIC DEPTH</td>
<td>BROAD</td>
<td>NARROWER</td>
</tr>
<tr>
<td>USE OF PROF. JOURNALS</td>
<td>LOW</td>
<td>HIGHER</td>
</tr>
<tr>
<td>NUMBER OF SOURCES</td>
<td>LOW</td>
<td>HIGHER</td>
</tr>
<tr>
<td>PERCEPTION OF AVAILABLE SOURCES</td>
<td>LOW TO MEDIUM</td>
<td>HIGH</td>
</tr>
<tr>
<td>LINEARITY</td>
<td>LINEAR</td>
<td>DENDRITIC</td>
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<tr>
<td>WHERE BEGUN</td>
<td>OFFLINE</td>
<td>ONLINE</td>
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<tr>
<td>WHERE ENDED</td>
<td>OFFLINE</td>
<td>OFFLINE</td>
</tr>
<tr>
<td>ON-OFFLINE INTEGRATION</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>MULTIPLE ONLINE SOURCES</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>SEARCH SUCCESS</td>
<td>LOW TO HIGH</td>
<td>HIGH</td>
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<tr>
<td>SATISFACTION WITH RESULTS</td>
<td>LOW TO HIGH</td>
<td>HIGH</td>
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<tr>
<td>AFFECTIVE RESPONSES TO:</td>
<td></td>
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<tr>
<td>CBBS’S</td>
<td>N/A</td>
<td>POSITIVE</td>
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<tr>
<td>LCS</td>
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<tr>
<td>KNOWLEDGE INDEX</td>
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<tr>
<td>THE SOURCE</td>
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<tr>
<td>TEACHER/RESEARCHER</td>
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<tr>
<td>ONLINE SEARCHING</td>
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<td>POSITIVE</td>
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Figure 65. Entry- and Exit-Point Change Parameters
In summary, this chapter has presented evidence to answer the four major question sets posed by the design of the study insofar as they pertain to the specific participants involved. Conclusions will be drawn from this analysis in Chapter V.
CHAPTER V
CONCLUSIONS

RESTATEMENT OF THE STUDY'S PURPOSE:

This research was conducted to obtain data concerning (A.) How secondary students searched for information in response to the demands of school, (B.) How they perceived and affectively responded to, four classes of online services; (C.) Whether or not they could master the technology and logical skills involved in online searching, and (D.) The degree to which students could integrate multiple online services with traditional offline sources to design and execute a search strategy superior to that generated by a single online service or by conventional offline means only.

Figure 65, first introduced in Chapter IV (page 431) is reproduced on the next page as it serves as a summary of the study's major findings and provides a structured list from which they can be sequentially discussed. Following the presentation of major findings, some post-analysis observations are offered as well as some directions for future research.

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<td>MEDIUM TO HIGH</td>
</tr>
</tbody>
</table>

| SEARCH STRATEGY:                             |               |            |
| LENGTH OF SEARCH CHAIN                      | SHORT         | LONGER     |
| SOURCE FOCUS                                | ENCYCLOPEDIAS | JOURNALS   |
| TOPIC DEPTH                                 | BROAD         | NARROWER   |
| USE OF PROF. JOURNALS                       | LOW           | HIGHER     |
| NUMBER OF SOURCES                           | LOW           | HIGHER     |
| PERCEPTION OF AVAILABLE SOURCES             | LOW TO MEDIUM | HIGH       |
| LINEARITY                                   | LINEAR        | DENDRITIC  |
| WHERE BEGUN                                 | OFFLINE       | ONLINE     |
| WHERE ENDED                                 | OFFLINE       | OFFLINE    |
| ON-OFFLINE INTEGRATION                      | NO            | YES        |
| MULTIPLE ONLINE SOURCES                     | NO            | YES        |
| SEARCH SUCCESS                              | LOW TO HIGH   | HIGH       |
| SATISFACTION WITH RESULTS                   | LOW TO HIGH   | HIGH       |

| AFFECTIVE RESPONSES TO:                     |               |            |
| CBBS'S                                       | N/A           | POSITIVE   |
| LCS                                         | N/A           | POSITIVE   |
| KNOWLEDGE INDEX                             | N/A           | POSITIVE   |
| THE SOURCE                                  | N/A           | POSITIVE   |
| TEACHER/RESEARCHER                          | N/A           | POSITIVE   |
| ONLINE SEARCHING                            | N/A           | POSITIVE   |

Figure 65. Entry- and Exit-Point Change Parameters
CHANGE IN KNOWLEDGE BASE

From the standpoint of producing a change in the participants' knowledge base, the data presented by this study indicate that students can readily master: (A.) The technical aspects of telecommunications (modem operation, modem software, file up- and download, etc.), (B.) The operation of all four types of online services presented (DIALOG, The Source, LCS, and Computerized Bulletin Board Systems), and (C.) The boolean logical skills necessary to conduct an effective descriptor-based information search. The students were clearly able to manipulate all four classes of services even within a single classroom period. In fact, while DIALOG was seen by a majority of students as perhaps the most academically useful service, all students perceived that the integration of multiple services generally yielded the most satisfactory search results often by serendipitous means.

With regard to increase knowledge of offline, conventional information sources, most participants reported that the project had imparted to them a better understanding of library search techniques and the need for establishing online circulation systems such as LCS to manage large collections. Most reported a positive shift in their attitudes about libraries after exposure to a truly large
library system with a shelf list in the millions (The Ohio State University Library system).

CHANGE IN SEARCH STRATEGY:

Students entered the project with largely self-devised search strategies. These strategies were often quite short, linearly-arranged and tended to focus on heavy encyclopedia use. Journal citations were relatively uncommon in prior work. Research topics were oriented toward concepts rather than issues and the students expressed a strong desire to finish their projects/assignments quickly, using the smallest number of information sources that would allow completion of the assignment. All felt that their strategies were functional as teachers generally accepted their work and graded it satisfactorily (by the students' own standards). Searches generally began using home libraries, and then progressed to public libraries within close proximity. Despite the fact that the students' own high school library had the most extensive shelf-list of any school in its athletic conference (>20,000 titles), most students paradoxically did not consider it to be a useful source of information.

Physical closeness to the student and shelf-list size of a library were deemed important selection factors in choosing a library. No students were using online searching for academic purposes at the study's onset.
When students exited the environment, their search strategies had radically altered. As shown by the flow charts in Chapter IV, the students' searches became longer, more dendritic, showed evidence of recursion and demonstrated a marked shift away from encyclopedias and toward journal articles. The topics students chose for their final independent projects were, by the students own admission, much more tightly focused than previous offline efforts and, (also by their own estimation), incapable of being readily accomplished by conventional, offline means.

Unlike most information searches that both begin and end in a library, a number of this project's students developed a view of a library as a last, rather than first destination when seeking information. They strongly preferred to locate needed information via the integration of the four online services studied to locate needed sources. Next, they contacted LCS and searched for the materials whose existence they had established online. Lastly, they visited a library armed with a printout of materials which they already knew existed and were available. This is in marked opposition to the way most secondary level research is organized and conducted.
SOME POST-ANALYSIS OBSERVATIONS:

In reviewing the question set posed by this study it is apparent that as a curricular intervention, the project was an almost unqualified success. It was successful not only in having been able to answer its own research questions, but also in that it made a positive contribution to its own participants. Instead of sacrificing time and energy to take part in the research, the students uniformly exited it with new skills and positive affective changes in their attitudes toward information search and retrieval. All of the questions related to online exposure were answered positively. The data indicates that students can master online telecommunications technology and they view online services positively. Most importantly, they can integrate multiple online sources with conventional offline sources to produce search strategies superior to offline alone or to any single online service.

Without exception, the students liked what they were doing and they perceived great value in online telecommunications technology. Differing demographics appeared to have no effect on the overall outcome. Transfer of training was demonstrated as some students went out and bought modems, others bragged to friends and brought them to class, and all said that the experience had fundamentally changed the way they thought about gathering information.
Many reported a change in their previously negative attitudes and now felt well-equipped to deal with the information demands placed upon them by school. Even when all said that their search strategies had not changed in recent years, all left expressing profound change and in a manner that they found to be positive. Becky jokingly said, at the end, "You WARPED us!".

Empowerment was an oft-cited change parameter and it is concluded that telecommunication technology is a powerful change agent in giving students more information searching options and greater control over how they conduct research. After dealing with what they described as marginal library facilities and poor instruction in library use and search strategy formulation, it was both exciting and gratifying to see a group of adolescent students of all academic backgrounds actually be thrilled by sheer quantity and availability of information.

Perhaps the education community has been doing a greater disservice to students than previously thought. Apparently, teaching students how to use a card catalog in elementary school, never formally approaching the concepts involved in search strategy, and providing minimal printed collections is simply insufficient and sets students up to fail and develop negative attitudes about information
searching. We, as educators, often complain about "research by copied encyclopedia", yet we may, in fact, be its ultimate causation and primary source of reinforcement.

Students generally write broad encyclopedic papers and deal with discrete concepts rather than issues because the assignments they're often given encourages it and thus, the cycle repeats ad infinitum with teachers dissatisfied with the quality of student research and students frustrated by their own perceived information limitations. Yet, no one breaks the chain. Perhaps it is because most educators don't actually see their students working on assigned papers. They just make the assignment, set the deadline and move on. They don't accompany their students to the local branch library, and actually see the behaviors that the students in this study related with such consensus. Days or weeks pass and the students turn in their papers. All done by similar, limited means, the papers are often homogeneous, shallow overviews that get passed by sheer quantity. And the cycle starts anew.

Based upon what the researcher has seen and heard from students throughout the project, he is concerned how students can justifiably be expected to conduct college-level research, in libraries with shelf lists in the millions after graduating from twelve years of public
schooling with such minimal research skills. It is, indeed, a prescription for failure.

As Warren, who went on to be named the senior class valedictorian said, "Teachers accept my papers, they grade them well....there is no reason for my search strategy to have changed." And yet, despite his stellar academic credentials, he was one of the biggest proponents of short encyclopedia-based research and harbored very strong negative feelings toward libraries.

In retrospect, it seems that for many years these students had been plodding along, making up their search strategy as they went along, poorly using libraries that they didn't like, feeling like something was wrong, but not clearly knowing what it was. After all, everybody did what they did. It was just how things were done. It was a case of self-justification by sheer ubiquity. It is suspected that part of the reason for the students' glowing emotionally exuberant responses to online technology was that it was seen as the answer to their question, "Is this all there is...?". So many years of quiet frustration were dispelled within just three months as students shifted from intense dislike of information searching to a state in which it acquired game-like, enjoyable qualities.
Another reason for students' positive response to the project was that it *maximized time* and *minimized physical movement*, both of which were perceived as important. Budgeting time is very important in the lives of today's students, many of whom tend to be over-involved with a myriad of activities besides school per se. Telecommunications was viewed as helpful because it compressed search time by keeping students from manually dealing with card catalogs and physically moving all over a library, often not finding what was sought. In mere seconds, a search through appropriately chosen databases on DIALOG can return vastly more than enough citations to write the average, topically-broad high school research paper. A second phone call, to an LCS-type circulation control system can identify the location and availability of the citations chosen by the student. Then, after two phone calls, sitting in one place, the student can get to the library and retrieve sources that he or she *already knows are there.*

This strategy is a somewhat backward approach to what most students do in conventional, offline searches. Offline research generally implies going to the library *first*, with *no sources* and then beginning the slow, laborious process of, A. finding what the library has on the topic and then, B. physically setting out to find them and hoping that they're available. And the smaller the shelf list of the
library, the more frustrating this time-worn technique becomes as there is less to find on any given topic. It is suggested that, however inadvertently we as educators do it, setting up conditions that frustrate students and turn them away from the joys of learning constitutes educational malpractice.

The are many variables involved in executing an school project, paper or presentation. This research has demonstrated that manipulating those variables can lead to improved finished products. By making online search services broadly available in schools, students can maximize their synthesis and writing time by compressing search time. It also maximizes the students' limited time and energy resources by allowing them to complete much of their search from home or school and then visit the library last, to pick or photocopy those sources that they have already identified as useful and available.

All the project's participants were impressed by how much more information was available to them than they previously thought. Never heard during the study were the commonplace excuses, "I couldn't find anything on it in the library.", or "It's not in the encyclopedia!" This research presented students with options and new ways of doing old things without the frustration and loss of time so common to offline research. The old, "I can't find anything on it in
the encyclopedia," excuse simply became invalid. Students learned quickly that encyclopedias were not the repository of human knowledge and that failing to find one's topic in them meant changing one's subject. When students once tried searching the medical database "MedLine" under the descriptor, "Heart" the computer responded with, "processing..., processing..., processing..., processing, etc.," until finally it stopped the search saying that the citations located were astronomical in number and the search must be narrowed.

As though a switch had been thrown, the students realized how broad their earlier papers had been and how unnecessarily so. They now had the world's largest library at their fingertips and no topic was too obscure. In fact, students began playing games with each other, trying to come up with a topic on which the others couldn't locate information. The challengers were rarely successful.

But what is even more remarkable was that these teenagers were playing this "game" in the first place. Seeing that there was information readily available led students to exhibit another non-typical behavior, focusing and narrowing their search topics. Jeff thought he really had an obscure (for high school) topic for his final project, one he picked deliberately to see if the systems would deliver him sufficient information. On the topic of
"Fast vs. Slow-Twitch Skeletal Muscle Fibers" he gathered over 1,400 citations from Knowledge Index alone. He was overwhelmed and went back to further tighten his topic.

Similarly, Warren, in the second interview, perceived the broadness of hypothetical search on the bombing of Hiroshima. Before he started to describe his search, he made several efforts to get the researcher to narrow the question for him. He kept asking, "What kind of effects? Political? Military?, Medical? From the Japanese perspective or the American?," and so forth.

Lisa, at the project's conclusion decided to actually search for information on the second hypothetical search, "The Impact of The Beatles on Popular Music". Searching "Magazine Index", the popular press database, Lisa seemed pleased when she walked up to the researcher and handed him a printout of close to 400 "hits" on The Beatles, and said, "I thought you'd just like to know."

None of this focusing behavior was demonstrated at the project's beginning. Perhaps with the availability of online resources teachers could make more focused demands on their students forcing superior, yet "do-able" searches that would employ encyclopedias merely as a source of overview, introductory information, a "whistle-stop" on the way to serious scholarly research.
Similarly, students may be encouraged to work on topics that lie slightly outside the mainstream of most high school papers. That is to say, searching for information on issues, not concepts. For example, most of the students had difficulty with the search for information on The Beatles' impact on pop music. They knew it wasn't encyclopedic, but one said she would still look, though she expected not to find anything because it was so long ago. Warren said he felt the topic was difficult to search because it wasn't academic. Something about researching the most popular musical group in western history and the profound impact that they exerted on music, on dress, on hairstyles, etc., was not academic.

It appears that students, ostensibly in silent partnership with their teachers, have set up an implicit set of rules governing what is an appropriate subject on which to do a paper. It may be that both have fallen victim to years of exposure to information sources so small and restricted in depth and breadth, that the concept of searchable "academic topics" has been reduced to some diluted common denominator dependent upon whether the topic in question passes the litmus test of being so significant that information of it is contained in every library, everyplace. Perhaps research is warranted in this area to determine how the appropriateness of "academic topics" for
papers is arrived upon. What are the rules? Would online assistance help broaden the definition?

**CONTEXTUALIZED CHANGE:**

One major conclusion drawn from this research is that school, like any other social institution, is rule-governed and produces **contextualized behaviors**, those that occur only when one is in a particular environment. This study looked for evidence of change over time and that was clearly demonstrated by all of the participants. The permanence of the changes can only be speculated upon. Maybe these students went on to become tremendous online searchers. Maybe their skills and new behaviors eventually become extinct.

Eric, however demonstrated a contextualized change that was less dependent upon the linear passage of time. His changes were dependent upon his immediate surroundings and he moved in and out of two completely different search strategies, one totally offline and the other online. Even in his exit interview, Eric drew a basically linear, completely conventional, offline search in response to both the Hiroshima and Beatles questions.

This position was considered by the researcher as quite paradoxical, as Eric was certainly one of the project's champions, going on at great length about how exciting and
useful online searching was. But when asked to draw his searches in May after experiencing all four services, he chose to go offline exclusively. When pressed for an explanation to the seeming contradiction, Eric stated that he knew the project was just that, a transient piece of research that in a matter of days was going to vanish. He realized that however useful he perceived the technology, it really wasn’t going to be a part of "real" school. He had no long-term access and therefore while professing great pleasure with online searching, he went back to what he had always done because that was what was going to be left. While in class, he was amazing to watch perform online searches. For a person of his young age, he had remarkable computer operational and logical skills. But it didn’t matter. After the project would shut down, he knew that the old realities would reappear in an instant and he changed his overt search behaviors in anticipation.

**Sampling Unit:**

A great amount of educational research is performed by a researcher/visitor who would have access for limited amounts of time. It is somewhat rare to find a situation where a researcher can stay in the studied environment all day, every day, for an entire course’s duration. Because of the smaller time spent in the classroom, the design of much research tends to select a smaller time unit for data
sampling. The literature is replete with research that defines the instructional unit as a classroom period of 40 to 55 minutes in length. These units are convenient, as they are self-contained and many teachers' lesson plans are geared to reached a conclusion, a point, within that time. Episodic analysis by time unit rather than instructional events may not always be appropriate. In this research there were four main online cycles of several weeks in length. There were very few teacher presentations that reached an informational climax in 50 minutes. The independent nature of the class simply didn't require that period-focused approach. That being the case, data collection with an emphasis on what happened on any single day was not very significant. Even the lesson plans for each day held small meaning within the context of that day, but pointed toward a synergistic addition to other lessons. There were larger patterns of change evolving, some that would not make themselves known until the very end of the project. There was much structuring and restructuring of time and task as students grappled with a very foreign technology. As a result, this study collected data with regard to long term process, not inflexible units of time such as periods or days. By analogy, as the project unfolded, it became apparent that days were like individual bricks, all rather uniform and not terribly useful by themselves. With time, however, the bricks started
arranging themselves into a building with greater dimensions
and significance. Having proved a successful design,
(preferable, in the researcher's opinion), it is suggested
that other long-term pieces of research might consider
moving away from rigidly time-based, daily or classroom
period sampling.

**FURTHER RESEARCH POSSIBILITIES**

Within the context of the study's question set, the
analysis is complete. Many layers remain for further
research and/or secondary analyses of the data collected by
this work. The data pool collected is enormous and
certainly lends itself to having other questions overlaid
upon it. In the taxonomy that this work developed, several
categories of talk emerged that were not directly involved
in addressing the study's questions.

**LEGAL ISSUES**: It is suggested that others might examine some
of the lesser employed categories of student talk and design
research to explore them. For example, students were
fascinated with the potential legal misuse of computer
telecommunications. This was evident in the amount of talk
that finally resulted in the creation of a category called
"Legal Issues". Why? Why did students, on two occasions
attempt to make unauthorized entries, however unsuccessful,
into private, corporate computer systems?
CARRYOVER OF SEARCH STRATEGY: This work stopped studying the participants at the end of the second school semester of the 1985-1986 school year. Some of the participants are either in college or, may even have graduated already. How did they search for information in college? Did the skills that they became so adept at carry over to higher education? Longitudinal, long-term studies could reveal much about the stability of search patterns over time and different schooling environments.

"CASTING ONE’S NET FOR INFORMATION": Students generally seek information from sources that a card catalog, or authority has told them exists. In this study, searches were often carried on, at least in part, by students posting their questions on the bulletin boards or online Special Interest Groups (SIGS) and/or CBBS’s. This approach of "casting one’s net and hoping to catch something" was a fruitful strategy on numerous occasions and most of the participants came to see it as just another search possibility in their growing repertoire.

On occasion, information was found by these quasi-inductive searches that would have been difficult, if not impossible to locate by conventional, offline means. This was dramatically illustrated by Eric’s encounter with a high-level computer security expert who provided much
assistance to him in his final project on "Hackers vs. Hackees".

CompuServe, which has now completely taken over The Source, has nearly 100 online SIGs (or "Forums" as it calls them) ranging from an "Educational Research Forum" to a "Religion" and a "Gardening" forum. These provide many intriguing possibilities for research of a somewhat new order, providing a degree of instant interconnectivity not seen before. What are the educational implications of this kind of information searching?

TEACHERS AS PROFESSIONAL CONSUMERS OF INFORMATION: This study focused on students alone. Since the researcher doubled as the instructor, no data could be gathered on how telecommunications impacts upon teachers. Teachers might benefit enormously from having superior information search and retrieval services at their disposal. Research on telecommunications and the teacher as searcher and consumer of information could prove both interesting and enlightening.

AN INFORMATION DEPARTMENT STORE: The students in this research found that the four classes of online services differed greatly in type, quantity and quality of information available. The general consensus was that Knowledge Index was the most directly useful in education,
followed closely by LCS. Next came information utilities like The Source and lastly, CBBS's. It isn't enough to say, though, that this means Bibliographic Databases hold the only potential for education.

Students demonstrated that they not only could integrate the online services to search out a particular topic, they enjoyed the integration, feeling that the information received, though focused on the same topic, was qualitatively different. The best of Knowledge Index was its only offering, high-speed bibliographic searching by keyword. LCS showed where the materials could be physically located and whether they were currently available. The Source and CBBS's were praised for their SIGS and electronic mail and teleconferencing abilities and other human interconnectivity factors that students rated as important to them.

Consider a merger of the best of all four: a collection of broadly useful databases mounted on one system, with chat, electronic mail, teleconferencing, and Special Interest Groups related to the subject matter databases, and finally a tie-in, perhaps an electronic gateway, to the nearest large library indexing system that would indicate where the materials could be found. Based on the caller's address, calls to the main system could be automatically patched through to the largest library running
a computerized circulation system that is reasonably close to the patron.

The students simulated such a system with several phone calls. It could exist. Drawing a parallel from a student that said the OSU Library was, "like a Woolco's with book shelves", a combined system like that proposed would be virtually an "information department store", offering not only hard bibliographic data, but a human touch where individuals who share common interests could assist one another, discuss new developments, "cast their nets" for help from unknown individuals, etc. There is nothing technologically innovative about the physical integration of online services. Pedagogically, however, it could potentially change how great numbers of persons seek out information.

**ONLINE CONVERSATIONS:** Note a final suggestion for further research. What is the nature and characteristics of online "chatting", the real-time communication with unseen others? What communicative rules govern these kinds of discussions? CompuServe's "CB" simulator, a real-time teleconferencing system modeled after the style of CB radios is, and always has been, their most lucrative program. CBer's commonly travel hundreds, even thousands of miles to occasional parties where they get to physically meet those whom were previously known only as a glow on a monitor screen. CBer's
always go by "handles" ranging from the fantastic to the humorous to the nearly obscene. Why do persons pick the handles they do and why is anonymous conversing by keyboard such a fascination? How are paralinguistic cues transmitted?

AGREEMENT WITH EARLIER RESEARCH

In relating this research to the literature reviewed in Chapter II, it was apparent that many of the findings of this study are in agreement with those found by earlier researchers. This was particular true in regards to the following areas:


2. Online searching is perceived by students as "easier" than conventional offline searching although the term "easier" had considerable variability in meaning. Eastman (1986) had similar findings.
3. Online searching was seen as practically useful, empowering, and a provider of increased options in information access. This too, is in line with the research reported by Eastman (1986).

4. Students are very conscious of the time-consuming nature of offline research and tend to view it negatively. Kupferberg (1986) made similar findings.

5. The time and trouble involved in physically conducting an offline search in a library was cited as a negative aspect of library-based research. The restrictions placed upon students' information searching as a result of their physical mobility or lack therefore was seen as a strong deterrent to extensive library research. Ojala (1986) also made note of this finding.

6. Online searching instilled in students a greater understanding of the range and diversity of information sources. Mancall and Deskins (1984a) felt that this was a goal worth pursuing.

7. Online searching tended to produce searches that were more diverse, interactive/reactive and reflective than offline searches due to online searching increased number of information access points.

8. In many cases, participants expressed animosity toward offline conventional searches and libraries themselves that was markedly lessened by exposure to online searching. Callison and Daniels (1988), Diodato (1984),
and Liesener (1985) also explored negative feelings towards libraries and how some end-users viewed online searching as a means of minimizing time spent in a library.

Perhaps this study's greatest contribution to the information known about secondary level online searching was the demonstration that students can move among online services with considerable skill and can integrate different classes of online services to produce searches that are superior to those generated by any single class of online service and certainly to those generated by offline means. While one later study (Dowling and Pruitt, 1987) related the usefulness of sequentially training students via an array of progressively more difficult online services, no study before that reported herein has successfully gauged students' ability to merge services together to produce successful search strategies never before studied.

In conclusion, it must be pointed out that this research came perilously close to never happening. The scale upon which this study was mounted made it very expensive. If it were not for grants of online connect-time, it simply would not have happened. Dr. Roger Summit, CEO of DIALOG Information Services, and widely published expert searcher, initially turned down a request for a connect-time grant saying,
"Let me suggest, in any event, that your students not be exposed, at least simultaneously, to the multitude of services you mention. Because of the unique - but not entirely distinct - protocols of the various systems, it has been our experience that simultaneous learning of multiple systems can be confusing and could lead to different results than if the students were taught a single system."

Beliefs such as Dr. Summit's are not uncommon in the library science literature. These systems are complex and challenging. But somewhere in all this is a set of underlying assumptions about what students can and cannot learn and what they should or should not be exposed to. These decisions are not generally made in conjunction with the students themselves. This study not only refutes the contention above, it provides solid evidence that we should be doing more system integration, not less.

Students are amazingly flexible and often capable of much more than adults give them credit for. They learned not one, but four online systems, moved among them at will, designed and executed unique, innovative successful searches, and perhaps most importantly, at least in one sense, they enjoyed themselves as they learned...
POSTSCRIPT

In the four years since this study was performed at the Whitehall-Yearling High School, some significant changes have occurred. When the project was concluded, there was a demand from both the student body and the faculty to retain online search services. The district administration agreed and has since made available, open accounts to DIALOG and CompuServe (which acquired The Source in the summer of 1989). Free services such as local computerized bulletin boards and OSU's Library Control System continue to be accessed routinely. Thus, all four services studied by the project are provided without cost or restriction to the high school’s students and faculty. Outside phone lines (those that bypass the school’s phone system and allow long-distance calls) are also provided by the administration.

The high school offers a semester course in general computer applications entitled, "Software Tools". Training in the use of the four classes of online services examined in this study is now an integral part of that course’s curriculum. Some movement is being made toward instituting another semester class dealing only with computer telecommunications.
Regular workshops in telecommunications are offered to the faculty and draw very well. Several staff members, particularly in the areas of language, history, and science have incorporated online searching into their courses and require that students be trained to use DIALOG and LCS. Students now routinely come to the computer lab to plan and execute their own information searches.
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APPENDIX A

Letters of Grants of Connect-Time
November 20, 1985

Mr. Douglas K. Schooler
Whitehall City School District
675 South Yearling Road
Whitehall, Ohio 43213

Dear Mr. Schooler:

We would like to encourage your endeavors regarding use of online in high school classes. (I have enclosed a recent paper I gave in Europe which references and some other secondary level programs such as you propose.)

Normally we do not give grants, but rather provide our Classroom Instruction Program which carries a nominal charge of $15/hour where probably 2-3 hours per semester per student would suffice. Our interest in considering a grant would normally relate to the development of a continuing funded program within the school district as opposed to one-shot dissertation research. We will, however, consider your request further.

Let me suggest, in any event, that your students not be exposed, at least simultaneously, to the multitude of services you mention. Because of the unique - but not entirely distinct - protocols of the various systems, it has been our experience that simultaneous learning of multiple systems can be confusing and could lead to different results than if the students were taught a single system, or were taught the systems sequentially with extensive practice and use at each stage.

Perhaps we can hear back from you on these two points as we further consider your request.

Sincerely yours,

Roger K. Summit

RKS:bc
2 enc
January 27, 1986

Douglas K. Schooler  
Computer Services Coordinator  
Whitehall City School District  
675 S. Yearling Road  
Whitehall, Ohio 43213

Dear Mr. Schooler:

Dr. Summit has asked me to review the request which you have made for support of connect time charges for your planned project to introduce a group of 10 students to the use of external resources through online systems. As is shown by our provision of the DIALOG CIP program, we feel that the use of online services at the secondary school level can be of great value in enhancing the educational process. After review of your additional comments regarding the purpose and technique of your research, we would like to offer support during the period from January 27 through June 7, in hopes that this program will indeed evolve into a regular part of the school curriculum.

There are two possible approaches. If you wish to use the DIALOG CIP program and teach the regular DIALOG command language, we can provide a grant for up to $500 worth of CIP time (about 30 hours of online time). If you would prefer to use the KNOWLEDGE INDEX search interface, we can provide a Ki demo password, accessible during regular business hours as well as in the evening, for up to six hours of online time per month (also about 30 hours of online time). Please let me know which approach you prefer to use for purposes of your research, and I will make arrangements for the appropriate password to be established for you.

Per your previous correspondence with Dr. Summit, we do suggest that the study be carried out with only one bibliographic service, to minimize confusion by the students.
I will look forward to hearing from you shortly regarding your preferred approach.

Sincerely,

Libby Trudell
Marketing Manager

LT/ch
cc: A. Caputo
    D. Holloway
    R. Summit
January 28, 1986

Douglas Schooler
Computer Services Coordinator
Whitehall City School District
675 S. Yearling Road
Whitehall, OH 43213

Dear Douglas:

It was a pleasure speaking with you this morning, and I feel confident that, together, we will learn a lot from your computer project.

To confirm our discussion this morning, STC agrees to provide 10 Source accounts and user manuals, each with 10 hours of usage. It is understood that additional time will be needed and will be decided upon and assigned at a later date.

Manuals and sign-on information will be sent under separate cover.

You agree to report once weekly to me via Sourcemail on successes and failures regarding Source usage in your program; use reasonable diligence in assuring that Source services are not used for game-playing and other non-education related activities; and, if appropriate, speak with various media about Source usage in your program.

If we find that The Source becomes a successful part of your program, we would appreciate your involvement in a workshop at the April conference of the International Association of Education Data Systems. Your involvement may include providing background information, photographs, and anecdotes, or may be extended to include participation in a conference workshop.

Enclosed, you will find a newsletter focusing on educational services of The Source. Additional copies will be sent along with the ID numbers and manuals.

Thank you for your interest in The Source. I look forward to working with you.

Sincerely,

Nancy Beckman
Manager, Public Relations

Enclosures

1616 Anderson Road, McLean, Virginia 22102  703/734-7500

The Source is a service mark of Source Telecomputing Corporation, a subsidiary of The Reader's Digest Association, Inc.
The Source Services are offered in participation with Control Data Corporation.
APPENDIX B

Parental Consent Form
RELEASE

I hereby consent to be videotaped while participating as a student in the class, "Computer Science II" at The Whitehall-Yearling High School.

It is my understanding that the videotape will be used for research purposes only, in connection with a study of online telecommunication being conducted by Douglas K. Schoeller, under the direction of Judith L. Green of The Ohio State University. I understand that I have the right to withdraw data at any time if I so choose. At no time will the videotapes be reproduced or used for other purposes.

I acknowledge that I have read and understand the consent form. I sign it freely and voluntarily.

Signed:

[Signature]

(student) (14)

[Signature]

(parent / guardian)

on this 10th day of JUNE, 1986
APPENDIX C

Library's Suggested Search Strategy Chart
SELECT A TOPIC

ENCYCLOPEDIAS
(General or Special for an overview)

DICTIONARIES
(for unknown or obscure terms/words)

BOOKS
by subject
by author or title

JOURNAL ARTICLES

LCSH
Card Catalog

Periodical and Newspaper Indexes

LCS

OTHER SOURCES

Biographical Indexes
Book Reviews
Essay and General Literature
U.S. Gov. Documents
Statistical Sources

Figure 66. Library’s Suggested Search Strategy
APPENDIX D

Warren's Final Project and Search Strategy
COMPUTERS: THE LEGAL AND MORAL ASPECTS OF SOFTWARE PIRACY

WARREN C. ENG
COMPUTER SCIENCE 2
COMPUTERS: THE LEGAL AND MORAL ASPECTS OF SOFTWARE PIRACY

This paper will discuss the legal and moral aspects of software piracy. The word software has a variety of definitions. Steven Mandell, the author of Computers, Data Processing, and the Law, says, "To some, software is merely the programming associated with a computer system. To others, particularly, one court of law, software denotes the information loaded into the machine and directions given to the machine...as to what it is to do and upon what command."

(5:4) Software is sometimes defined as anything other than hardware. Software is also defined as object code. (7:23) Software can be defined as anything that can be transmitted over the telephone wires. (15:5) Software is fuel for the computer. (11:11) Software programs are considered a set of instructions for the

*This shortened form of footnoting will be used throughout the paper. The first number within the parentheses is in reference to the bibliographical numbering; the second, the page within the cited source.
computers. (16:2) With the various definitions of the term software, many problems occur with copyright protection. A legal definition for software may solve some problems. (7:25)

Computer programs are registrable for copyright if the program is the writing of the author and if the submitted program is a copy that can be accepted by the computer. (13:38) Once a copyright for the piece of software has been established, there is a legal claim to the work. M.J. Salone, the author of How to Copyright Software, says, "Infringement of a copyright is any use of a work inconsistent with one or more of the exclusive rights making up the copyright." (10:188)

But what good is a copyright to the pirate in the home?

Apparently to some, there is no use of a copyright to the home pirate. There are basically two types of pirates. They are known as the hobbyist and the professional. The hobbyist pirate copies software for the glory of defeating the copy protection methods. (9:42) Some people pirate for the love of a challenge. (8:21) The copyright law is ineffective in dealing with the small, individual, and decentralized cases. (9:42) Expenses and time are two causes in ignoring small time pirates. (3:2) Juveniles would most likely be treated more easily by the court system. A reproduction of the program could subject the pirate to
one year in prison and/or a ten thousand dollar fine, as well as a civil liability suit. The professional pirates, usually former employees, are more likely to disguise the pirated software to reap profits from the program. (9:42-43) By pirating a program, one saves development costs. The price and type of a computer are also factors in encouraging pirates. (2:38) Some companies pirate one piece of a purchased program to make hundreds of copies. (8:21) Some claim the legal use of Section 117 of the Computer Software Copyright Act of 1980 which allows backup copies as long as the original is still in one's possession. (9:44)

How does piracy affect the computer world? Software authors lose money in royalties. Consumers pay more money to adjust for the loss of sales from piracy. (8:21) Piracy can lead to inefficient products. Backup support from the company could be lost. (12:57) Development of new software could be delayed. (12:57) This delay could be caused by the time consuming efforts of a company to develop protection techniques.

Copy protection methods include the reading of a serial number in the memory of a computer. The program would only run on that computer in the future. (8:21) Some companies issue updated versions of a program to registered owners. Some design extensive
documentation. (8:22) Some companies use secret codes within the program. (3:2) One industry introduced sketches of an electronic lock that needs an electronic key to operate the program. (6:4) One company suggested a method that includes the destruction of the software by scrambling the data. (16:2) Mike Lewis, the author of "Scuttling Software Pirates", quotes Marv Goldschmitt who says, "The industry plans to attack the problem (piracy) on three fronts: educating the public about intellectual property, improving technical protection, litigation and legislation." (4:28) In Richard Baker's book, Scuttle the Computer Pirates: Software Protection Schemes, Professor Adi Shamir suggests, "Software producers (should) modify the disk drives on which they record their programs to produce marginal strength pulses in selected locations." (1:89) Some companies have introduced products or programs to simulate any alterations when a program was first copied. (3:2) Shamir recommends a limited amount of uses for a program. (1:89) A time bomb plan could be used to self-destruct the program after a certain number of uses. For people that send in the warranty registration card, an additional code would be added to defuse the time bomb. (1:90) Not a single computer system has been built with security measures that are unbreakable. (14:2)
What if legal techniques and copy protection techniques do not get through to the pirate? Many will decide if pirating is moral. (8:22) Is it right for one to deprive a programmer for his share of royalties, which could be a part of his income? Is it right for software publishers to charge exorbitant prices for a fair piece of software? Why should one pay for programs that one could easily get for free? Is it right to steal a person’s work? These are questions that depend on the moral judgments of each person.

Pirates are everywhere. Perhaps an increased awareness to the consequences of piracy could lead to fewer pirates. Willie Schatz, the author of "Keeping Pirates at Bay," quotes Micropro president Glen Haney, who says, "Piracy is not stopable, but it's controllable." (12:58) Here is a reminder: Unauthorized duplication of software could lead to imprisonment and fines. (9:42-43) This paper has discussed the legal and moral aspects of software piracy.


14. Vartabedian, Ralph, "Can Software Be Made Safe From


If I were to write a research paper without any knowledge of telecommunications, then I would first search the local libraries, such as the Whitehall-Yearling High School Library, the Whitehall Public Library, the Bexley Public Library, the Columbus Public Library. I would use the Com-Cat to search for the books and Reader's Digest to search for the periodicals. Since piracy is a fairly new topic, I would have very few interviews with people. My search would probably end as I would prepare to write my paper.
I. SEARCH STRATEGY FOR PROJECT

A. The Source

1. Source member directory
   a. I searched these key words and left messages asking for information about the pros and cons of piracy.
      (1). piracy
      (2). pirate
      (3). pirating
      (4). trading
      (5). cracking
      (6). exchange
      (7). crash
      (8). crack
      (9). sysop
   b. I received about six replies that could have been used to prepare the report.

2. I did not check out Microsearch, Microline, or the SIGS but they are additional sources.

B. Bulletin boards

1. I left a message on a public bulletin board asking for information about the pros and cons of piracy.
   a. Atari Computer Enthusiasts of Columbus (ACEC)

2. I read many messages on ACEC that discussed the many aspects of software piracy. Apparently, someone wanted to trade something. A heated debate followed.

C. Knowledge Index (KI)

1. I searched the following databases.
   a. BOOK1
   b. COMP1
   c. COMP2
   d. COMP3
   e. COMP4
   f. GOVE1
   g. GOVE2
   h. MAGA1
   i. NEWS1
   j. NEWS2

2. I used these descriptors.
   a. computer?
   b. crime?
   c. pirat?
   d. software?
   e. law?
   f. copy?
D. Library Control System (LCS)
   1. I searched for the sources found from using KI. I photocopied the materials that I found. The materials were usually where LCS said they were. Getting the materials took the most time.

E. Columbus Public Library
   1. I searched this library so I could bring home the books that I needed.

F. Bexley Public Library
   1. This library was used because I had a library card to take the books home.
APPENDIX E

Talk Analysis Spreadsheet Focused on Lisa, Warren, and Eric

503
File: TALK ANLYSE SS

TABLE 1: PRIOR EXPECTATION (12)

<table>
<thead>
<tr>
<th>QUESTIONS</th>
<th>ANSWER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Why did you enroll in this class?</td>
<td>Generally, I'm enthusiastic about computers. The day began with very high expectations of the Randall and Library Control System. These expectations were met with great satisfaction. Really, there was no basic guideline from what I remember. I just knew that it was about telecom and that it was a research project. (From having you as my teacher for &quot;Software Tools&quot; last semester.)</td>
</tr>
<tr>
<td>2. What do you know about your computer?</td>
<td>I've played around with a little BASIC, but that was just drawing some Graphics and stuff. Not much. T: OK, not scared of computers? L: No. They can get frustrating at times, though. T: What did you know about telecom? L: That telecom enables you to dial LG to another computer, and you can type into your computer to someone at a computer anywhere else for away.</td>
</tr>
</tbody>
</table>

Figure 67. Focus: Prior Expectation and Prior Computing
ENTRY SEARCH (100)

First I look in encyclopedias that I have in my house. Then if nothing comes up there, I go to the library. T: Do you enjoy the process? U: It takes too much time, I think. I don't like it at all. I'd rather spend my time at home with computers. T: But you don't remember being taught formally about library searching? U: No, I didn't. Some elementary teachers might tell you to go to the library for better info. T: Have you had any further training like in middle or high school? U: No.

HIROSHIMA (197)

I'd look for books on science about atomic bombs. Check out the encyclopedias, see if they have anything. Then I'd probably go check out Whitewall, and if they don't have it then go to Boxley. And check it out and see if they have any ads or magazines about the time they dropped the bomb on Hiroshima. If they have any timely reports on what, like reporters on journalists that they saw or the effects that they knew that happened right then, if you really wanted to make this a good report, okay, the way you might go to somebody like a professor at OSU. The first thing I would do is get on down in the main library and look under Hiroshima first (in encyclopedias). From there I would look under other references, maybe other volumes of the encyclopedia or other brands, like Funk and Wagnalls, maybe Collier's. Then I would go to books on maybe wars, and like, you know, down to Hiroshima, that particular war, or the bombing, whatever. It's probably the way that I had so far and see if there was enough for the paper or whatever you're responsible for. It depends on how much I have.

HIROSAKA (198)

Since the "Entry Search" questions were scanned but not transcribed like the three case study subjects, no other comments are available but the topics and student-drawn flow charts all point towards highly linear, encyclopedia-oriented searches.

Figure 68. Focus: Entry Search and Hiroshima 1
Figure 69. Focus: Exit Search and Hiroshima 2
The Beatles and their impact on popular music. First, I'd briefly write down information on my feelings about the Beatles. T: Ok, so you would start with yourself as a source. I: Yes, from what I know of them. The I possibly would check the library, like late ancient books that have been written about them, maybe, and possibly magazines. I'd probably talk to my friends and what they know about them. And maybe I could possibly even talk to older brothers or people who experienced their music while they were still here working together.

I don't know if you don't find anything in whitelisted about Beatles. First of all, you could check out the school library, but chances are... Well, encyclopedia, our good friend, but they don't go very far. So, you'd look for it under the catalog for Beatles or rock music. If you really want to make it better, then you go to librarian and they'll have you know, huge reference books. Or you could always try, and then, or I really don't know... you could ask an older brother or sister.

First I'd start on the reference section under "Music." It could be classified under "Pop." I don't know. Beatles. "Pop" maybe, "Soft Rock." I really don't know. I'd probably start under "Music," narrow it down, look under source Beatles or if they have it under titles as, maybe "Sixties." From there, I guess, other sources. I'd check those. Like, if they had books specifically on the Beatles and their life. From there I'd maybe check under other types of music under the same time frame, like maybe jazz or classical.

Since the "Entry Search" questions were scanned but the scan was like, the ones back onto subjects, no other comments are available but the topics and students-drawn charts all point towards highly linear, encyclopedia-oriented searches.

Becky's log off to find correct spelling of Michael "Deaver" IRL. First I check the direct source. Like the Word of God and finds 701 hits in MEDLINE. No other comments are available but the topics and students-drawn charts all point towards highly linear, encyclopedia-oriented searches.

The Source's member directory for interests in Appleworks. She gets 3 names and ID's to send SourceMail to in INFO. IRL searches, during final project progress check collectively state that they are having no problems. Matt is searching "job" or "run?" and "anorexia" and gets 3 hits on KI.


Also addresses question number 2.0 on how students search. It also speaks to 4.1 "that were the indicators of growth by establishing a baseline to compare later searches.

Question 3.0 "that were students' perceptions of online services. Answer: Uniformly positive. Question 4.2 on integration of services? Answer: Positive. Question 4.1 on change? Answer: Positive. 4.1 Change? Answer: Positive. 5.1 Change? Answer: Negative.
## Major Themes in Talk

<table>
<thead>
<tr>
<th>SUGGESTED ANSWER</th>
<th>MAJOR THEMES IN TALK</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIKELY</td>
<td>BEATLES 2 (31)</td>
</tr>
<tr>
<td>likely</td>
<td>When computers come into play, I am willing to give an extra effort in enhancing my knowledge. T: What are your impressions of online telecommunication? I: I like it, for one thing. T: What else makes it fun? U: Hell, just being there. Being around this much information. T: What do you think are the strong points of the Source? U: The first thing I liked is the Sourceful. The documentation is detailed and very helpful. (Teacher's Book).</td>
</tr>
<tr>
<td>LIKELY</td>
<td>POSITIVE: LIKE (56)</td>
</tr>
<tr>
<td>likely</td>
<td>when computers come into play, I am willing to give an extra effort in enhancing my knowledge. T: What are your impressions of online telecommunication? I: I like it, for one thing. T: What else makes it fun? U: Hell, just being there. Being around this much information. T: What do you think are the strong points of the Source? U: The first thing I liked is the Sourceful. The documentation is detailed and very helpful. (Teacher's Book).</td>
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<tr>
<td>LIKELY</td>
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</tr>
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<td>likely</td>
<td>When computers come into play, I am willing to give an extra effort in enhancing my knowledge. T: What are your impressions of online telecommunication? I: I like it, for one thing. T: What else makes it fun? U: Hell, just being there. Being around this much information. T: What do you think are the strong points of the Source? U: The first thing I liked is the Sourceful. The documentation is detailed and very helpful. (Teacher's Book).</td>
</tr>
<tr>
<td>LIKELY</td>
<td>POSITIVE: LIKE (56)</td>
</tr>
<tr>
<td>likely</td>
<td>when computers come into play, I am willing to give an extra effort in enhancing my knowledge. T: What are your impressions of online telecommunication? I: I like it, for one thing. T: What else makes it fun? U: Hell, just being there. Being around this much information. T: What do you think are the strong points of the Source? U: The first thing I liked is the Sourceful. The documentation is detailed and very helpful. (Teacher's Book).</td>
</tr>
</tbody>
</table>
Figure 72. Focus: Positive: Enjoy and Positive: Impressive
<table>
<thead>
<tr>
<th>File: TALK-ANALYZE.SS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CATEGORY AND # OF COMMENTS</td>
</tr>
<tr>
<td>HARREN</td>
</tr>
<tr>
<td>MALE</td>
</tr>
<tr>
<td>SENIOR</td>
</tr>
<tr>
<td>18 YEARS OLD</td>
</tr>
<tr>
<td>ATARI COMPUTER OWNER</td>
</tr>
<tr>
<td>NO PRIOR TELECOMMUNICATIONS</td>
</tr>
<tr>
<td>MEDIUM COMPUTER SKILLS</td>
</tr>
<tr>
<td>&quot;A&quot; STUDENT</td>
</tr>
<tr>
<td>LISH</td>
</tr>
<tr>
<td>FEMALE</td>
</tr>
<tr>
<td>SENIOR</td>
</tr>
<tr>
<td>18 YEARS OLD</td>
</tr>
<tr>
<td>DOES NOT OWN COMPUTER</td>
</tr>
<tr>
<td>NO PRIOR TELECOMMUNICATIONS</td>
</tr>
<tr>
<td>LGH-MEDIUM COMPUTER SKILLS</td>
</tr>
<tr>
<td>&quot;B&quot; STUDENT</td>
</tr>
<tr>
<td>ERIC</td>
</tr>
<tr>
<td>MALE</td>
</tr>
<tr>
<td>SOPHOMORE</td>
</tr>
<tr>
<td>18 YEARS OLD</td>
</tr>
<tr>
<td>THREE-SHULAH COMP OWNER</td>
</tr>
<tr>
<td>MINOR TELECOM. EXPERIENCE</td>
</tr>
<tr>
<td>HIGH COMPUTER SKILLS</td>
</tr>
<tr>
<td>EXTRAVT &quot;A&quot;-&quot;C&quot; STUDENT</td>
</tr>
</tbody>
</table>

**HARRISON**

Software is easy to use. The Library Control System (LCS) which I used in the Main Library on the campus, was fairly simple to comprehend. T: Do you think it's unduly difficult to learn more than one system? H: No. I know commands on several so it's not hard for me to remember. T: Do you find that this took a lot of conscious study on your part? H: I just learn them by experience or by watching other people use it. But what we've introduced to in this class has made things seem easier - without having to spend all that time in the library without moving.

**LISH**

My favorite part was how easy it was to retrieve a book by a particular author. From my own personal experience, the entire system (CLS) was easy to figure out and use. All in all, the entire library system is relatively simple, however, by just "exploring" the way through, it is very likely that one will understand what is happening. Even if I hadn't asked, I'm sure that I would've cleared the problem just by reading the brochure more. (LCS)

**ERIC**

Using LCS is not too difficult. The commands are simple enough to learn. Getting the information is easy. Luckily, LCS saved the day. Using The Source is not complicated. Everything is pretty much straightforward. It's really simple.

**HARRISON**

I was completely satisfied with the system. T: Ok, is there anything that you would tell KI? (for improvement?) H: No. T: Are you satisfied with what you got back? H: Yes, the day began with very high expectations of the Rand-writer and Library Control System. These expectations were met with great satisfaction.

**LISH**

(no recorded instances)

**HARRISON**

T: What were your impressions of LCS? E: Good speed though even when lots of terminals are in use. T: What about LCS? E: I think for its purpose it serves it well. I mean, you don't look up a book that they have, bang, it's in there. T: Okay, how about Bulletin Boards? E: They pretty much serve their purpose. They're bulletin boards - place messages and send messages. T: Did it (KL) do the job? E: Yes. T: Have the commands OK? E: Yes. T: Has it (KL) friendly enough? E: Yeah, it was friendly.

**LISH**

T: What were your perceptions and affective responses? Positive.

**ERIC**

Jeff: The subject search on KL was better than LCS since LCS is restricted to Library of Congress subject headers. Teacher: did you reach a comfort level easily with The Source? Group consensus, “Yes” Nott: If you still do not understand something about the library there is a help screen. Teacher: Did KL do the job? Group consensus, “Yes”

**HARRISON**

1. The systems are basically well designed with clearly understandable command structures and purposes.
2. The systems apparently accomplish what they were intended to.

**LISH**

3. What were perceptions and affective responses? Positive.

**ERIC**

Jeff: The subject search on KL was better than LCS since LCS is restricted to Library of Congress subject headers. Teacher: did you reach a comfort level easily with The Source? Group consensus, “Yes” Nott: If you still do not understand something about the library there is a help screen. Teacher: Did KL do the job? Group consensus, “Yes”

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**LISH**

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Jeff: The subject search on KL was better than LCS since LCS is restricted to Library of Congress subject headers. Teacher: did you reach a comfort level easily with The Source? Group consensus, “Yes” Nott: If you still do not understand something about the library there is a help screen. Teacher: Did KL do the job? Group consensus, “Yes”

**HARRISON**

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**LISH**

3. What were perceptions and affective responses? Positive.

**ERIC**

Jeff: The subject search on KL was better than LCS since LCS is restricted to Library of Congress subject headers. Teacher: did you reach a comfort level easily with The Source? Group consensus, “Yes” Nott: If you still do not understand something about the library there is a help screen. Teacher: Did KL do the job? Group consensus, “Yes”

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**ERIC**

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**HARRISON**

1. The systems are basically well designed with clearly understandable command structures and purposes.
2. The systems apparently accomplish what they were intended to.
I indicated: I answered: Yes. In my library class, I have 2018-2022 experience that I would recommend to anyone.

- **Possible uses of BBs:**
  - To exchange students love for peer review editing.
  - The LCS would be very valuable. The system is great time-saver. In a few minutes or less, one can find where the materials are. T: Do you know what telecon available in schools? L: I think it would be good especially for when you're going on to college, while I don't always succeed, it helps me be more self-reliant and in control. I'm looking forward to the rest of the class.

**Categories:**
- **Positive:** Size Positive (101)
- **Positive:** Value (101)

**Discussion:**
In conclusion, the experience in the course has been fulfilling and worthwhile. T: Do you think text books would be really useful to the average H.S.? L: Yes, I think it's worth the money. T: Do you think that online capabilities should be available at the secondary level? L: Yes, it's a new experience for students. I think it would be a positive affect on students considering the new technology that we're progressing toward in the world today. T: Do you think that the online sources are understandable and usable? L: Yes, with slight training & a little bit of background on commands & menus. It's appropriate for students.

T: What are the educational uses of BB's? L: To exchange students work for peer review editing, "electronic guidance". I think the LCS would be very useful. The system is great time-saver. In a few minutes or less, one can find where the materials are. T: Do you know what telecon available in schools? L: I think it would be good especially for when you're going on to college, while I don't always succeed, it helps me be more self-reliant and in control. I'm looking forward to the rest of the class.

**Categories:**
- **Positive:** Size Positive (31)
- **Positive:** Value (101)

**Discussion:**
To locate one book out of a four million volume library it's incredible. I enjoyed the notion of the location of a book in a certain library. T: What are the strong points about it? M: It has so much information there, you could find almost anything.

The size was overwhelming and I still do not comprehend how many books are available in one place.

**Categories:**
- **Positive:** Size Positive (101)
- **Positive:** Value (101)

**Discussion:**
In conclusion, the experience in the course has been fulfilling and worthwhile. T: Do you think text books would be really useful to the average H.S.? L: Yes, I think it's worth the money. T: Do you think that online capabilities should be available at the secondary level? L: Yes, it's a new experience for students. I think it would be a positive affect on students considering the new technology that we're progressing toward in the world today. T: Do you think that the online sources are understandable and usable? L: Yes, with slight training & a little bit of background on commands & menus. It's appropriate for students.

**Questions:**
**Question 3.0 What were students' perceptions and affective responses to online services?**
**Suggested Answer:** Strongly positive.

**Question 4.0 & 4.1 Did students change and what were indicators?**
**Answer:** Yes. Indicators: strong affective resp.
<table>
<thead>
<tr>
<th>File: TALK ANALYZE.SS</th>
<th>Positive: Teacher Impressions (6)</th>
<th>Negative: System Dissatisfaction (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warren</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(M) Male Senior</td>
<td>I: Ok, anything else that's made it enjoyable?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>II: Being around you, Mr. Schooler.</td>
<td></td>
</tr>
<tr>
<td>Lisa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(F) Female Senior</td>
<td>(no recorded instances)</td>
<td>(no recorded instances)</td>
</tr>
</tbody>
</table>

**Figure 75. Focus: Teacher Impressive and System Dissatisfaction**
NEVER: DISLIKE (15)

I can only find one fault with Smartie. One cannot continue to download a file after returning to the main menu. T: How do you feel about searching for info on school? IC: It's a hassle to go and get the books and spend time at the library. I don't like it because it takes too much of my time. T: How about the Source? IC: There were too many menus and wastes your time. T: What do you think are the weak points of BBS's? IC: Like I said before, the non-standardized menus, lack of multi-users.

NEGATIVE: HARD (24)

I went through a little hard to get used to communications programs as they have their own special terminology that's different from programming in BREE. T: What are your impressions of LCS? I: Finding the actual books was hard. IC: She felt slowed down, not by searching for info, but physically finding what she knew, from online sources was already in the library. I've had trouble with the journals for some reason. I couldn't find the journal. T: What do you think are the weak points of the Source? IC: The Micro-Search, I had problems with that.

File: TALK. flf « L V 2 E . S S

NEGATIVE: DISLIKE (15)

PREM 

I can only find one fault with Smartie. One cannot continue to download a file after returning to the main menu. T: How do you feel about searching for info on school? IC: It's a hassle to go and get the books and spend time at the library. I don't like it because it takes too much of my time. T: How about the Source? IC: There were too many menus and wastes your time. T: What do you think are the weak points of BBS's? IC: Like I said before, the non-standardized menus, lack of multi-users.

NEGATIVE: HARD (24)

I went through a little hard to get used to communications programs as they have their own special terminology that's different from programming in BREE. T: What are your impressions of LCS? I: Finding the actual books was hard. IC: She felt slowed down, not by searching for info, but physically finding what she knew, from online sources was already in the library. I've had trouble with the journals for some reason. I couldn't find the journal. T: What do you think are the weak points of the Source? IC: The Micro-Search, I had problems with that.

File: TALK. flf « L V 2 E . S S

Figure 76. Focus: Negative: Dislike and Negative: Hard
Figure 77. Focus: Negative: Not Useful and Negative: Discipline
Figure 78. Focus: Negative: Technical Problem and Negative: Size Negative
<table>
<thead>
<tr>
<th>FILE: TALK ANALYZE SS</th>
<th>SEARCH UNSUCCESSFUL (14)</th>
<th>MISUSE (13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WARREN</td>
<td>Warren searching &quot;1040ST&quot; and &quot;Comp&quot;. Got mess of hits screen indicated &quot;processing...&quot;, meaning search term &quot;Comp&quot; being found excessively. No success on finding IBM's annual report.</td>
<td>(no recorded instances)</td>
</tr>
<tr>
<td>I LISA</td>
<td>I either got nothing or a lot (topic: psychology of ex-convicts and six-days-earns). Search Psych 1 &amp; 2. First gave over 2000 hits on ex-con, 20 for six-days-earns. Zero for the intersection.</td>
<td>(no recorded instances)</td>
</tr>
<tr>
<td>ERIE</td>
<td>Having difficulty finding &quot;Time&quot; magazine on LCS. Also tries to search (&quot;Computer&quot; and &quot;Crime&quot;) and not (&quot;Security&quot; and not operator is wrongly used). Getting hits on concept of (not security).</td>
<td>Trying to search (&quot;Computer&quot; and &quot;Crime&quot;) and not (&quot;Security&quot; and not operator is wrongly used). Getting hits on concept of (not security).</td>
</tr>
<tr>
<td>RELATID TALK FROM OTHER MEMBERS OF THE GROUP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAJOR THEMES IN TALK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QUESTION(S) ADDRESSED AND SUGGESTED ANSWER</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 79. Focus: Search Successful and Misuse
<table>
<thead>
<tr>
<th>FILE: TALK-ANLYZed.55</th>
</tr>
</thead>
<tbody>
<tr>
<td>CATEGORY AND # OF CONTENTS</td>
</tr>
<tr>
<td>17 YEAR OLD</td>
</tr>
<tr>
<td>ISRAEL-NEAR</td>
</tr>
<tr>
<td>INNOVATION</td>
</tr>
<tr>
<td>COMPUTER USER</td>
</tr>
<tr>
<td>15 YEAR OLD</td>
</tr>
<tr>
<td>MAJOR COMPUTER SKILLS</td>
</tr>
<tr>
<td>FUTURE VISIONARY</td>
</tr>
<tr>
<td>&quot;E&quot; STUDENT</td>
</tr>
<tr>
<td>ISRAEL</td>
</tr>
<tr>
<td>FEMALE</td>
</tr>
<tr>
<td>SENIOR</td>
</tr>
<tr>
<td>18 YEAR OLD</td>
</tr>
<tr>
<td>MAJOR COMPUTER USER</td>
</tr>
<tr>
<td>PRIOR TELECOMMUNICATIONS</td>
</tr>
<tr>
<td>HIGH COMPUTER SKILLS</td>
</tr>
<tr>
<td>SOPHOMORE</td>
</tr>
<tr>
<td>17 YEAR OLD</td>
</tr>
<tr>
<td>SYMPH - SIMILAR CORP. OWNER</td>
</tr>
<tr>
<td>SUPERUSER</td>
</tr>
<tr>
<td>HIGH COMPUTER SKILLS</td>
</tr>
<tr>
<td>IMPROVING &quot;A&quot; - &quot;C&quot; STUDENT</td>
</tr>
<tr>
<td>RELATED TALK FROM OTHER MEMBERS OF THE GROUP</td>
</tr>
<tr>
<td>MAJOR THEMES IN TALK</td>
</tr>
<tr>
<td>QUESTION(S) ADDRESSED AND SUGGESTED ANSWER</td>
</tr>
</tbody>
</table>

**LEGAL ISSUE (32)**

- Fascination with potentially destructive power.
- Interest in computer software piracy.
- Similarities drawn between themselves and characters in "War Games".
- Interest in ways by which to corp. systems reach.

**COST (17)**

- T: Are you satisfied with the rate structure of these online resources? W: The information that you get back is worth the money spent online. T: Do you think this would be really useful to the average H.S.? W: Yes, I think it's worth the money.

**Figure 80. Focus: Legal Issue and Cost**
Figure 81. Focus: Discovery: Serendipity and Discovery: Factual Knowledge
I discovered the Red Bone Inn. Allows teleconferencing (SBS is one of my favorite telecommunication packages). Contacts are San Leandro HS in CA. Also, Buffalo, NY. I discuss call to "Open Campus" in San Leandro, CA. Talked with 15-year-old SVOP. She was surprised with LD call. I found that the best way to find a piece of writing was by using the author and title search (LCS).

Lisa: NICE upgrade and seen files. Leaving online message about group's activities and requesting correspondence. (All outside users who might be interested). However, I just "exploring" the way through. I think it will be interesting. (I learned what is happening with the Learning LDB).

Eric: I've been doing computer-related stuff for over five years, and I realize the extent of all the power that we have at our fingertips. Others might not realize that they have nearly the whole world at their feet, and not take advantage of those resources. It's (telephone) a feeling of power. Power without physically moving. (Group agrees.) Telecommunications is old hat now. I have a sense of empowerment and mastery over large amounts of information.

M.I.C.E. SYSO offers to raise Lisa's access level (higher access = more power).

Eric writes his own simple BBS software in BASIC and others in group take turns dialing his system.

I realize that this is only the beginning to the world of telecommunications. That's what makes it fun! I'll just being here. Being around this much information. I know from what I've experienced in class and from what I tell my friends, people are just amazed at what I can do through this.

Debbie experiments with Source Tour's handholding nature. She sends out messages to see what people think. Group: lauds commands for "Red Bone Inn" BBS and sets up conference line.

Group impressed with themselves after Source contacts them for publication, "huzzah!" and "we're bad" comments. Group unimpressed with telecom hype in an Apple Education Newsletter and feels information is below them and "old hat". Daryl: I think telecommunications is one of the most powerful things I have ever experienced. Daryl: Telecom thus made me aware of the real power that you have with a computer.

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Group impressed with themselves after Source contacts them for publication, "huzzah!" and "we're bad" comments. Group unimpressed with telecom hype in an Apple Education Newsletter and feels information is below them and "old hat". Daryl: I think telecommunications is one of the most powerful things I have ever experienced. Daryl: Telecom thus made me aware of the real power that you have with a computer.
**File: Talk Analyze 55**

<table>
<thead>
<tr>
<th>CATEGORY AND # OF CONTENTS</th>
<th>CHANGE: PRESENT (50)</th>
<th>CHANGE: FUTURE EXPECTATION (20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HARREN</td>
<td>I thought about using telecon replace the method I've been using for years.</td>
<td>I realize that this is only the beginning of the world of telecommunications. I am looking forward to using the Source.</td>
</tr>
<tr>
<td>MALE</td>
<td>It has changed the way I think about computers and information.</td>
<td>I am looking forward to all the possibilities and advantages of having telecommunications.</td>
</tr>
<tr>
<td>SENIOR</td>
<td>You feel that strongly about it.</td>
<td>I hope that after completing the course, I will be able to inform others about telecommunications. I feel real comfortable around computer.</td>
</tr>
<tr>
<td>HOSTED PREVIOUSLY</td>
<td>I hope that by the end of this course I will consider dialing the Source for information just like a daily routine in life.</td>
<td>I hope to use them in college. I am looking forward to using the LCS for any research papers in the future.</td>
</tr>
<tr>
<td>MEDIUM COMPUTER SKILLS</td>
<td>Has the way in which you locate info changed much over past few years?; No.</td>
<td>On the entire experience: I hope to carry over this skill to college.</td>
</tr>
<tr>
<td>FUTURE MALEDICTORIAN</td>
<td>Has the way in which you locate info changed much over past few years?; No.</td>
<td></td>
</tr>
<tr>
<td>FEMALE</td>
<td>Not until this class. It's great! Usually more specific topics yield smaller bibliographies. Not the case here, but 40 sources in a smaller topic.</td>
<td></td>
</tr>
<tr>
<td>18 YEARS OLD</td>
<td>Does NOT own computer.</td>
<td></td>
</tr>
<tr>
<td>HOSTED PREVIOUSLY</td>
<td>It has telecommunications changed the way that you look for info at all?</td>
<td>I expect that this is a skill that will help me in college next year. And since I'm going to OSU, I'll be using the computer LCS and I might know somebody who has a modem.</td>
</tr>
<tr>
<td>HOSTED PREVIOUSLY</td>
<td>Has telecommunications changed the way the you look for info at all?</td>
<td></td>
</tr>
<tr>
<td>MEDIUM COMPUTER SKILLS</td>
<td>T: Has telecommunications changed the way that you look for info at all? L: Yes. It has really changed the way I think about computers and about using them to get info.</td>
<td></td>
</tr>
<tr>
<td>FUTURE MALEDICTORIAN</td>
<td>T: Now, why would you go to the library last? L: Because I figure I'll probably find, if that the library has anything, I'll find it through KI. By doing this I'll probably find definite books in these libaries and I can go straight there instead of looking through the library first. T: Has teleseconce made things easier for you or harder? L: I think its made it easier.</td>
<td></td>
</tr>
<tr>
<td>FUTURE MALEDICTORIAN</td>
<td>The library is fun. That is new, what about when I have to use it for real? I imagine that it will get pretty tedious.</td>
<td></td>
</tr>
<tr>
<td>BALKIM</td>
<td>I hope that I can use those services that are available to their extent, for the project due at the end of the year.</td>
<td></td>
</tr>
<tr>
<td>FEMALE</td>
<td>I think so, I've realized that there are other places starting to get through this old, hard head of mine that they can be utilized. Well, like in the past, I've always used encyclopedia, libraries, but now I realize that</td>
<td></td>
</tr>
<tr>
<td>18 YEARS OLD</td>
<td>Source &amp; DIALOG is open to us. DIALOG it kind of makes you want to forget those other ones, you say &quot;Hey, nothing in there, go to KI, run twenty million citations.&quot; Says the would not have chosen the topic that he did if online searching were unavailable. T: How do you feel about using library articles for research? E: Extremely valuable.</td>
<td></td>
</tr>
<tr>
<td>MEDIUM COMPUTER SKILLS</td>
<td>Becky: I found myself using more journals and less books.</td>
<td></td>
</tr>
<tr>
<td>FUTURE MALEDICTORIAN</td>
<td>Becky: I couldn't have done this paper (finds as currently as it is, nor as specific.</td>
<td></td>
</tr>
<tr>
<td>SCIENCE</td>
<td>Related talk from other members of the group</td>
<td></td>
</tr>
<tr>
<td>MEDIUM COMPUTER SKILLS</td>
<td>All the stuff from which you wanted to gain hands-on experience with telecon and other applications areas.</td>
<td></td>
</tr>
<tr>
<td>FUTURE MALEDICTORIAN</td>
<td>Deb: I feel comfortable with such a large library. I also feel it will benefit me. Also, further use of libraries because now I understand how to use them.</td>
<td></td>
</tr>
<tr>
<td>SCIENCE</td>
<td>Related talk from other members of the group</td>
<td></td>
</tr>
<tr>
<td>MEDIUM COMPUTER SKILLS</td>
<td>Rob: I hope that in the future all students will have the opportunity to gain a hands-on experience with telecon and other applications areas. Deb: I now feel comfortable with such a large library. I also feel it will benefit me further use of libraries because now I understand how to use them.</td>
<td></td>
</tr>
<tr>
<td>FUTURE MALEDICTORIAN</td>
<td>Question 4. Did change? Strong Yes</td>
<td></td>
</tr>
<tr>
<td>SCIENCE</td>
<td>Question 4.1 What were indicators? See thematic dialog box above.</td>
<td></td>
</tr>
<tr>
<td>MEDIUM COMPUTER SKILLS</td>
<td>Question 4.2 Did change? Strong Yes</td>
<td></td>
</tr>
<tr>
<td>SCIENCE</td>
<td>Question 4.1 What were indicators? See thematic dialog box above.</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 83. Focus: Change: Present and Change: Future Expectation**

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