

TEACHER PERCEPTIONS OF PSINET
AS A COMPUTER TELECONFERENCING NETWORK
FOR THE IMPROVEMENT OF SCIENCE AND
MATHEMATICS EDUCATION

A Dissertation
Presented to
the School of Education
Drake University

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Education

by Dennis Paul Day, Sr.

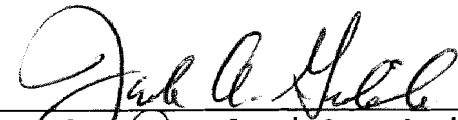
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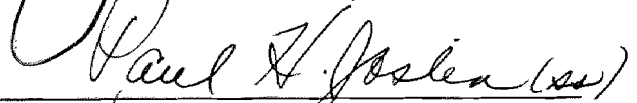
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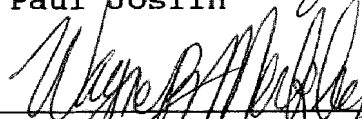
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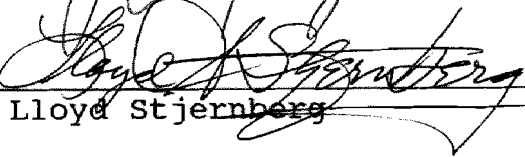
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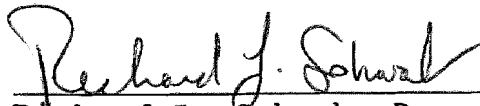
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TEACHER PERCEPTIONS OF PSINET AS A COMPUTER TELECONFERENCING
NETWORK FOR THE IMPROVEMENT OF SCIENCE
AND MATHEMATICS EDUCATION

An abstract of a dissertation by
Dennis Paul Day, Sr.
December 1994
Drake University
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This is a descriptive study of two small groups of educators in Iowa during the 1991-92 and 1992-93 school years. The researcher examined the use of People Sharing Information network (PSInet) by "new user" educators. PSInet is an asynchronous teleconferencing network that provides modifiable conferencing and private messaging to network users. The participants were surveyed using "Likert-type" survey questions and discussion questions to determine ease of setting up computer hardware, learning to use the software and network, applicability to the teaching/learning processes, and difficulties encountered by the "new user" educators. Analysis of responses suggests teachers are more apt to promote student use than self use, are more likely to use telecommunication via PSInet to communicate locally than long distances, and are more likely to communicate within their own school system than with sources outside the system. Results suggest asynchronous teleconferencing using PSInet is easy to set up and use, and is applicable to those teaching/learning projects that could benefit by sharing data gathered in several different locations, and projects requiring collaboration among individuals geographically remote to one another. Indications are PSInet provides accessibility to near or distant colleagues and other professionals with ease. Problems associated with applying PSInet to the teaching/learning process seem to be related to educator time constraints and adapting the structure of teaching/learning processes to make use of the technology.

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Chapter 1

INTRODUCTION

In barely more than four decades the electronic digital computer has revolutionized information storage and processing. It has evolved from nonexistent to prevalent, and from giant to small and affordable. Computers have become commonplace in American society. The larger, more costly machines of the 1950s and 60s were used in education primarily for administrative purposes or in universities for graduate level research. The invention of the personal computer allowed the computer to become widespread and divergent in schools.

Computer Conferencing

In 1982 it was reported that for more than a decade computer conferencing had been used for discussion among geographically separated individuals (Kerr & Hiltz, 1982). Typically, the expense of using computers limited conferencing to government or business and industry. Computer conferencing made its way into education after the necessary software was developed and the costs of owning and operating computers was reduced by the introduction of the personal computer.

Researchers report that there are advantages to using computer conferencing to communicate. All information, other than what is transmitted through the

written word, is blocked from the reader. There are no visual clues as to the age, gender, or other physical characteristics of the writer. Auditory clues such as accents, speech defects or patterns are not transmitted from writer to reader. Prejudices are overlooked and physical disabilities are unnoticed (Coombs, 1989). There is evidence that students use higher order thinking skills more when communication is not directly face-to-face, and that students communicating via computer conference may use better communication skills than when using traditional methods (Whitney, 1990).

Computer conferencing for teachers offers information sharing, discussion and possible application to the classroom. When given access to an asynchronous computer conferencing network (a type of computer conferencing that does not require both computers online simultaneously), how might teachers use it? The ability to contact experts beyond the classroom and to easily exchange data with other professionals would suggest that, in the hands of educators and their students, computer conferencing could be a useful and powerful tool.

In this investigation, teachers were provided access to a network that was currently in place and available primarily to mathematics and science teachers. They were provided networking capabilities through the use of PSInet (People Sharing Information Network), a software product from International Business Machines (IBM). PSInet provides

a national asynchronous computer conferencing system which is becoming increasingly pervasive in its influence within science and mathematics education. The network makes contact with other schools, educators, universities and agencies possible using asynchronous computer teleconferencing. PSInet is a modifiable network allowing conferencing with a great many other user and private messaging between individuals.

PSInet serves approximately 60,000 users nationally and nearly 200 in Iowa (Siebert, 1992). It's effectiveness in meeting the educational and professional needs of mathematics and science teachers had yet to be assessed.

Objectives

This researcher investigates the history, and new teacher-users perceptions of the effectiveness of using asynchronous computer telecommunications, specifically PSInet, to enhance the teaching/learning of science in Iowa.

General Questions

Answers to the following questions were sought. What is PSInet and how does it work? Is asynchronous computer conferencing via PSInet a technology applicable to effective teaching/learning? Do "new user" teachers perceive asynchronous computer conferencing as an enhancer of communication? What do teachers using PSInet think are the most useful features of PSInet? Are there educational applications of PSInet not available using other, more conventional educational methods?

Method

The researcher followed the use and application of PSInet as it was introduced and used by teachers in central Iowa. Data were collected from two different user groups by mailed surveys. PSInet's conferencing and messaging features were also used to maintain contact between users and researcher throughout the project.

The research was conducted with two different audiences at different times. Trial One was conducted as part of the project, "spotlight" on Iowa. The participants were central Iowa science teachers. Trial Two was conducted after several Area Education Agencies (AEAs) had PSInet servers operating and several Iowa educators had used the network. The participants in Trial Two were selected from user lists on AEA's 3, 11, and 12 network servers. Surveys were sent to users who had posted an abstract on the system. A posted abstract was used as an indicator of an individual's activity on the network. Data were collected using both Trial One and Trial Two to obtain evidence to answer the research questions.

Answers to questions concerning the history and nature of PSInet were obtained through a literature search. Two-way communication with teachers through computer conferencing was also conducted to provide teachers with technical assistance and to monitor their use of the network.

Chapter 2

BACKGROUND OF TECHNOLOGY USE IN EDUCATION

"Since World War II, the performance capabilities of computers and telecommunications have been doubling every few years at a constant cost" (Dede, 1989, p. 23). This growth in technology is having an impact on nearly all of society. "Some claim that technological advances are driving the emergence of a new era: industrial society is being replaced by a civilization based on knowledge processing" (Dede, 1989, p. 26). Researchers report "Telecommunications technology is transforming nearly every sector of American society: small business, manufacturing, commerce, broadcasting, religion, banking, tourism, entertainment, health, and defense. But not education." (Weinstein & Roschwald, 1990, p. 115). Today's schools still rely heavily on chalkboards, lectures, and textbooks for instruction. Educators are still choosing 19th century technologies for the classroom (Mecklenburger, 1990). While technology is transforming many other occupations, fewer than 10% of all educators are using telecommunications effectively (Weinstein & Roschwald, 1990). Many educators are yet to be convinced that the electronic technologies for communication are worth the time (Watson, 1990).

A study of teachers in the United States revealed that personal computers are common in the classroom. Almost two

thirds of the teachers involved in the study, the majority of whom felt less computer literate than their students, had access to a computer (Crum, 1989). The problem with the use of computers in instruction may be more related to curriculum development than to having the hardware at hand.

Levinson (1990, p. 123) writes:

The notion that technology will transform our schools is not a new one; educational technologies have been introduced before, hailed as the "solution" to the problems in our schools, and assimilated into the existing structure without transforming it.

Mecklenburger (1990, p. 106) articulates the same educational issue:

For example, telephone and typewriters, films and videotapes, computers and optical data storage have scarcely affected the operations of the schools, while they have transformed the operations of most businesses.

These 20th century technologies have been added onto the existing school structures without any real change in the way schools operate (Mecklenburger, 1990).

Like other technologies of the 20th century, it is doubtful that computer teleconferencing will become a valuable tool in science and mathematics classes, unless those who will be in positions to take advantage of it, students, teachers, and school administrators, are willing

to put it to use. Procedural change has little chance of succeeding unless teachers are willing to adjust to the change by modifying and adapting their instruction (Moursund, 1979). Educators must be willing to adapt the teaching/learning process to teleconferencing techniques to reach beyond classroom walls to research solutions to real world problems.

Should not educators risk exploring aspects of telecommunication and its application to the educational process? Present educational methods will require significant change as telecommunication devices and techniques are introduced to the classroom. Computer telecommunications can have an important role in providing real life experiences to students and offering opportunities to explore the real world beyond the confines of the classroom. There is little doubt computer technology is changing the way people live and conduct business. However, a major concern remains. Will education adjust the teaching/learning process to incorporate these technological advances?

History of Electronic Computers

Electronic computers were conceived and developed in 1943, during World War II. Dr. J. Presper Eckert and Dr. John W. Mauchly developed a calculating device to compute ballistic tables for artillery (Runyan, 1991). The world's first fully functional electronic digital computer, the Electronic Numerical Integrator and Computer (ENIAC), a

product of their efforts, went into operation in November of 1945 (Augarten, 1984).

Motivating forces for computer development, after the war effort, included: the development of nuclear energy uses, higher labor costs due to the post war economy, and the increase in government paper work. Social welfare programs developed by the United States Government (the "New Deal") necessitated the development of methods and machines to streamline paper work. Electronic computing provided solutions to these problems. In 1951 the United States Census Bureau accepted delivery of UNIVAC from the Remington Rand company. This would be the first non-defense application of an electronic computer (Runyan, 1991).

Solid state electronics began with the invention of the point-contact transistor in 1947 (Augarten, 1984). The junction transistor, invented by William Shockley, was developed in 1951 (Augarten, 1984).

In 1952 UNIVAC was used to predict the presidential election. Increasing bureaucratic needs, left as part of the government's "new deal" efforts prior to the war, continued to demonstrate a need for computers (Runyan, 1991).

Industry made its first large scale use of computers in 1954 when General Electric's Appliance Division developed the first successful industrial payroll application. That same year the first mass-produced computer, the IBM 650, was developed and marketed (Augarten, 1984).

The late 1950's brought the "space age" to the United States and again the government needed more computing power. The Department of Defense continued to be the largest user of computers. Private industry became a factor in the demand for electronic computing as large insurance companies began to make use of computers for electronic calculations and record keeping (Runyan, 1991).

The development of integrated circuitry based on Germanium by Jack Kilby at Texas Instruments in 1958 allowed more circuitry in a much smaller space (Augarten, 1984). In 1961 Robert Noyes received patent protection for silicon-based integrated circuits (Runyan, 1991). Both developments paved the way to smaller, cheaper, and more powerful computers.

Digital Equipment produced the PDP-8, pioneering the mini-computer path in 1965. The mini-computer made use of integrated circuits and was about the size of a household refrigerator. By the early 1970's the minicomputer had broken up the central ownership of computing resources. The minicomputer made communications with other computers more cost-effective. Smaller, less costly computers could be used "on site" to organize and prepare data before transmission to large mainframe for final large batch processing. The PDP-8 spawned the development of cheap, reliable concentration devices that made more efficient use of leased lines to the mainframes (Runyan, 1991).

The cumbersome minicomputer operating system was soon superseded by the invention of the microprocessor chip. Invented by Ted Hoff, the microprocessor chip went on the market as the Intel 4004 in 1970. The original microprocessor chip, produced by Intel, was used in a programmable calculator produced by the Busicom Company of Japan. The chip was introduced to the public in November of 1971. In April of 1972, Intel introduced the first eight-bit microprocessor chip, the 8008 (Augarten, 1984). Two years later, Intel would produce the now famous 8080 microprocessor chip. The 8080 made dozens of new products available, including the personal computer (Augarten, 1984). Micro Instrumentation and Telemetry Systems, (MITS) marketed the first full-fledged PC (personal computer) in January of 1974. It was based on the Intel's 8080 microprocessor (Augarten, 1984).

The Apple II, invented by Steven Jobs, was introduced in 1977 (Augarten, 1984). In less than a year the hobby computer market was formed by the addition of MITS Inc.'s Altair 8800, Radio Shack's TRS 80 PC (personal computer), and Commodore's PET PC (Personal Electronic Transacter) (Runyan, 1991). The PCs made use of microprocessor chip technology and were much smaller, easily fitting on an office desk top, and less expensive than their predecessor, the minicomputer. A new category of computers, microcomputers, was formed.

In 1976 Digital's 310 W minicomputer originated word processing on the computer, thus merging word processing and computing on one machine (Runyan, 1991).

The PC started its life as a hobbyist's computer but soon found its way into the office as a more cost effective word processor than the minicomputer. With the development of sophisticated software for the PC, came the need for PC on the desk top in the office. The PC, like the minicomputer before it, was a more cost effective machine (Runyan, 1984).

Daniel Bricklin developed VisiCalc, an electronic spreadsheet, for the Apple II in 1978. The electronic spreadsheet helped users find greater applications for PCs. This development accelerated the demand for desk top computing. In the early 1980's the combination of word processing and spreadsheet technologies brought the PC to the workplace (Runyan, 1991).

IBM announced its Personal Computer with MS-DOS (Microsoft-Disk Operating System) developed by Microsoft in 1981. The IBM PC became the most popular and influential personal computer in the market place, stabilizing the relatively new computer industry by establishing industry standards (Augarten, 1984).

The proliferation of PCs in the work place in the early 1980's generated a demand for linkage. Local Area Networks (LANs) between workstations were established as soon as the new machines found their way into organizations.

The LAN was the direct result of Metcalf's invention of ETHERNET (a method of linking computers together) eight years earlier (Augarten, 1984).

In the late 1980's, electronic mail and desktop publishing would again increase the adaptability and usability of the microprocessor in the work place. The successful development and acceptance of the PC was augmented by the development of sophisticated software (Runyan, 1991).

Paul J. Friedl developed the ACT-1 Computer Conferencing System in 1985 to run on personal computers. This concept brought the possibility of computer conferencing using the lower cost personal computer. The ACT-1 was the prototype for the development of the IBM People Sharing Information Network (PSInet) computer conferencing system (Friedl, 1992).

Educational Computer Networks

A simple count of the states listed in A Survey of Educational Computer Networks (McAuge, 1990) as having networks for education indicated that 37 states had 49 different telecommunication networks. Only 17 of these states had state-wide networks. Indiana had two state-wide computer networks. Eight of 37 states had intrastate networks that were less than state-wide.

Iowa had two of these intrastate networks. The "Interactive Computer Conferencing and Electronic Distribution System" (ICC & EDS) was operated by the

University of Northern Iowa, with funding from the State of Iowa. This interactive network connects elementary through post-secondary teachers around the state via computer conferencing, for coordinating policy and administrative affairs related to student teaching. This system allows users to access ERIC and CD ROM data bases and will become part of the state wide fiberoptics network ICN (Iowa Communications Network) (McAnge, 1990).

Within the state the "Kirkwood Community College Network" had five interactive educational networks. One of these interactive networks (ITFS) connected 23 K-12 school districts providing shared high school programs and college credit courses. The Business Industrial Training Network (Bitnet) uses ITFS to provide on-site training to selected businesses. Urban Network was being used by the Cedar Rapids School District to link schools for in-service teacher training. Telelink, a microwave-based two-way audio, two-way video, connected the main campus with students in a 4300 square mile service area. A full service cable network serves seventeen communities and a public radio service is provided to the seven county area.

This network and several other regional networks in the state of Iowa are to be incorporated into ICN (Iowa Communications Network). The ICN is a multi-tiered network that will embrace several levels of technology. The ICN will be centered in Des Moines and will serve 19 regional centers, including the community colleges. These regional

centers will then serve the schools in the area, ultimately connecting every school, library, and state agency in Iowa (McAnge, 1990).

Seven of the thirty-seven active states are developing new computer networking systems, with a total of ten of these projects in progress. Ten additional states have proposed computer networks (McAnge, 1990).

There were 49 computer conferences reported as in operation or being proposed in 37 states. Forty-two of these had provisions for teacher-teacher interaction, while only eight had made provisions for student-student interaction (McAnge, 1990).

The survey by McAnge (1990) also listed 44 networks with public access. Twelve are vendor-specific commercial networks. These include networks like "America Online," for Apple computer users, and "The National Geographic Kids Network" a network providing materials and activities for classroom use. Twelve are public networks and data bases including "CompuServe," "Dialog," and Dow Jones "News/Retrieval." Twenty educational networks finish out the list of public access networks and databases. These include "Accu-Data," Bitnet, EIES (Electronic Information Exchange System), GTE Education Network, and PSInet.

PSInet

People Sharing Information Network, or PSInet, is a national computer conferencing network for science and mathematics educators. In 1985 it was funded through a

grant from the National Science Foundation with cooperation from the IBM corporation (Friedl, 1992). The project is coordinated through the Council of State Science Supervisors (CSSS), with the cooperation of the Mathematics, Science, Education Board (MSEB) (Gerlovich, Friedl, & Gillan 1988).

PSInet is a method of connecting personal computers by standard telephone lines for the purposes of sending messages, papers and computer files from one computer to another remote computer. The software package is marketed by the IBM corporation and is designed to work on IBM Personal Computer or IBM Personal System/2 with a minimum of 512KB of memory, a formatted fixed disk with at least 3MB of storage available, and an internal or external 1200 or 1200/2400 baud modem that supports the AT command set. The software was developed by IBM Palo Alto Scientific Center (People Sharing Information, 1989). As of 1994 PSInet could also be used on a Macintosh microcomputer.

PSInet uses a dedicated personal computer as a server to control communications among the users' personal computers (workstations). PSInet has several advantages over conventional bulletin boards. The user's microprocessor does all of the pre-processing. All messages, papers, documents, and requests are prepared on the user's workstation prior to going "online". The workstation makes the call, provides the server with the user's requests, messages, forms and papers. The server performs requested functions, such as, obtaining requested papers and messages

the server is holding for the workstation, and then terminating the transaction. Incoming papers and messages are filed on the workstation's hard disk for future reference. Users can read any messages and/or papers received at their leisure. This greatly reduces the time the computer is "online," because all of the preparations are performed on the user's computer. Users perform these functions at their convenience. The time of day, length of time used to make decisions, reading or typing speed are not factors of concern for the user (Gerlovich, Friedl, & Gillan 1988).

Connect time to the server is minimal, often less than a minute, allowing the server to process many workstation's commands in a day. This, and using the workstation computer to compile the command lists allows the use of a PC rather than a mainframe or a minicomputer as a server. The use of PCs rather than a mainframe or minicomputer also significantly reduces the costs of hardware purchase and maintenance.

Because the workstation is active on the phone line for only a very short time and because the workstation can be programmed to make the call to the server any time of the day, existing voice telephone lines are often all that is required. Dedicated lines are not necessary for efficient use of PSInet.

The following are listed as features of PSInet:

1. Join PSInet conference sessions to receive papers submitted by other users
2. Submit papers to PSInet conference sessions for other participants to read
3. Begin new conferences and sessions to initiate dialog about new topics
4. Participate in "outside" conferences on other PSInet networks
5. Learn about other PSInet users by reading their abstracts, short descriptions of themselves for others on the network
6. Send private messages to one or more PSInet users
7. Use the built-in ASCII text editor, PSIedit or use another ASCII editor to create and edit papers and messages
8. Create online forms to send as papers or messages for other users to fill out and return
9. Edit and resend documents
10. Save network tasks and accomplish them all in a single telephone call
11. Set a computer to automatically dial the network at any selected time
12. Store papers and messages on your computer in a personal data base PSInet creates automatically

13. Search for documents in a data base by session, author, title, date, or keywords
14. Sort lists of papers or messages by session, author, title, or date
15. Print all or selected entries in a list of PSInet documents, or even print the list itself
16. Copy one or more messages or papers to DOS files for use with other programs
17. Use PSInet to send any kind of file as a paper or message, whether it be a file containing a program, data, or graphics" (People Sharing Information, 1989, pp. 1-2).

Iowanet

A grant from the Roy J. Carver Charitable Trust to Drake University made it possible to link every school building in Iowa, including colleges and universities. The grant provided training, PSInet software, and expenses for one teacher from every building to attend a training session. Regional servers were also provided for each of Iowa's 15 AEAs. Training was provided for each system operator (sysop) as well. The state server, located at Drake University in Des Moines, Iowa, maintained a link with the national server, formerly in Ames, Iowa, now at Drake University (Mitchell & Gerlovich, 1992).

Internet

The national director of PSInet, a professor at Drake University, received a grant from the National Science

Foundation (NSF) to create an electronic gateway between PSInet and Internet. This gateway, located at Drake University provides two way messaging capabilities between PSInet users and the users of the world wide Internet (Drake University 1992).

Educational Research on the Use of Technology

Technology in the educational process has been researched for many years. As early as 1939, the effectiveness of instruction via radio was investigated. The investigators reported that those students taking their classes via radio performed as well as, or better than, those in a traditional classroom (Cook & Nemziek, 1939). Since that time there have been hundreds of studies conducted examining radio, audio tape and televised instruction (Hargrave & Thompson, 1991). Most of the studies show that there is little difference in student achievement. "The best current evidence is that media are MERE VEHICLES that deliver instruction, but do not influence student achievement any more than the truck that delivers our groceries causes changes in nutrition" (Clark, 1983).

A review of the literature (Hargrave & Thompson, 1991) shows educational research in the 1980's, began using ethnographic studies to determine what kinds of educational processes work best with different media. Much of the research centered around interactive video and hypermedia. More recent research efforts in computer based learning

indicate needed change in the role of teacher in the teaching/learning process (Hargrave & Thompson, 1991)

Summary of the Use of Technology in Teaching/Learning

The technologies that have been developed to date have made little if any change in the teaching/learning process. Most technologies have been used by educators as faster and more improved delivery systems. Radio, motion pictures, television, and projection equipment allow learners greater accessibility to lectures, visual images, sounds and printed materials. These technologies have allowed the educator easier access to larger numbers of learners. The teaching learning process has, in that sense, become more efficient by using technology. The processes of teaching, however, have remained basically unaltered by the introduction of technologies. Lecture is still the most common method of teaching.

Chapter 3

METHOD

Objectives

This investigation studied "new user" teacher perceptions of the effectiveness of asynchronous computer telecommunications (a type of computer conferencing that does not require both computers online simultaneously), specifically PSInet, to enhance the teaching/learning of science in Iowa.

Research Questions Addressed

1. What applications of asynchronous computer conferencing are thought by science teachers to have the greatest potential for enhancing the teaching/learning process in science education?
2. Do "new user" science teachers perceive computer conferencing as enhancing communication with their colleagues?
3. Does asynchronous computer conferencing provide access to information perceived as useful by science teachers?
4. Which features of PSInet are thought by science teachers to be the most useful in teaching/learning science?
5. What difficulties are encountered by "new user" science teachers when setting up a PSInet work station?

6. What are the difficulties encountered by "new user" science teachers who are learning to use PSInet?
7. What are the difficulties encountered by science teachers using PSInet in the teaching/learning process?

Methodology

Data for the research were gathered by surveying two groups of Iowa educators. In the first group, Trial One, a sample of 16 in-service teachers of science in central Iowa were provided computers and PSInet software. They were instructed to develop and use a minimum of two unit plans using computer teleconferencing and to share these plans with other teachers on the PSInet network. Lesson development by participants was sporadic and sparse. In addition, teachers were asked to use at least one lesson plan developed by other teachers on the network. They were then to critique the lesson, and report their findings on PSInet. Again, participation was sparse. Teacher-use of PSInet for communication with other professionals and agencies was encouraged.

In the second group, Trial Two, surveys were sent to 40 educators that were using PSInet on servers located in Iowa Education Agencies (AEAs) 3, 11, and 12.

Data Collection

Trial One examined the use of PSInet by teachers from August 1991 through May 1992. Data were collected using a survey consisting of Likert-type questions. In addition to the Likert-type questions, the survey contained several open

ended discussion questions and places for respondents comments. Ten surveys were returned by the respondents in Trial One.

The surveying of participants in Trial One was conducted near the end of the school year in April and May of 1992. Trial Two was conducted in the early spring of 1993. Hardware and software were provided to all of the central Iowa science teachers participating in Trial One in September, 1991. The project was monitored until the end of the Spring semester in June of 1992. All data collection from Trial One ceased with the completion of the survey, after the end of the school year in May and June of 1992. In Trial Two the survey was sent to the PSInet users of Iowa AEA (Area Education Agency) servers in areas 3, 11, and 12, after training in the use of PSInet had been provided by Drake University with funds from the Carver Trust. The survey was sent to the active users of PSInet in these areas during March and April of 1993. Twenty four surveys were returned by the respondents in Trial Two.

Survey Drafts

Each of the seven basic research questions addressed by the survey were analyzed and several specific survey questions were developed to answer these seven questions. These survey questions were then grouped together with each of the seven research questions they addressed.

Survey Questions AddressingResearch Question Number One

What applications of asynchronous computer conferencing are thought by science teachers to have the greatest potential for enhancing the teaching/learning process in science education?

Please answer the following questions by placing the number that best fits your situation in the corresponding blank.

4 I strongly agree.

3 I agree.

2 I disagree.

1 I strongly disagree.

0 Not applicable to my situation.

___ 1. I encouraged students to use PSInet.

___ 2. My students were eager to learn to use PSInet.

___ 3. I used PSInet as a teaching/learning tool.

___ 4. I made use of new or innovative teaching methods that used PSInet.

___ 5. Some of my students established contact with individuals beyond the confines of my classroom.

___ 6. Those student contacts with persons outside my classroom were educationally helpful to the students involved.

7. Describe applications of telecommunications using PSInet to the teaching/learning environment in your classes. _____

8. Describe difficulties encountered when attempting to apply telecommunications using PSInet to the teaching/learning environment. _____
9. What, in your opinion, are the best uses of PSInet for the science teacher? Please provide examples.
10. Please describe your experiences using PSInet in the teaching/learning process. _____

Survey Questions Addressing

Research Question Number Two

Do "new user" science teachers perceive computer conferencing as enhancing communication with their colleagues?

- ___ 11. I used PSInet to correspond with persons in other schools in the same district.
- ___ 12. I used PSInet to correspond with persons in other school districts.
- ___ 13. I used PSInet to correspond with persons in educational fields other than my own.
- ___ 14. I correspond often with persons in fields other than education.
- ___ 15. I was able to find sources of information on PSInet that were helpful to me as teacher.

Survey Questions Addressing

Research Question Number Three

Does asynchronous computer conferencing provide access to information perceived as useful by science teachers?

- ___ 16. Having the ability to contact other professionals using PSInet has increased my sense of "belonging" to the teaching profession.
- ___ 17. PSInet is easier to use than the US mail.
- ___ 18. When I asked for information on the network, I received the information requested.

Survey Questions Addressing

Research Question Number Four

Which features of PSInet are thought by science teachers to be the most useful in teaching/learning science?

PSInet enables the user to perform many tasks: Which applications of PSInet do you find to be the most useful to the teaching/learning process? Use the following numbers to indicate your response in the corresponding blanks.

4 I found this feature to be very useful.

3 I found this feature useful.

2 This feature is of little value to me.

1 This feature is of no value to me.

0 I do not know, I have never used this feature.

- ___ 19. Joining PSInet conference sessions to receive papers submitted by other users.
- ___ 20. Submitting papers to PSInet conference sessions for other participants to read.
- ___ 21. Beginning new conferences and sessions to initiate dialog about new topics.
- ___ 22. Participating in "outside" conferences on other PSInet networks.

- ___ 23. Learning about other PSInet users by reading their abstracts.
- ___ 24. Creating my own abstract for others to read.
- ___ 25. Sending private messages to one or more PSInet users.
- ___ 26. Using the built-in ASCII text editor, PSIedit.
- ___ 27. Using another ASCII editor to create and edit papers and messages.
- ___ 28. Creating online forms to send as papers or messages for other users to fill out and return.
- ___ 29. Editing and resending documents.
- ___ 30. Saving network tasks and accomplishing them all in a single telephone call.
- ___ 31. Setting a computer to automatically dial the network at any selected time.
- ___ 32. Storing papers and messages on my computer in a personal data base PSInet creates automatically.
- ___ 33. Searching for documents in a data base by session, author, title, date or keywords.
- ___ 34. Sorting lists of papers or messages by session, author, title or date.
- ___ 35. Printing all, or selected, entries in a list of PSInet documents, or even printing the list.
- ___ 36. Copying one or more messages or papers to DOS files for use with other programs.

- ___ 37. Using PSInet to send any kind of file as a paper or message, whether it be a file containing a program, data, or graphics.

Survey Questions Addressing

Research Question Number Five

What difficulties are encountered, by "new user" science teachers when setting up a PSInet work station?

Please answer the following questions by placing the number that best fits your situation in the corresponding blank.

- 4 I strongly agree.
 3 I agree.
 2 I disagree.
 1 I strongly disagree.
 0 Not applicable to my situation.

- ___ 38. The hardware configuration was easy to set up.
 (telephone, computer, monitor, printer, and modem)
 ___ 39. The process of getting on-line the first time was easy.
 40. Please describe any problems you encountered during the process of setting up. _____

Survey Questions Addressing

Research Question Number Six

What are the difficulties encountered, by "new user" science teachers, learning to use PSInet?

- ___ 41. The training I received was enough to teach me how to get started using PSInet.

- ___ 42. PSInet software was easy to install.
- ___ 43. I used PSInet immediately after receiving my training.
- ___ 44. I have read the PSInet support manual.
- ___ 45. Individual training was helpful.
- ___ 46. Learning to use PSInet was challenging.
- 47. Please describe any problems encountered installing PSInet. _____

Survey Questions Addressing

Research Question Number Seven

What are the difficulties encountered by science teachers using PSInet in the teaching/learning process?

- ___ 48. Help was readily available from other individuals.
- 49. Please describe problems you had learning to use PSInet. _____
- ___ 50. The telephone connection is in a convenient place.
- ___ 51. The computer stays hooked up to the telephone line.
- ___ 52. The computer has to be moved before it can be used "online".
- ___ 53. There is pressure (implied or explicit) to not make computer calls.
- ___ 54. I had difficulty obtaining access to a telephone line for PSInet.
- ___ 55. Policies or existing practices make it difficult to have the needed access to the telephone.
- ___ 56. Existing telephone lines are adequate for using PSInet.

- ___ 57. The telephone is readily available when it is needed.
- ___ 58. The cost of making calls is a factor in determining the length and number of telephone calls.
59. Please describe any difficulties experienced with access to, or use of the telephone. _____
- ___ 60. I have time to use computer teleconferencing during my work day.
- ___ 61. I have time to use computer teleconferencing during my off hours (either at school or home).
62. Please describe other problems concerning time and your use of PSInet. _____
- ___ 63. I am reluctant to use PSInet.
- ___ 64. I have ready access to PSInet when I want to use it.
- ___ 65. Omitted.
- ___ 66. All of the necessary equipment is available when I need it.
- ___ 67. I would use PSInet more if it were more conveniently located.
68. Please describe the most convenient place for the PSInet work station. _____
- ___ 69. I can think of many ways to use computer teleconferencing in teaching/learning.
- ___ 70. I often use PSInet to contact outside resources.
- ___ 71. Students are allowed to use PSInet to contact outside resources.

___ 72. Students were given specific assignment requiring the use of PSInet.

Please make any comments that you feel are important to the research or to the teaching/learning process. _____

Data Analysis

Responses to the "Likert-Type" questions were tabulated and listed in tables by percentages. The number of responses in the "Strongly Agree" and "Agree" were compared to the total number of respondents choosing to answer the question. This ratio was listed as a percentage of "agreeable" responses. These percentages were then listed in tables for comparison purposes. The data in these tables were used to plot graphs from which inferences were made.

The answers to each of the open ended questions were categorized. The number of respondents giving answers in each of the categories was determined and inferences made from the relative numbers of answers in each of the categories. The inferences made from each of these processes were, in turn, validated by two selected users of PSInet and further checked by members of the doctoral committee.

Teacher Training and Preparation

Participants in Trial One received minimal training in the use of PSInet during the Fall of 1991. This training amounted to about one hour of one-on-one computer instruction per individual. Other sources of assistance included personal help with equipment or process from

researchers, peer help from other teachers in the project, software documentation, and the help function of PSInet. The training was completed during the Fall in-service time and in short intervals after school hours during the school year as needed or requested. Additional questions on the use of the system by the new users were addressed on PSInet, by telephone and personal contact. This minimum training was a fairly typical pattern of training for new users of PSInet throughout the nation.

Demographics

Respondents in both Trial One and Trial Two were Iowa educators. Those respondents receiving surveys in Trial One were central Iowa teachers of science or mathematics working in or near Des Moines. Respondents in Trial Two were educators, not necessarily teachers, working in Iowa Area Education Agencies (AEA's) numbered 3, in North Central Iowa, 11, in Central Iowa, and 12, in North West Iowa. Even though Trial Two included AEA 11, which in turn includes central Iowa and Des Moines, there was no duplication of respondents in the two trials.

Figure 1 represents the relative positions of the Area Education Agencies (AEAs) in the State of Iowa.

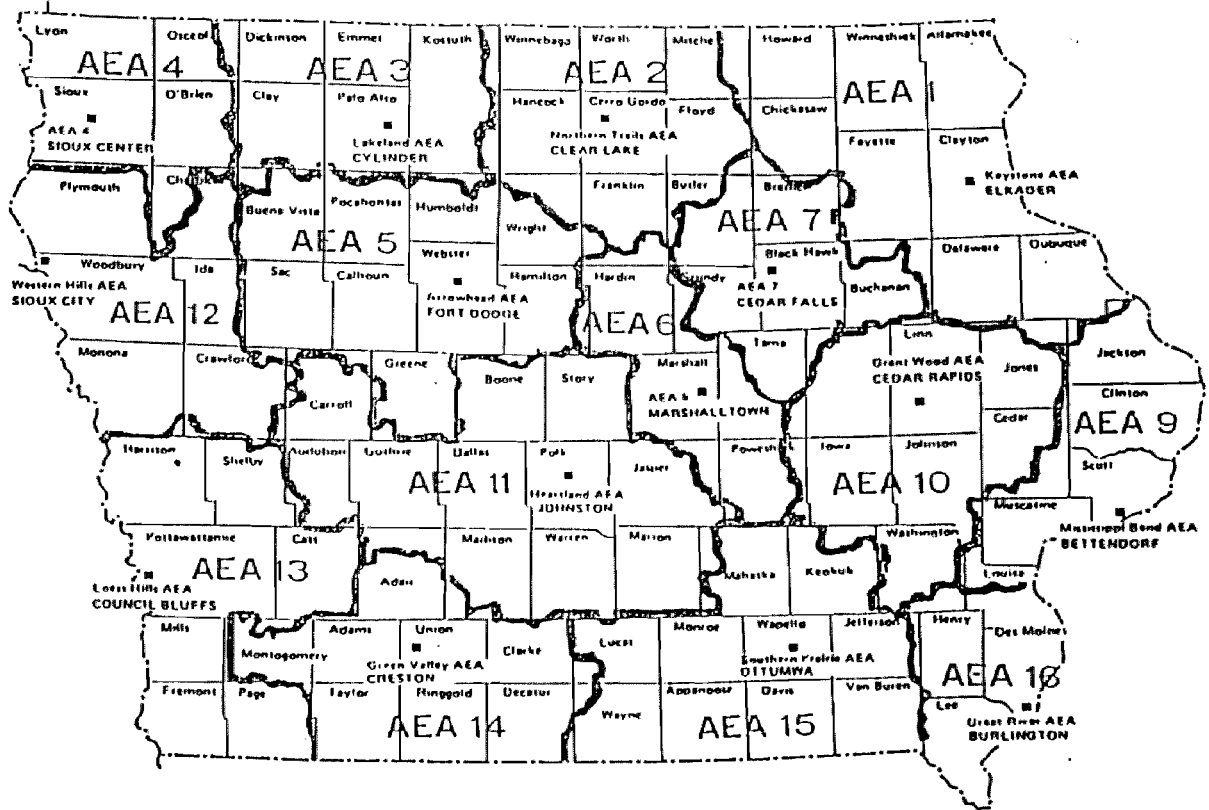


Figure 1. Iowa Area Education Agencies.

(Mitchell & Gerlovich 1992)

In Trial One the survey was sent to a select group of teachers selected to be part of "Iowa Showcase," a project exploring the use of PSInet in the teaching/learning process. The focus of the project was on the use of telecommunications using PSInet to enhance classroom instruction in the areas of science and mathematics. The teachers participating in the project were provided

computers, PSInet software, and support by the researchers. The respondents surveyed in Trial Two were educators who were already using PSInet, as evidenced by their having an abstract posted on the network.

Figure 2 represents the percentage of respondents in each age group in Trial One and Trial Two. The demographics questionnaire can be found in appendix A on page 116. The data supporting this graph can be found in Table A-1 on page 117.

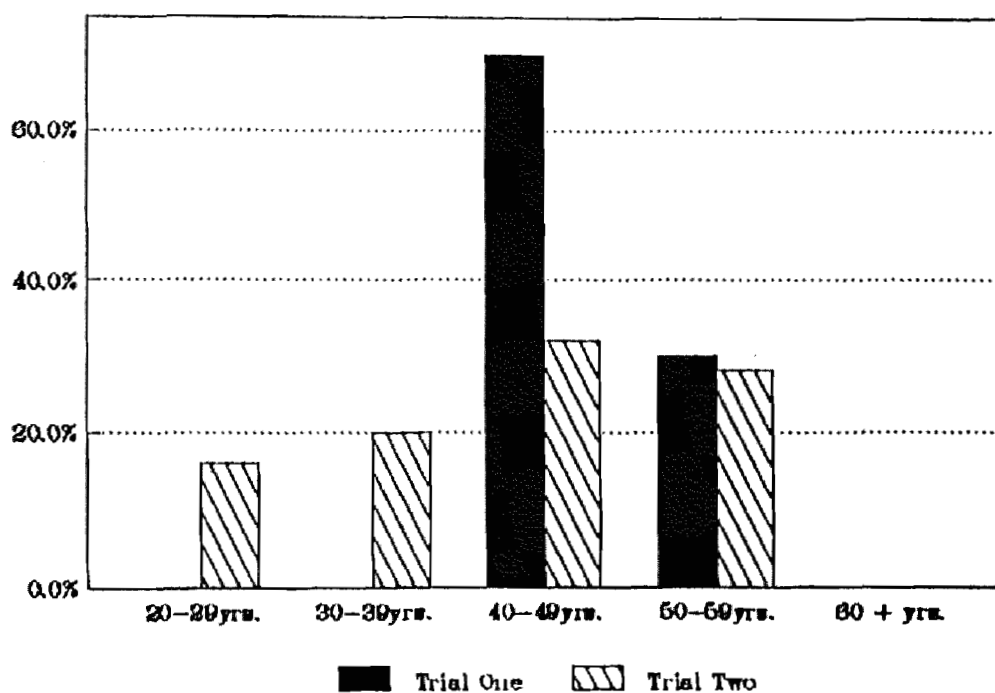


Figure 2. Ages of Respondents in Trial One and Trial Two.

Seventy percent of the respondents answering the survey in Trial One were in the 40 to 49 years of age bracket. The other 30% were in the 50 to 59 age group. By comparison,

the Trial Two survey shows 32% were in the age 40 to 49 years group. Nearly as many, 28% were in the age 50 to 59 years bracket.

Figure 3 represents the percentage of respondents grouped by gender for Trial One and Trial Two. The data supporting this graph can be found in Table A-2 on page 118.

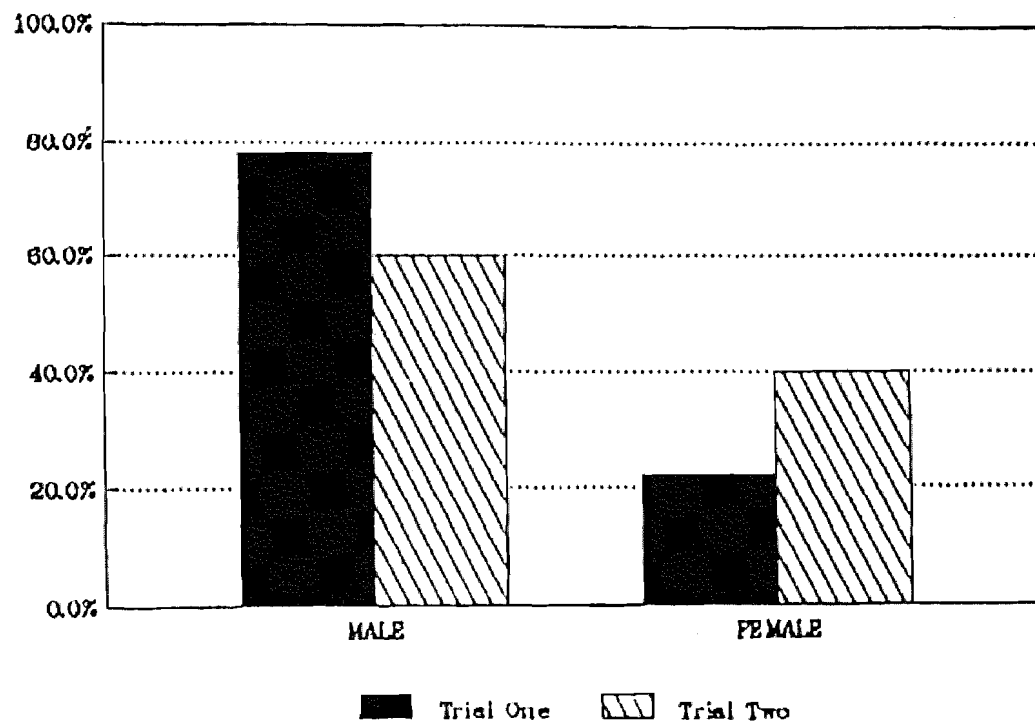


Figure 3. Gender of Respondents in Survey
Trial One and Trial Two.

Seventy percent of the respondents in Trial One were male and 60% of the respondents answering the survey in Trial Two were male.

Figure 4 represents the percentage of respondents grouped by years of teaching experience for Trial One and

Trial Two. The data supporting this graph can be found in Table A-3 on page 118.

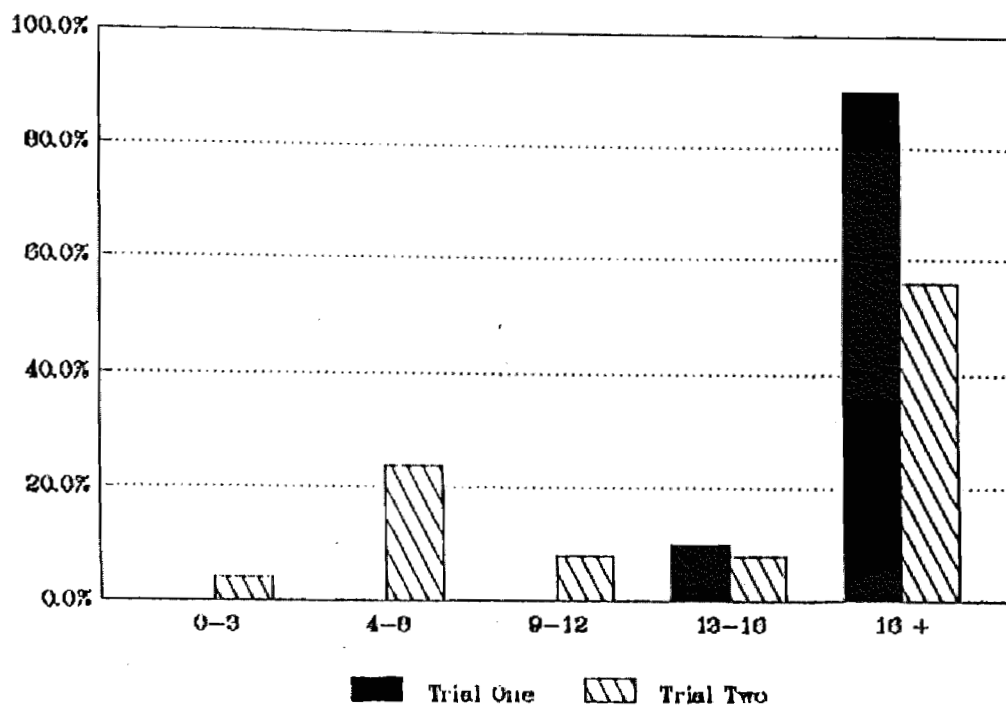


Figure 4. Years of Teaching Experience Among Respondents.

The respondents in Trial One were experienced respondents. Ninety percent indicated 16 or more years teaching experience. In Trial Two, 56% of the respondents had 16 or more years teaching experience.

Figure 5 represents respondent teaching level. The data supporting this graph can be found in Table A-4 on page 119.

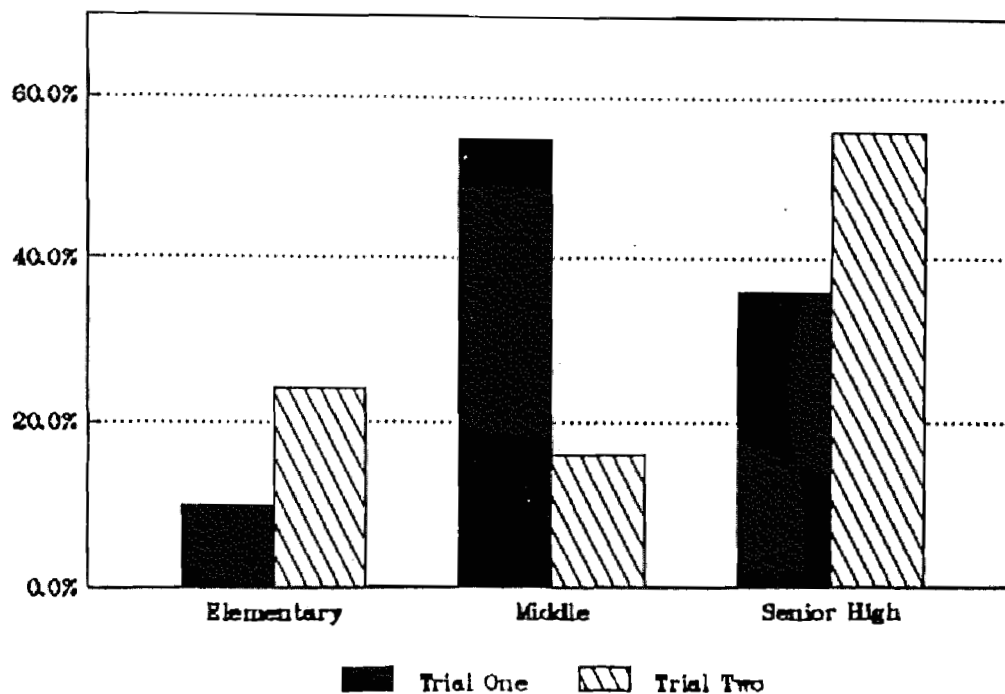


Figure 5. Teaching Level of Respondents in Trial One and Trial Two.

The respondents in Trial One taught in all three traditional levels of public of education. Ten percent at the elementary level, 60% in middle or junior high school, and 30% were high school teachers. In Trial Two 24% worked in Elementary School, 16% in Middle School, and 60% at the Senior High School level.

Figure 6 represents the percentage of respondents presently teaching Mathematics, Science or other areas in Trial One and Trial Two. The data supporting this graph can be found in Table A-5 on page 120.

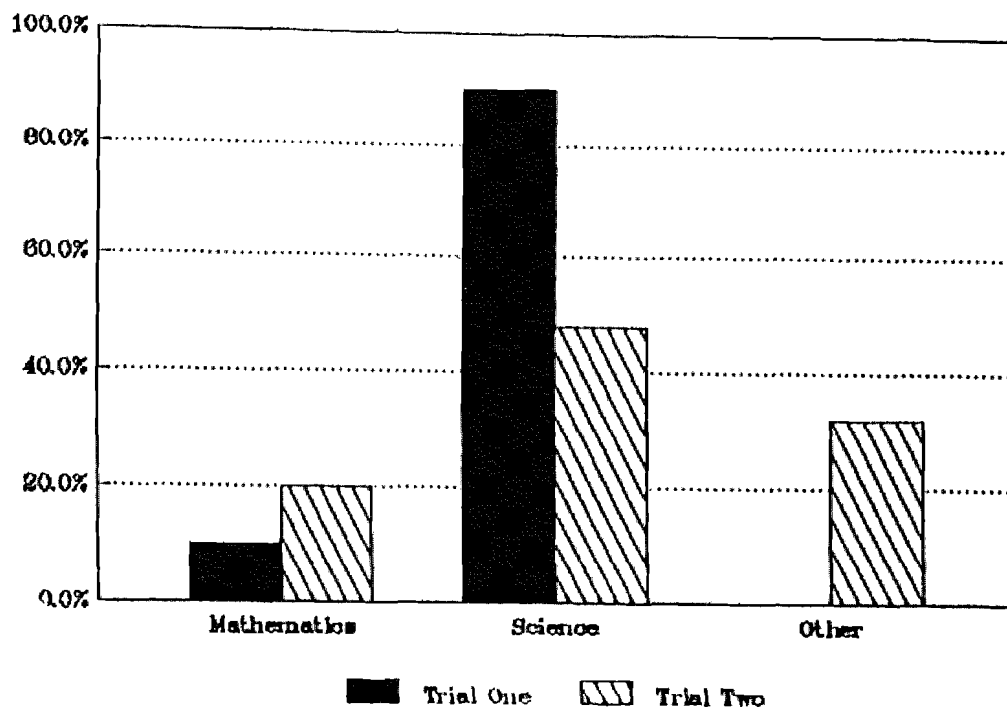


Figure 6. Teaching Area of Respondents in Trial One and Trial Two.

Ninety percent of the respondents in Trial One were science teachers and the others were teachers of mathematics. In Trial Two 48% were science teachers and 20% were teachers of mathematics. Others did not indicate their teaching area and 8% indicated they were media specialists.

Figure 7 Represents respondent's self perception of computer experience for Trial One and Trial Two. The data supporting this graph can be found in Table A-6 on page 120.

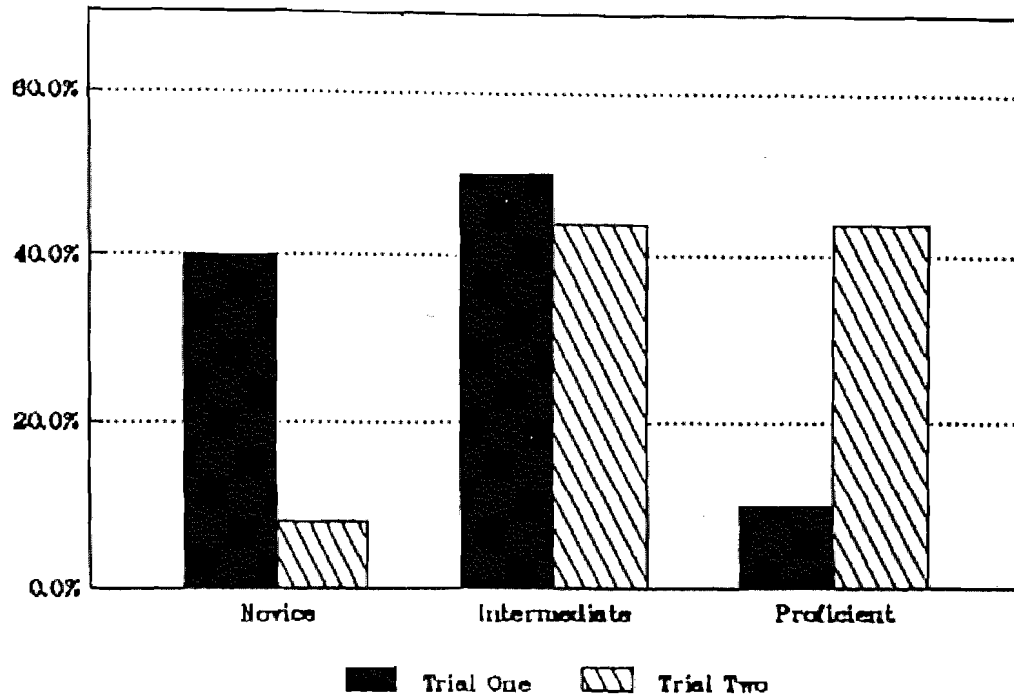


Figure 7. Computer Experience of Respondents

Forty percent of the respondents in Trial One considered themselves as having intermediate level computer skills. Fifty percent considered themselves as computer novices and 10% percent considered themselves as proficient with the computer. In Trial Two 44% of the respondents designated themselves as intermediate skill level users of computers. Eight percent considered themselves novices and 44% percent indicated they considered themselves proficient in the use of the computer.

Figure 8 represents types of existing computer experience possessed by respondents in Trial One and Trial Two. The data supporting this graph can be found in Table A-7 on page 121.

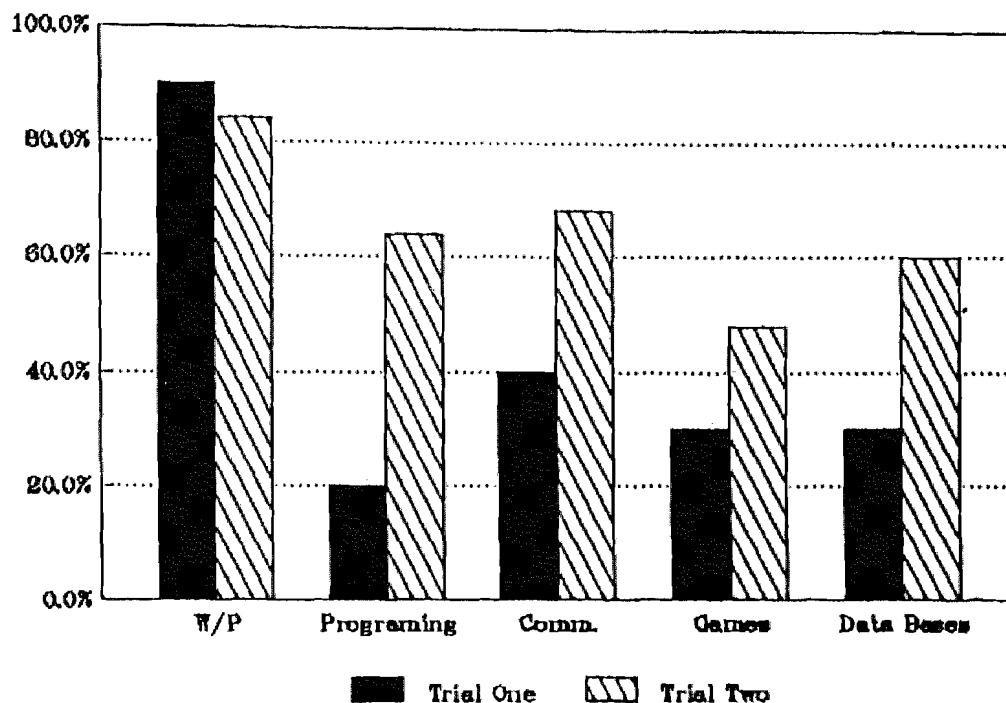


Figure 8. Computer Experience Possessed by Respondents in Trial One and Trial Two.

The respondents experience with computer applications varied, but nearly all, 90%, of the respondents in Trial One indicated they had some experience with word processing. Eighty-four percent of the respondents in Trial Two indicated they had experience in word processing.

Figure 9 represents the size of school the respondents were working in during Trial One and Trial Two. The data supporting this graph can be found in Table A-8 on page 122.

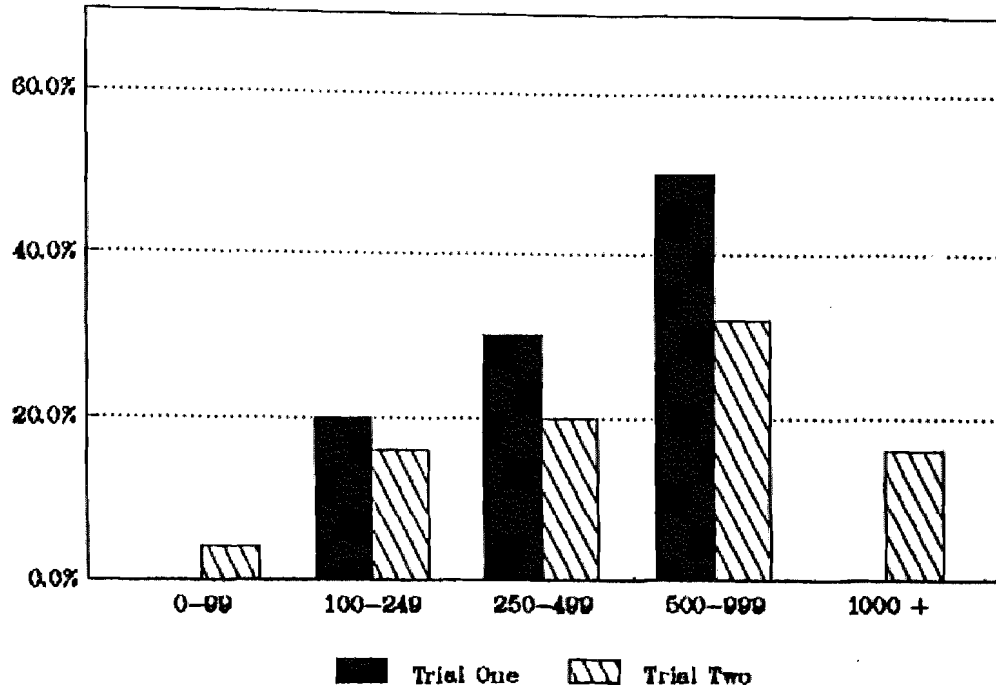


Figure 9. Size of Respondent's Schools

Nearly one-third, 30%, of the respondents in Trial One indicated they worked in a school with between 250 and 499 students. One half, 50%, worked in schools with between 500 and 999 students. In Trial Two, 16% of the respondents were employed in schools with student populations between 100 and 249 students. Twenty percent were in schools with student populations between 250 and 499, and 32% were working in schools with between 500 and one 999 students. A total of 78% of the respondents worked in schools with fewer than 999 students.

Figure 10 represents the size of school district the respondents were working in during Trial One and Trial Two. The data supporting this graph can be found in Table A-9 on page 123.

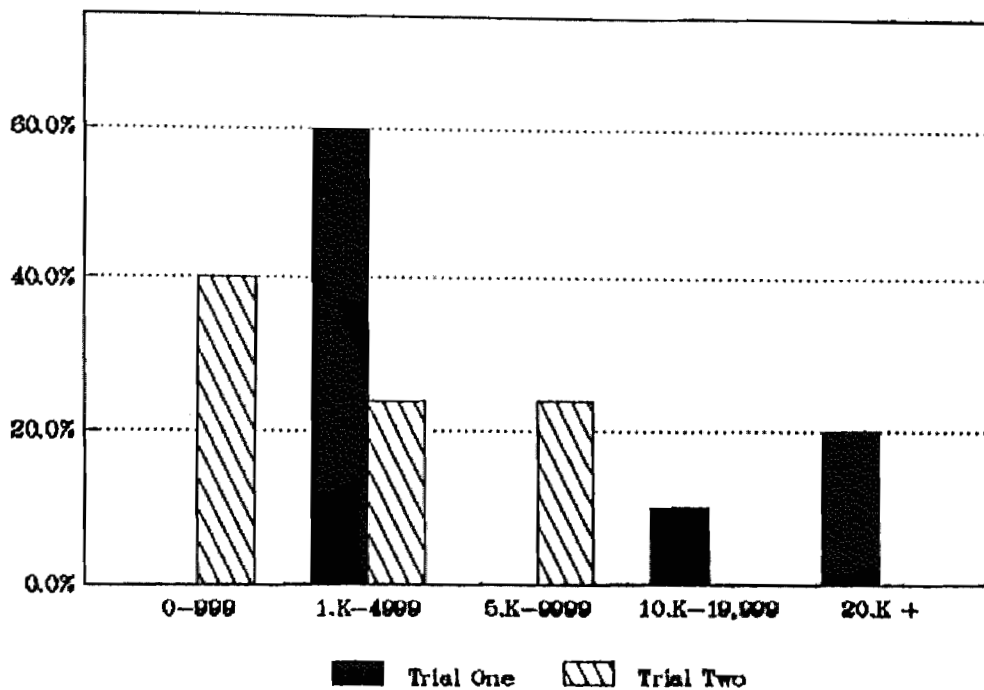


Figure 10. Size of Respondent's School Districts

Sixty percent of the respondents in Trial One worked in school districts serving fewer than 4,999 students. Forty percent of the respondents in Trial Two worked in districts with fewer than 4,999 students.

Figure 11 represents educator experience with PSInet for Trial One and Trial Two. The data supporting this graph can be found in Table A-10 on page 124.

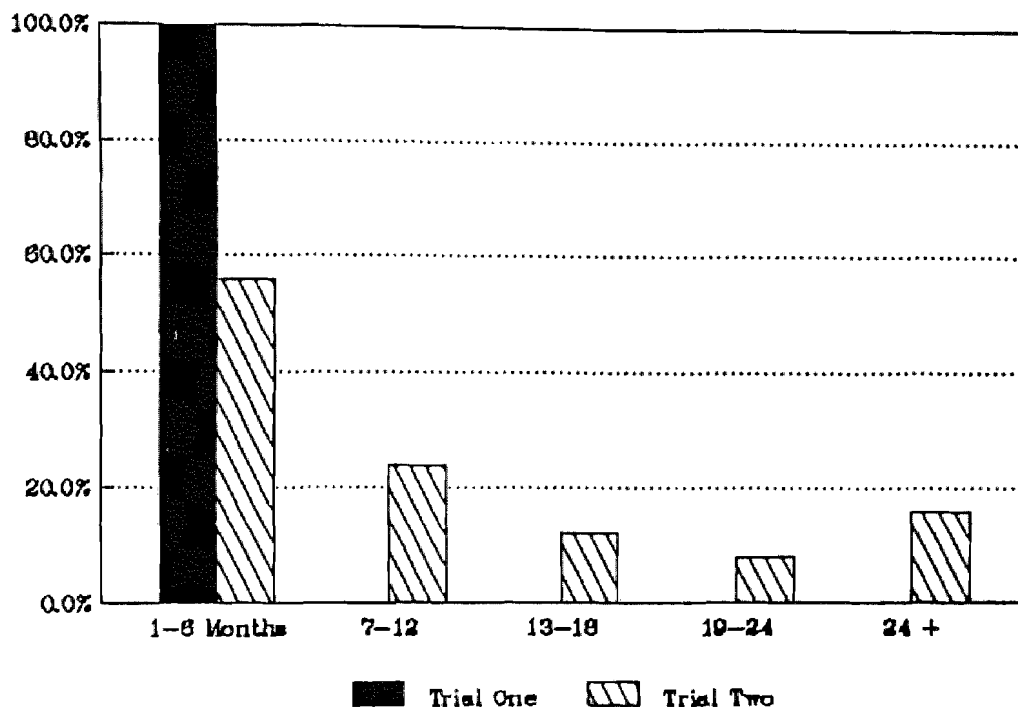


Figure 11. Respondent's Experience Using PSInet

None of the respondents in Trial One had previous experience using PSInet as a teaching tool. The respondents in Trial Two also had very little experience using PSInet. Sixty percent of those returning surveys indicated less than 6 months experience with PSInet.

During Trial One 62 1/2% responded to the survey. The percentage of individuals responding in Trial Two was similar. There were 60% of those receiving the survey responding.

Tabulation of Data

The survey questions that pertained to each of the seven research questions were grouped with the research question. The survey questions were then analyzed by these groups.

The broad scope of the study necessitated asking many questions delving into the several features of PSInet and many possible problems associated with learning to use and adapt PSInet to teaching/learning strategies. Inherently there were questions asked that did not pertain to every respondent in the study. Provisions were made in the design of the survey for those situations that did not apply to respondents by providing an answer space for indicating (not applicable to my situation). Thus respondents needed only to respond to questions that applied to their situation.

The data derived from the two trials of the survey were tabulated in two different ways. An arithmetic mean was determined for the "Likert-type" choices. Using responses 1 through 4. The "0" responses (not applicable to my situation) and the "nr" (no response) are not included in the determination of the means of the responses. In addition to the arithmetic mean a percentage of agreeable responses was determined using responses 3 and 4 (those responses in agreement with the statement). The percentage listed is the approximate percentage of agreeable responses that either strongly agree "4" or agree "3". The "0" responses and the non-responses "nr" are not included in the

calculation of the percent of agreeable responses. The percent of agreeable responses was determined using only data from those respondents that responded to the agree or disagree statements. Thus only those choices numbered 1, 2, 3, and 4 were used to determine the percent of agreeable answers.

Definitions

The following terms are defined for this study:

Asynchronous Computer Teleconferencing: A form of computer teleconferencing which connects users together in a manner that allows messages to be sent and received at any time. Even if the other participant is not on-line at the time, a message can be left for them, and will be received by them, when they choose to go on-line.

Computer: An electronic device that stores and manipulates information. It is made up of at least a central processing unit, memory units, and in-put and out-put devices.

Computer Telecommunications Software: The computer programs that direct the computers and modems in the act of transferring information from one computer to another.

Computer Teleconferencing: A particular kind of telecommunications in which participants interact with each other using their computers connected together by modem and telephone line. There are two distinct forms of computer teleconferencing, asynchronous and synchronous.

Microcomputer: A type of small computer that makes use of

micro-processor technology and is small enough to sit on a typical desk.

Microprocessor: A silicon chip that contains the central processing unit (CPU) for a microcomputer (Spencer 1983).

Modem: "An acronym for modulator-demodulator. A device that provides the appropriate interface between a communications link and a data processing machine or system by serving as a modulator and/or demodulator" (Spencer, 1983). It converts computer electronic impulses to sound impulses for transmission on telephone lines. By necessity the modem must also convert sound impulses being received on the telephone line to electronic impulses for the receiving computer.

Personal Computer (PC): A microcomputer designed for personal use.

Synchronous Computer Teleconferencing: A form of computer teleconferencing which connects the users together at the same time. Like a telephone conversation, the participants interact with each other directly.

Technology: Innovations that aid in the creation, communication, manipulation or storage of information.

Telecommunications: An exchange of information taking place between two or more remote places by electronic transfer media. For purposes of simplifying this definition for this research, telecommunications was limited to mean only those activities that transfer user-accessible information from one place to another.

Chapter 4

RESULTS OF SURVEY QUESTIONS

Survey questions are listed in numerical order, grouped under each of the research questions. A graph of the result, or summary of answers to each question, follows each group. Tables showing the responses to the "Likert-Type" questions, along with averages and percentage of responses in agreement, can be found in appendix B.

Research Question Number One

What applications of asynchronous computer conferencing are thought by science teachers to have the greatest potential for enhancing the teaching/learning process in science education?

Results of Survey QuestionsNumber 1 Through 10

All Likert-type questions and statements were answered by placing the number that best fit the situation in the corresponding blank.

4 I strongly agree.

3 I agree.

2 I disagree.

1 I strongly disagree.

0 Not applicable to my situation.

If there was no response to a question, an "nr" was recorded

to keep track of the number of respondents choosing not to respond.

- ___ 1. I encouraged students to use PSInet.
- ___ 2. My students were eager to learn to use PSInet.
- ___ 3. I used PSInet as a teaching tool.
- ___ 4. I made use of new and innovative teaching methods that used PSInet.
- ___ 5. Some of my students established contact with individuals beyond the confines of my classroom.
- ___ 6. Those student contacts with persons outside my classroom were educationally helpful to the students involved.
7. Describe applications of telecommunications using PSInet to the teaching/learning environment in your classes. _____
8. Describe difficulties encountered when attempting to apply telecommunications using PSInet to the teaching/learning environment. _____
9. What, in your opinion are the best uses of PSInet for the science teacher? _____
10. Describe experience using PSInet in the teaching/learning process. _____

Figure 12 represents the percentage of responses in agreement for "Likert-Type" Questions 1 through 6 in Trial One and Trial Two. The data supporting this graph can be found in Table B-1 on page 125.

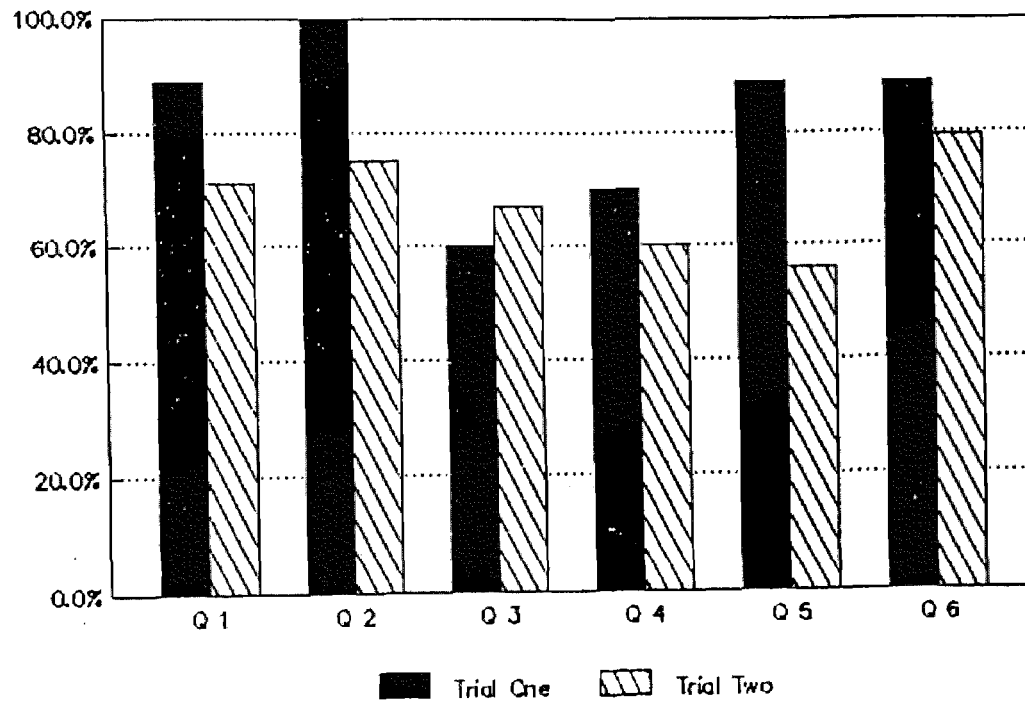


Figure 12. Percentage of Responses in Agreement on Questions Number 1 through 6.

Table 1 contains a summary of the responses to question seven on Trial One and Trial Two.

Table 1

Summary of the Responses to Question Number Seven: Describe Applications of Telecommunications Using PSInet to the Teaching/Learning Environment In Your Classes.

Application of telecommunications to the teaching/learning environment	Trial One %	Trial Two %
Research	70	12
Surveys of students and teachers	30	12
Double blind experiments	10	0
Issue investigation, opinion surveys	10	0
Contact with other teachers	60	8
Creating data bases for research	0	24
Student as tutor of distance learner	40	0
Question/answer questions by students	40	10
Creative scientific writing	20	0
Reproducibility experiment (tinker toys)	20	0
Student pen pals	20	30
Assignments for remote students	0	4
Questions of experts on the system	0	16
Gave no response	20	40

Table 2 contains a summary of the responses to Question eight on Trial One and Trial Two.

Table 2

Summary of the Responses to Question Number Eight: Describe Difficulties Encountered when Attempting to Apply Telecommunications Using PSInet to the Teaching/Learning Environment.

Difficulties Encountered Applying Telecommunications to Learning Environment	Trial One %	Trial Two %
Training of initial user	60	8
Training others in building	0	4
Need training on classroom application	0	4
Equipment	40	0
Telephone	20	0
Computer	20	0
Time to use	30	12
Time to process information received	0	4
Time management	0	4
Ratio of student users to number of	30	4
Lack of response on the network	20	32
Access to use of telecommunications	0	20
Phone line not available	0	8
Access to the computer	0	12

table continues

Difficulties Encountered Applying Tele-communications to Learning Environment	Trial One %	Trial Two %
Costs to use computer or phone lines	10	0
Fear of Computer Viruses	10	0
Gave no response	20	16

Table 3 contains a summary of the responses to question 9 on Trial One and Trial Two.

Table 3

Summary of the Responses to Question Number Nine: What, in Your Opinion Are the Best Uses of PSInet for Science Teachers?

The Best uses of PSInet For the Science Teacher	Trial One %	Trial Two %
Research		

Research

Large shared interactive data bases	50	52
Surveys	30	0
Duplication experiments	20	0
Current issue investigation	10	0
Finding information not in the library	0	44

table continues

The Best uses of PSInet For the Science Teacher	Trial One %	Trial Two %
Communication		
Teacher/teacher colleague contacts	20	16
Colleague and/or student collaboration	10	0
Students as mentors to remote students	10	0
Classroom access to the outside	10	0
Access to experts	0	28
Staying updated on developments	0	30
Teaching technology	20	00
Gave no response	0	36

Question number ten may have been too vague to expect any kind of meaningful response. "Describe your experience" could have meant "Describe how you felt about your experience with PSInet?" or "Describe what you did." The respondents queried in Trial One described their uses of PSInet. They described using PSInet as a source of information, answering questions of others, and for teacher collaboration. Those surveyed in Trial Two reported things such as "Very limited", "My students were very excited", and "They were very good!, It was exciting." Because of the two distinctly different interpretations of the question on the two different trials, it was decided to exclude question number 10.

Research Question Number Two

Do "new user" science teachers perceive computer conferencing as enhancing communication with their colleagues?

Results of Survey Questions

Number 11 Through 15

- 11. I used PSInet to correspond with persons in other schools in the same district.
- 12. I used PSInet to correspond in other school districts.
- 13. I used PSInet to correspond with persons in educational fields other than my own.
- 14. I correspond often with persons in fields other than education.
- 15. I was able to find resources of information on PSInet that were helpful to me as a teacher.

Figure 13 represents the percentage of responses in agreement for "Likert-Type" questions 11 through 15 in Trial One and Trial Two. The data supporting this graph can be found in Table B-2 on page 127.

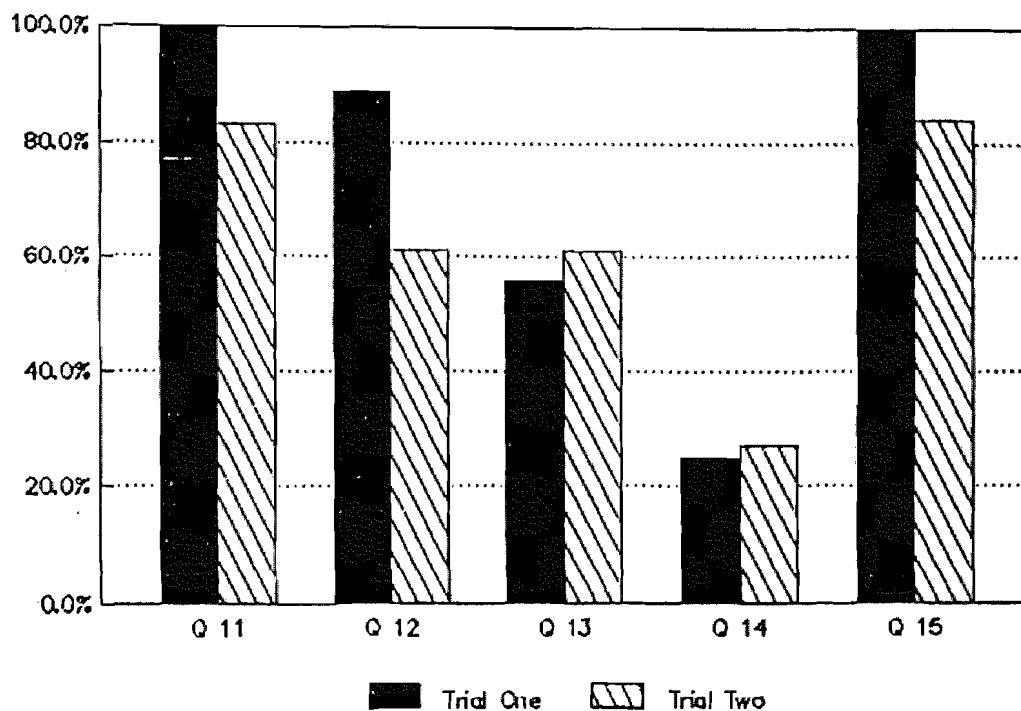


Figure 13. Percentage of Responses in Agreement on Questions Number 11 through 15

Research Question Number Three

Does asynchronous computer conferencing provide access to information perceived as useful by science teachers?

Results of Survey Questions

Number 16 Through 18

- ___ 16. Having the ability to contact other professionals using PSInet has increased my sense of "belonging" to the teaching profession.

- ___ 17. PSInet is easier to use than the US mail.
- ___ 18. When I asked for information on the network, I received the information requested.

Figure 14 represents the percentage of responses in agreement for "Likert-Type" questions 16 through 18 in Trial One and Trial Two. The data supporting this graph can be found in Table B-3 on page 128.

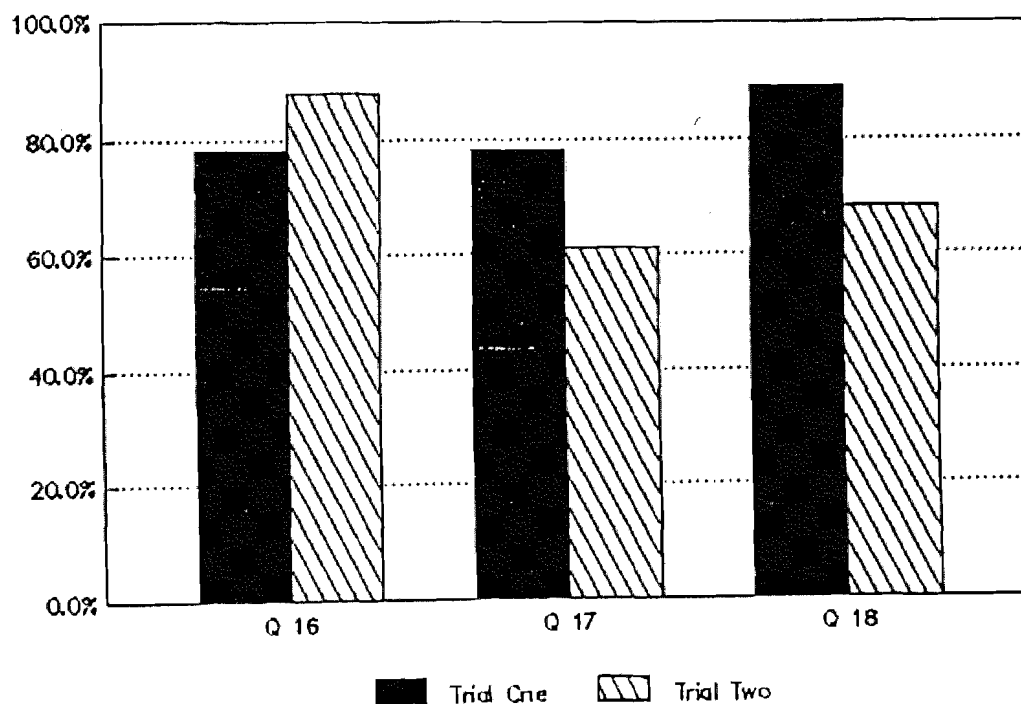


Figure 14. Percentage of Responses in Agreement for Questions Number 16 through 18

Research Question Number Four

Which feature of PSInet are thought by science teachers to be the most useful in teaching/learning science?

Results of Survey Questions

Number 19 Through 37

- ___ 19. Joining PSInet conference sessions to receive papers submitted by other users.
- ___ 20. Submitting papers to PSInet conference sessions for other respondents to read.
- ___ 21. Beginning new conferences and sessions to initiate dialog about new topics.
- ___ 22. Participating in "outside" conferences on other PSInet networks.
- ___ 23. Learning about other PSInet users by reading their abstracts.
- ___ 24. Creating my own abstract for others to read.
- ___ 25. Sending private messages to one or more PSInet users.
- ___ 26. Using the built-in ASCII text editor, PSIdit.
- ___ 27. Using another ASCII editor to create and edit papers and messages.
- ___ 28. Creating online forms to send as papers or messages for other users to fill out and return.
- ___ 29. Editing and resending documents.
- ___ 30. Saving network tasks and accomplishing them all in a single telephone call.
- ___ 31. Setting a computer to automatically dial the network at any selected time.
- ___ 32. Storing papers and messages on my computer in a personal data base PSInet creates automatically.

- ___ 33. Searching for documents in a data base by session, author, title, date or keywords.
- ___ 34. Sorting lists of papers or messages by session, author, title or date.
- ___ 35. Printing all, or selected, entries in a list of PSInet documents, or even printing the list.
- ___ 36. Copying one or more messages or papers to DOS files for use with other programs.
- ___ 37. Using PSInet to send any kind of file as a paper or message, whether it be a file containing a program, data, or graphics.

Figure 15 represents the percent of responses in agreement for "Likert Type" questions 19 through 37 in Trial One and Trial Two. The data supporting this graph can be found in Table B-4 on page 129.

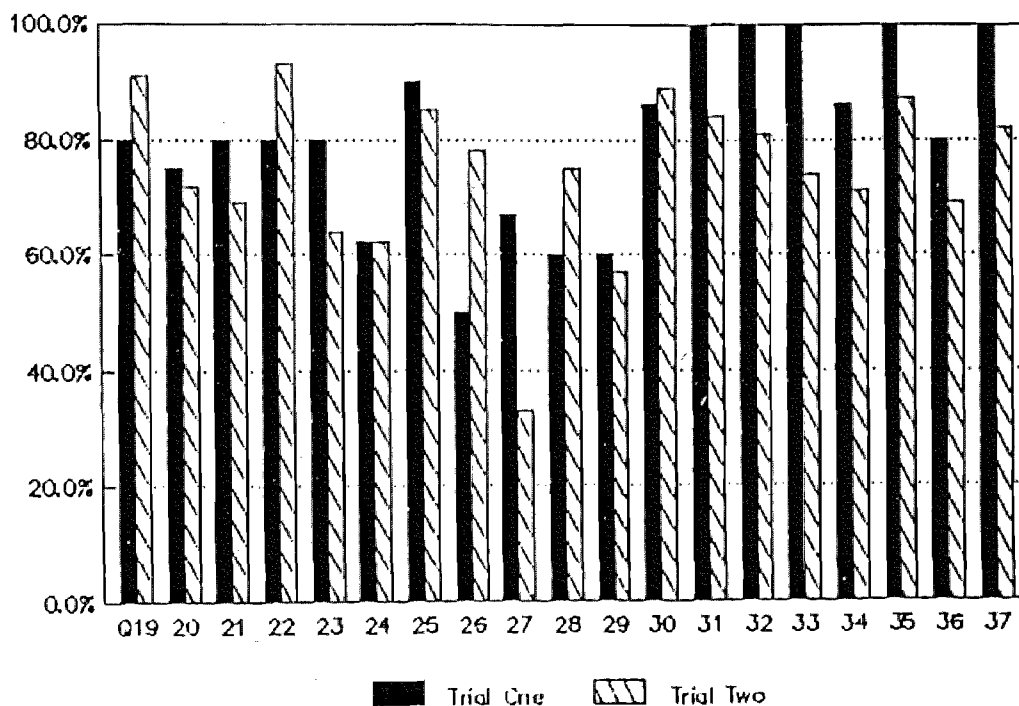


Figure 15. Percentage of Responses in Agreement on Questions Number 19 through 37

Research Question Number Five

What difficulties are encountered by "new user" science teachers when setting up a PSInet work station?

Results of Survey Questions

Numbered 38 Through 40

- ___ 38. The hardware configuration was easy to set up.
(telephone, computer, monitor, printer, and modem)

- ___ 39. The process of getting on-line the first time was easy.
40. Please describe any problems you encountered during the process of setting up. _____

Figure 16 represents the percent of responses in agreement for "Likert-Type" questions 38 through 39 in Trial One and Trial Two. The data supporting this graph can be found in Table B-5 on page 132.

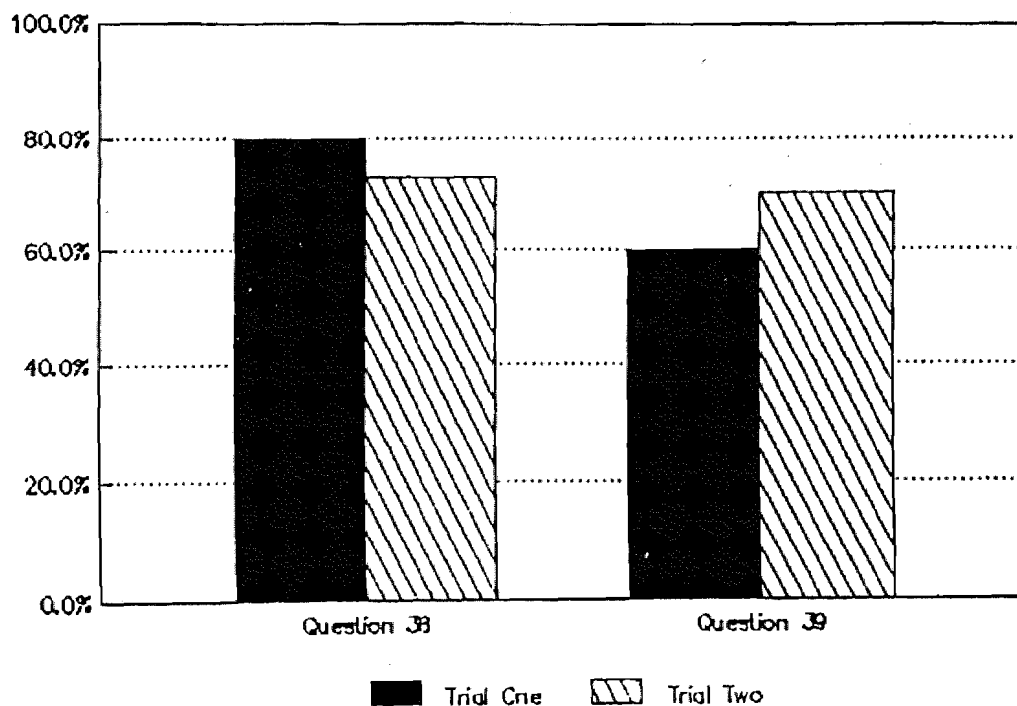


Figure 16. Percentage in Agreement to "Likert-Type" Questions Number 38 through 39

Table 4 reports a summary of the responses to question number 40 for Trial One and Trial Two.

Table 4

Summary of the Responses to Question Number 40: Please Describe any Problems You Encountered During the Process of Setting Up.

Problems Encountered During the Process of Setting up	Trial One %	Trial Two %
User felt unprepared	50	16
Problems with equipment	20	16
Time constraints	20	4
Insufficient number of computers	10	0
No problems	0	8
No response	20	52

Research Question Number Six

What are the difficulties encountered by "new user" science teachers, learning to use PSInet?

Results of Survey Questions

Number 41 Through 47

- ___ 41. The training I received was enough to teach me how to get started using PSInet.
- ___ 42. PSInet software was easy to install.
- ___ 43. I used PSInet immediately after receiving my training.
- ___ 44. I have read the PSInet support manual.

- ___ 45. Individual training was helpful.
- ___ 46. Learning to use PSInet was challenging.
47. Please describe any problems encountered installing PSInet. _____

Figure 17 represents the percent of responses in agreement for "Likert-Type" questions 41 through 46 in Trial One and Trial Two. The data supporting this graph can be found in Table B-6 on page 134.

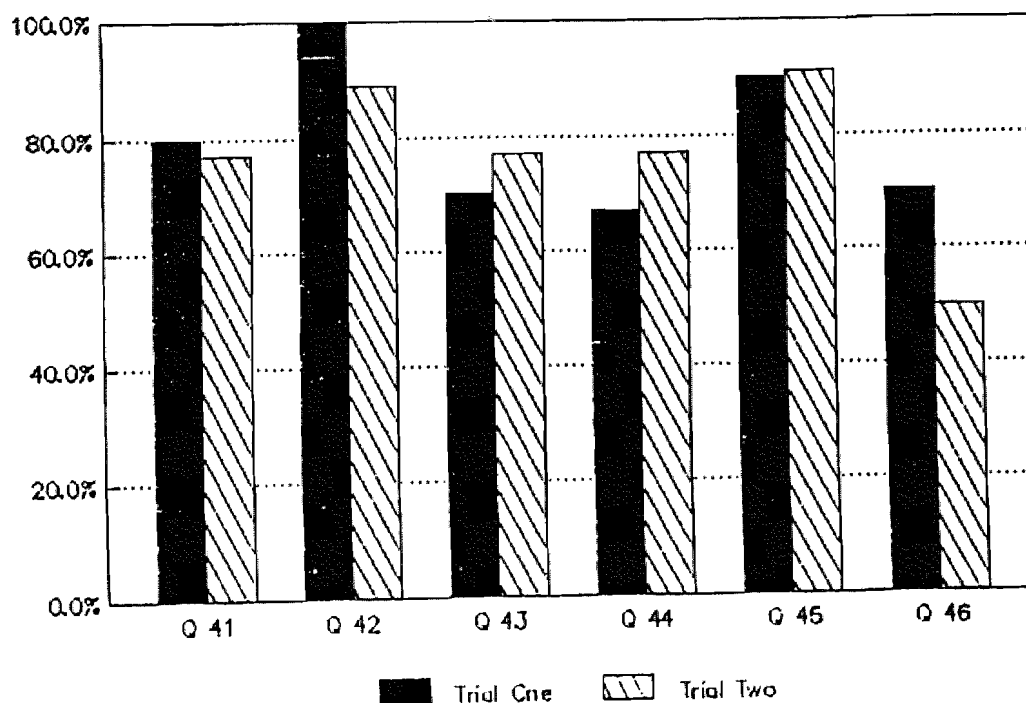


Figure 17. Percentage in Agreement for Questions Number 41 through 46

Table 5 reports a summary of responses to question number 47 for Trial One and Trial Two.

Table 5

Summary of the Responses to Question Number 47: Please Describe any Problems Encountered Installing PSInet.

Problems Encountered Installing PSInet	Trial	Trial
	One	Two
	%	%
Reported no difficulty	10	12
Equipment problems	40	4
Not enough computers for class use	10	0
Familiarization problems	10	0
Computer (MS Dos)	0	4
PSInet structure	0	4
Time to learn how to use	0	4
No response	60	52

Research Question Number Seven

What are the difficulties encountered by science teachers using PSInet in the teaching/learning process?

Results of Survey Questions

Number 48 Through 54

- ___ 48. Help was readily available from other individuals.
49. Please describe problems you had learning to use PSInet. _____
- ___ 50. The telephone connection is in a convenient place.

- ___ 51. The computer stays hooked up to the telephone line.
- ___ 52. The computer has to be moved before it can be used "online".
- ___ 53. There is pressure (implied or explicit) to not make computer calls.
- ___ 54. I had difficulty obtaining access to a telephone line for PSInet.

Figure 18 represents the percentage of responses in agreement for "Likert-Type" questions 48 through 54 in Trial One and Trial Two. The data supporting this graph can be found in Table B-7 on page 134.

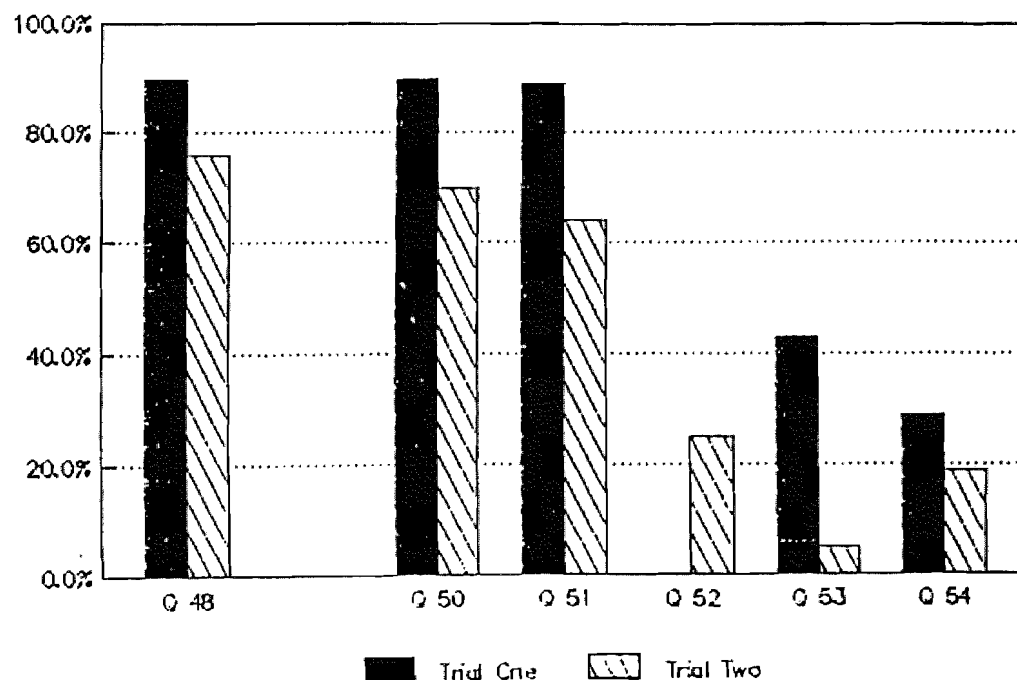


Figure 18. Percentage of Responses in Agreement on Questions Number 48 tThrough 54

Table 6 represents a summary of the responses to question number 49 for Trial One and Trial Two.

Table 6

Summary of the Responses to Question Number 49: Please Describe Problems You had Learning to Use PSInet.

Problems learning to use PSInet	Trial	Trial
	One	Two
	%	%
Help not readily available	20	44
Lack knowledge of MS DOS	30	4
Lack knowledge of PSInet	0	16
Inadequate training	0	4
Time limitations	20	4
No problems	0	12
No response	30	56

Results of Survey Questions

Number 55 through 61

- ___ 55. Policies or existing practices make it difficult to have the needed access to the telephone.
- ___ 56. Existing telephone lines are adequate for using PSInet.
- ___ 57. The telephone is readily available when it is needed.

- ___ 58. The cost of making calls is a factor in determining the length and number of telephone calls.
59. Please describe any difficulties experienced with access to, or use of the telephone. _____
- ___ 60. I have time to use computer teleconferencing during my work day.
- ___ 61. I have time to use computer teleconferencing during my off hours (either at school or home).

Figure 19 represents the percentage responses in agreement for "Likert-Type" questions 55 through 61 in Trial One and Trial Two. The data supporting this graph can be found in Table B-8 on page 135.

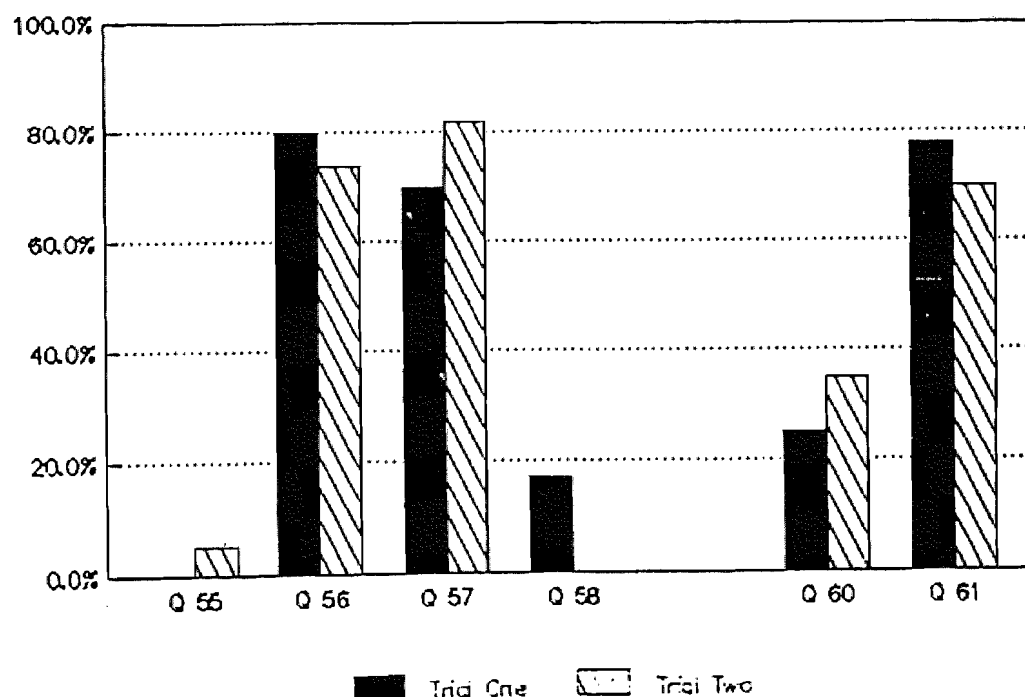


Figure 19. Percentage of Responses in Agreement on Questions Number 55 through 61

Table 7 represents a summary of the answers to question number 59 for Trial One and Trial Two.

Table 7

Summary of the Responses to Question Number 59: Please Describe Any Difficulties Experienced with Access to, or Use of the Telephone.

Difficulties Experienced with Access to or use of the Telephone	Trial One %	Trial Two %
No difficulties	40	12
Objection to the cost of telephone calls	10	4
Phone lines often in use	10	4
Non specific phone problems	0	4
Place of the phone connections	0	8
No response	40	68

Results of Survey Questions

Number 62 Through 67

62. Please describe other problems concerning time and your use of PSInet. _____

Table 8 represents a summary to the answers to question number 62 for Trial One and Trial Two.

Table 8

Summary of the Responses to Question Number 62: Please Describe Other Problems Concerning Time and Your Use of PSInet.

Problems concerning time and the use of PSInet	Trial One %	Trial Two %
Difficulties sharing the terminal	20	12
Paper work and other obligations	20	8
Problems with time	30	20
Class load	20	4
Inadequate knowledge of PSInet	0	4
Waiting for the Mac. version	0	4
Getting started	10	0
No response	30	56

- ___ 63. I am reluctant to use PSInet.
- ___ 64. I have ready access to PSInet when I want to use it.
- ___ 65. Omitted from the survey
- ___ 66. All of the necessary equipment is available when I need it.
- ___ 67. I would use PSInet more if it were more conveniently located.

Figure 20 represents the percent of responses in agreement for "Likert-Type" questions 63 through 67 in Trial One and Trial Two. The data supporting this graph can be found in Table B-9 on page 137.

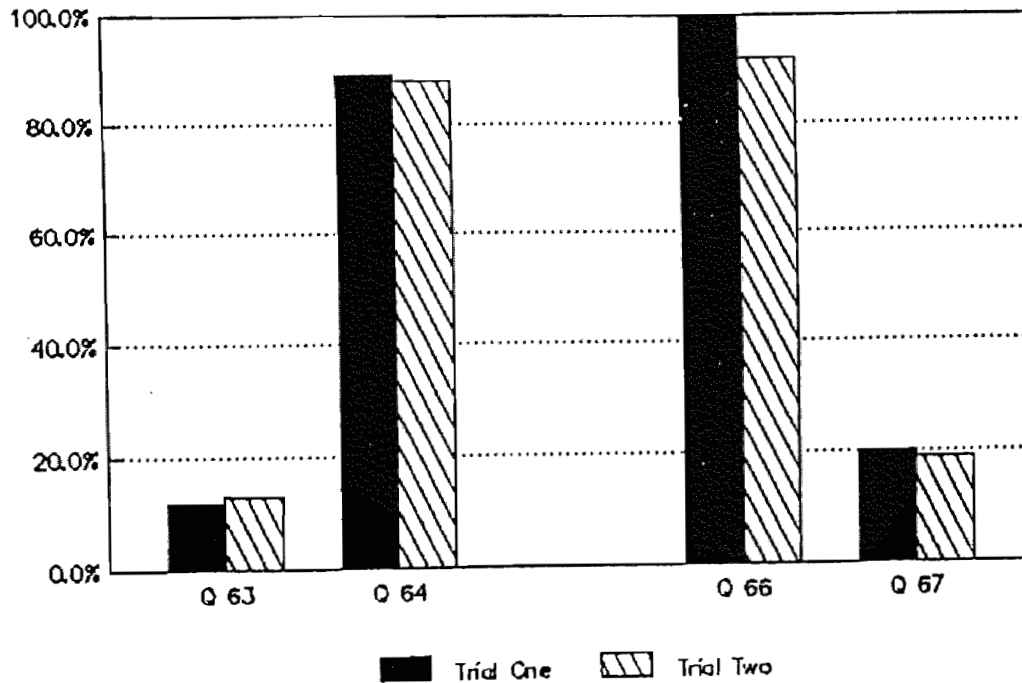


Figure 20. Percentage of Responses in Agreement with Questions Number 63 through 67.

Results of Survey Questions

Number 68 Through 72

68. Please describe the most convenient place for the PSInet workstation. _____

Table 9 represents summaries of the answers to question number 68 in Trial One and Trial Two.

Table 9

Summary of Responses to Question Number 68: Please Describe the Most Convenient Place for the PSInet Work Station.

The Most Convenient Place for the PSInet Workstation	Trial One %	Trial Two %
In the classroom	30	36
In the science office	20	8
In the school library	10	0
In the science resource room	0	4
At the teachers home	0	4
No response	50	32

- ___ 69. I can think of many ways to use computer teleconferencing in teaching/learning.
- ___ 70. I often use PSInet to contact outside resources.
- ___ 71. Students are allowed to use PSInet to contact outside resources.
- ___ 72. Students were given specific assignment requiring the use of PSInet.

Figure 21 represents the percentage of responses in agreement for "Likert-Type" questions 69 through 72 in Trial One and Trial Two. The data supporting this graph can be found in Table B-10 on page 138.

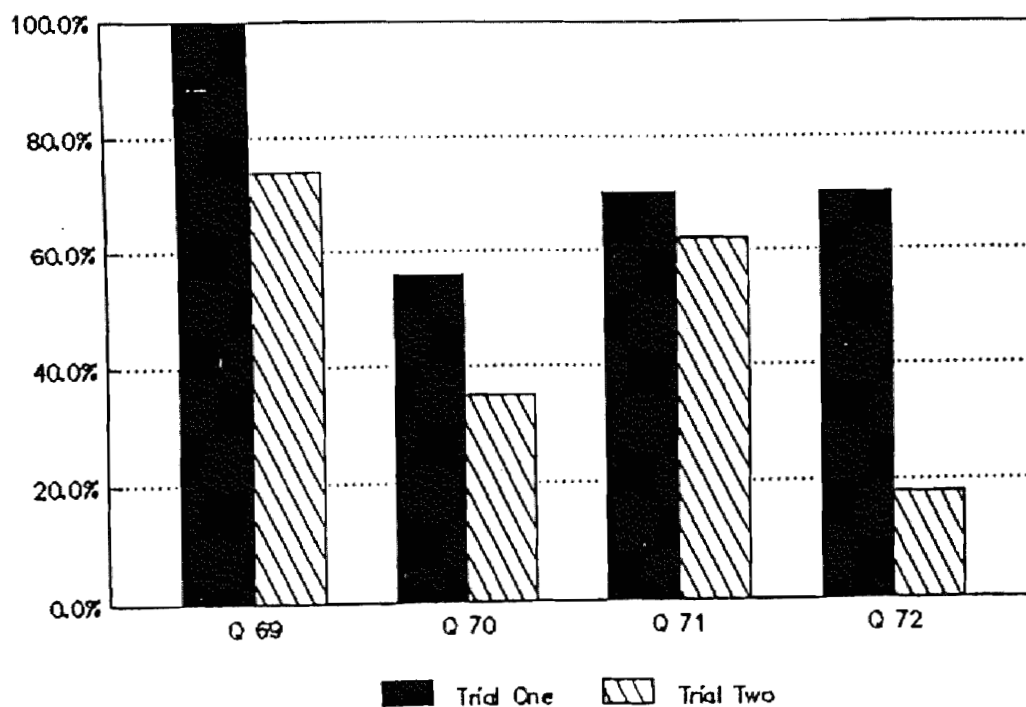


Figure 21. Percentage of Responses in Agreement on Questions Number 69 through 72.

Results of Request

for Comments

Please make any comments that you feel are important to the research or to the teaching/learning process.

Table 10 represents summaries of answers to the request for comments in Trial One and Trial Two.

Table 10

Summary of the Responses to the Request for Comments: Please Make Any Comments that You Feel Are Important to the Research or to the Teaching/Learning Process.

Felt by the respondents to be important to research or to teaching/learning	Trial One %	Trial Two %
No response	70	40
Not enough time	0	8
Need more training and practice	10	12

There were several comments in both Trial One and Trial Two that could not be easily categorized. The following comments were not categorized into any kind of significant grouping. They have been simply listed.

Comments from respondents in Trial One:

1. "My two students were assigned task of answering questions presented by elementary students."
2. (Please) "Allow students ownership in telecommunications."

Comments from Respondents in Trial Two:

1. (PSInet is) "Still in the development stage. There is a lot of potential, but it will take some more

coordination and effort to get people involved on a larger scale. Perhaps more data sharing, like the Milford water analysis of the Little Sioux River."

2. "Are you shadowing the Little Sioux River Project at IA12A?"
3. "Even though PSInet has been around a number of years, it is still in its infancy. As it grows, the kinds of student usage or which conferences they're allowed will have to be monitored more closely. A better system of remote messaging is needed."
4. Regarding Question number 53 (There is pressure (implied or explicit) to not make computer calls.) "Other than free? Yes. PSInet 800? No." Regarding question number 58 (The cost of making calls is a factor in determining the length and number of telephone calls.) "I can only do the A.E.A. 800 number."
5. "I have PSInet in my room but can only dial out from 8:00 PM to 7:00 AM each day. Biggest problem is getting other school instructors to use PSInet."
6. "Students had the option to use in an experiment." 7. "I will use PSInet more next school year when I have it relocated next to the phone and have more time."
8. "It is important we continue to use PSInet. Many schools in our area are not hooked up yet, and hopefully when they do they will be as excited about it as we are. It will be better when more use it and

understand it. The possibilities are limitless. Thank you."

9. "Regarding question number 14: (I correspond often with persons in fields other than education.) I intend to, (correspond with persons in other fields) though we are new at this. Regarding question number 18: (When I asked for information on the network, I received the information requested.) You are at the mercy of someone answering. Regarding question number 30: (Saving network tasks and accomplishing them all in a single call.) Others can easily destroy your commands, and you theirs, if you move the computer from room to room. Regarding Question number 31: (Setting a computer to automatically dial the network at any selected time.) Our phone system does not allow this as a smooth operation."
10. "An excellent way to share teaching ideas. (It is) easy to use (and) cost effective. Having access to all other schools in Iowa and beyond IF/WHEN this happens."
"DISADVANTAGES:
(1.) Mac version promised - but not produced.
Credibility is becoming a problem.
(2.) Problems with remote server reported, but not corrected, this affects several schools.
(3.) Remote messaging is 'poor to unusable.'

NOTE:

I really want to support this system, but disadvantages 1 and 2 are really getting in my way."

Chapter 5

ANALYSIS

Analysis of Research Question Number One

What applications of asynchronous computer conferencing are thought by science teachers to have the greatest potential for enhancing the teaching/learning process in science education?

Analysis of Data Collected from

Survey Questions 1 through 10

There were four questions in this section of the survey that received higher approval ratings and higher average responses than the others. These were questions pertaining to student use and student outcomes, as opposed to teacher use. The responses to the question (I encouraged students to use PSInet), with 89% in agreement in Trial One and 71% agreement in Trial Two, and to the question (Those student contacts with persons outside my classroom were educationally helpful to the students involved), with 89% agreement in Trial One and 79% agreement in Trial Two, suggest teachers feel students should seek contacts beyond the confines of the classroom. These responses also suggest teachers feel these contacts are educationally helpful to the student.

The question about student eagerness (My students were eager to learn to use PSInet), with 100% in agreement in

Trial One and 75% in agreement in Trial Two, suggests teachers believe the motivational aspect of the use of PSInet in the classroom is beneficial to the teaching/learning process.

The responses to the question, (Some of my students established contact with individuals beyond the confines of my classroom), with 89% in agreement in Trial One and 56% in agreement in Trial Two, may indicate teachers believed students were making use of PSInet. The responses to questions (Some of my students established contact with individuals beyond the confines of my classroom.) and (Those student contacts with persons outside my classroom were educationally helpful to the students involved.) indicate teacher belief that asynchronous computer telecommunications was beneficial to the teaching/learning process.

Those questions relating to student use and to student outcomes all received higher approval rating than those questions relating to teacher use and applications. It appears that teachers feel the use of PSInet was a good experience for students, but were less enthusiastic about teacher involvement. Teacher responses to the question (I used PSInet as a teaching/learning tool), with 60% of the responses in agreement in Trial One and 67% in agreement in Trial Two, and their responses to the question (I made use of new or innovative teaching methods that used PSInet) with 70% in agreement in Trial One and 60% in agreement in Trial

Two, were less enthusiastic than the responses to the survey questions involving student use and student benefits.

The response to the question (Some of my students established contact with individuals beyond the confines of my classroom), with 89% in agreement in Trial One and 56% in agreement in Trial Two, provides some indication the students were successful in their attempts at using PSInet as a messaging tool. The use of PSInet as a source of information beyond the classroom walls, as indicated by the question (Those student contacts with persons outside my classroom were educationally helpful to the students involved.) with 89% in agreement in Trial One and 79% in agreement in Trial Two, suggests student success with telecommunications.

Trial Two revealed the same priorities as Trial One with the exception Trial Two had a much lower percentage of agreement for the question (Some of my students established contact with individuals beyond the confines of my classroom), with 89% in agreement in Trial One and only 56% in agreement in Trial Two. This difference may be due to the fact that many of those responding to the survey in Trial Two reported working at the AEA level. Two of these respondents reported they were a media specialist, and six respondents did not respond to the question regarding the curricula they were presently teaching. It is possible that as many as 40% of those educators surveyed in Trial Two were educators serving in positions other than classroom teacher.

This could possibly account for the lower approval rating for this question.

The most popular application of teleconferencing using PSInet mentioned by the respondents in both Trial One and Trial Two, was its use as a research tool. Seventy percent of the responses from the respondents in Trial One mentioned research, for both students and teachers, as an application they had tried. Nearly 40% of the respondents surveyed in Trial Two mentioned uses of PSInet for research. Individual student or teacher research projects were the most common mentioned. The most popular application of PSInet in the area of research was surveying of other students and teachers on the network. Issues and opinion-attitude investigation being the most mentioned by teachers involved in Trial One.

The applications of PSInet in the area of research may have been more sophisticated in Trial Two than in Trial One. Respondents in Trial Two preferred to use PSInet as a collection and redistribution tool, referring in the discussion questions most often to the use of PSInet as a tool for collecting data from, and redistributing data to, teachers involved in a common experiment. Data were collected from several different workstations scattered around the state and combined. The data received from each individual or school were tabulated and collated, then redistributed to all of the respondents. The data were returned on the network as a paper, making it available to

anyone belonging to the same conference and session. Thus, by sharing data among several schools, classes, or individuals, all of the schools benefited by data collected from all of the respondents. Another popular research application mentioned in Trial Two was the development of double blind experiments using students and teachers available on the network.

The second most popular application overall was as a resource for information. Trial One showed 60% and Trial Two indicated 30% of the respondents surveyed used teleconferencing by PSInet as a resource for information not available from conventional sources. Asynchronous teleconferencing using PSInet was often used to collect teaching ideas from colleagues or to simply post a question about needed copies of a particular text book. Sixty percent of the respondents in Trial One and 20% of the respondents in Trial Two said they used PSInet to generally keep in touch with other teachers or educators in their field.

Students used PSInet to ask questions of "experts" outside the classroom. This was often a search for information not found in common, readily available, resources. Some teachers let their students become the "expert," by letting them answer questions asked by other, perhaps younger, students using the network. Other students became "experts" and tried to "stump" students on the network, by presenting a puzzle or problem on the network.

This kind of student/student expert interaction accounted for a significant amount of the use of PSInet during it's initial utilization by students.

Just plain "pen paling" was also a major use the students utilized automatically. There were some teacher assigned projects that encouraged or required student communications, but most often, without teacher intervention, the student recognized asynchronous telecommunications as a chance to communicate with geographically remote students.

The teachers and educators in both trials provided many lesson ideas that made use of for the use of PSInet. Some teachers, 40% of the teachers in the Trial One, used students as tutors for other students on the network. Students were also assigned to watch the network for questions by younger students and in turn to answer them. Each of these students then became an "expert" resource for younger students. A group of teachers in Trial One had students in one school send direction to students in another school on how to build an object with tinker toys. The students receiving the instructions built the object from the written directions. Later, the two groups of students and their teachers got together to compare directions with finished product. Discussing the comparison of the actual results with the expected results taught students the importance of complete and concise directions. This simple exercise emphasized the importance of precise procedures in

science for purposes of reproducibility of experimental results. One teacher proposed that testing and written assignments could be given to remote students using computer telecommunications. Another teacher, who taught special education classes, assigned her students to use PSInet for the purpose of gaining ideas for a creative writing assignment. Students finding pen pals among remote students was a popular use of asynchronous telecommunication and provided a needed writing experience for these students.

Lack of training was the most frequently mentioned difficulty among the Trial One users. It was mentioned by 60% of the respondents. At first, this might seem to be a large portion of the respondents. However, these educators were given only the minimum of introduction to the equipment and software, and were, intentionally, not provided formal training. They were also early users of the network. The number of users on the network was small and PSInet was just being introduced to teachers and to the teaching/learning process. There were no experts on "PSInet" to ask how to use asynchronous teleconferencing, specifically PSInet, as a teaching/learning tool. Difficulty in learning how to apply PSInet to the teaching/learning process was to be expected.

The second most mentioned problem was with the equipment. Problems involving the telephone accounted for 20% of the problems mentioned. These problems with the telephone were mentioned as often as problems with the computer hardware.

The third most severe difficulty mentioned was time. In Trial One 30% of the respondents mentioned time constraints, reporting they did not find the time they felt necessary to devote to the use of PSInet in the classroom.

The foremost problem mentioned by the respondents in Trial Two was the lack of responses to messages and papers placed on the network. Forty percent of the respondents in Trial Two reported problems getting a response to papers or messages sent. This was also a problem with the original group of teachers. "Lack of response" was given as an answer to the question (Describe your experiences using PSInet.), in Trial One. "Lack of response", to messages or papers sent, was not, however, mentioned in answering question number seven during Trial One.

The need for responses to messages and papers on the network is critical. If new users do not get responses to their inquiries they are likely to become discouraged and quit. The lack of responses to inquiries made on the system may be attributed to the number of users in a particular conference. With the use of PSInet in the classroom being a relatively new, perhaps there were too few classroom teachers on the network. However, other researchers of computer networking have noted a reticence on the part of users to participate in network discussion (Kerr & Hiltz, 1982). Kerr and Hiltz referred to this reticence as the "fishbowl" effect in which users are reluctant to

participate because they feel they are being watched and do not want their mistakes to be seen by every one in the conference. Some researchers attribute this apparent discomfort absence of non-verbal feedback in written communication (Kiesler, Siegal & McGuire, 1984).

Responses in Trial Two also indicate time constraints to be one of the difficulties reported. Twenty percent of the respondents in Trial Two mentioned time to learn the system, time to teach others (teachers and students), time to use the system, or personal time management. The time used in monitoring student papers and messages and finding a time when the computer was not being used by the students were also mentioned in Trial Two as problems encountered.

The responses to the survey in Trial Two indicate, while there was no significant difficulty reported with the computer equipment, training as one of the three most mentioned problems. The problems mentioned in Trial Two concerning training were more specific and of a different nature than those problems mentioned in Trial One. Respondents in Trial Two mentioned problems with the training of other teachers in their building on how to use the system, and the need for training teachers how to use the program in their classrooms. Only two users stated their initial training was a problem. It was expected that this group would have fewer complaints about their initial training because these respondents were established users of the system and many of them had taken part in the training

offered in the PSInet Training Laboratory at Drake University. The mentioning of training other teachers within the building, and the mention of the need for specific training on applications in the teaching/learning process should provide direction for future training sessions. Asynchronous computer telecommunications is in its infancy in the field of education and particularly in applications to the teaching/learning processes. It will take much research to determine what uses of this technology in education can be applied to the teaching/learning process.

The respondents in Trial Two also described difficulties with access to the phone line and to the computer. Five percent of the respondents reported difficulty with the telephone problems and 9% reported difficulty with computer hardware.

The respondents reply to the question (What, in your opinion, are the best uses of PSInet for the science teacher?) in Trial One mentioned research as the best use of PSInet. Several of the respondents mentioned more than one research project using PSInet. The responses to this question in Trial Two were also heavily in favor of research by students and teachers. These uses of PSInet included the creation of large shared interactive data bases for common and shared projects. Fifty percent of the respondents in Trial One mentioned the use of common or shared interactive data basses. Thirty percent of them mentioned the use of

student generated survey instruments to collect data from other users of the network. Forty four percent of the respondents surveyed in Trial Two indicated the use of PSInet to collect information or raw data of a type not found in libraries. This was information generally obtained through open questions on the network, or by student generated surveys sent to other users on the network. Communications between teachers and colleagues, and between students and their peers were also indicated as good uses of PSInet in the educational process.

Analysis of Data Collected from

Survey Question 10.

The question, describe your experience using PSInet in the teaching/learning process, may have been too vague to expect meaningful responses. "Describe your experience" could have meant "How did you feel about your experience with PSInet?" or "How did you use PSInet?" The respondents in Trial One described their uses of PSInet, while the respondents in Trial Two described their feeling about using it. Because of the two distinctly different interpretations of the question on the two different Trials, it was decided to exclude the question from final analysis. It probably was not stated explicitly well enough to obtain information usable in the research.

Summary of Research Question One

Teachers seem to see a need for students to use computer telecommunications and are positive about

educational benefits for students. These same teachers do not appear to see the same benefits for themselves. They see many uses for student research and for sharing student data between widely separated schools.

Analysis of Research Question Number Two

Do "new user" science teachers perceive computer conferencing as enhancing communication with their colleagues?

The respondents reported using PSInet to correspond. One hundred percent of the respondents in Trial One, and 80% of the respondents in Trial Two, were in agreement with the question, (I used PSInet to correspond with persons in other schools in the same district.). This was the smallest logical audience the researcher could visualize for the use of PSInet by teachers for communication.

The question (I used PSInet to correspond with persons in other school districts.) shows a less enthusiastic response. Eighty-nine percent of the respondents in Trial One and 61% of the respondents in Trial Two used PSInet to communicate with persons in other school districts. The audience is larger (people in other school districts) than for the previous question, but the percentage of respondents in agreement with (I used PSInet to correspond with persons in other school districts.) is decreased from the percentage in agreement in the previous question (I used PSInet to correspond with persons in other schools in the same district).

Slightly more than one half of the respondents reporting, 56% in Trial One and 61% in Trial Two, agreed with the question (I used PSInet to correspond with persons in educational fields other than my own). The audience is again greater in number (people in the educational field) than in the previous questions and the percentage of respondents that agree is again smaller.

In the question (I correspond often with persons in fields other than education.) the size of the audience was increased to include every conceivable profession. The percentage of respondents in agreement with the question was still smaller, only 25% of the respondents in Trial One and 27% in Trial Two. As the number of possible contacts available through the use of computer teleconferencing increased, and the audience became more diverse, the number of respondents in Trial One and in Trial Two making use PSInet decreased.

Responses to the question (I was able to find sources of information on PSInet that were helpful to me as teacher.) were more enthusiastic than the responses to previous three questions. All of the respondents in Trial One and 84% in Trial Two were in agreement with the statement. The respondents seem to believe in the value of computer telecommunications as indicated by their response to (I was able to find sources of information on PSInet that were helpful to me as teacher.). They also seemed to be

less than enthusiastic about using it as demonstrated by the responses to the questions (I used PSInet to correspond with persons in other schools in the same district), (I used PSInet to correspond with persons in other school districts.), and (I correspond often with persons in fields other than education.).

Summary of Research Question Two

Teachers seem to feel that PSInet enhances their communication with colleagues. However, communication with other more distant professionals did not appear to be utilized. One of the distinct advantages of PSInet is that long distance communication is as easy and as inexpensive as communication with individuals who are geographically closer. This concept was not well utilized by the respondents.

Analysis of Research Question Number Three

Does asynchronous computer conferencing provide access to information perceived as useful by science teachers?

A response of 78% in agreement in Trial One and 88% in Trial Two to the question (Having the ability to contact other professionals using PSInet has increased my sense of "belonging" to the teaching profession.) seems to indicate respondents believed communication with other members of the teaching profession was important.

Respondents seemed to feel that PSInet is easy to use. The responses to the question (PSInet is easier to use than the US Mail.) was 78% in agreement in Trial One and 61% in

agreement in Trial Two. Assuming respondents thought the US mail "easy to use" the suggestion is that PSInet is easy to use.

The response to the question (When I asked for information on the network, I received the information requested.) was 89% in agreement in Trial One and 68% in agreement in Trial Two. This seems to indicate the respondents thought PSInet useful for obtaining the information needed.

Summary of Research Question Number Three

Teachers seem to believe that PSInet is easy to use and that this type of communication is important for them. It apparently increased their sense of "belonging" to the teaching profession.

Analysis of Research Question Number Four

Which features of PSInet are thought by science teachers to be the most useful in the teaching/learning process?

Questions pertaining to each of the features of PSInet were ranked by respondent responses. The features having the highest average response on the "Likert-type" questions are listed first, and those questions receiving the lowest average response are listed last:

1. Setting a computer to automatically dial the network at any selected time.
2. Storing papers and messages on my computer in a personal data base PSInet creates automatically.

3. Sending private messages to one or more PSInet users.
4. Searching for documents in a data base by session, author, title, date or keywords.
5. Saving network tasks and accomplishing them all in a single telephone call.
6. Printing all, or selected, entries in a list of PSInet documents, or even printing the list.
7. Using PSInet to send any kind of file as a paper or message, whether it be a file containing a program, data, or graphics.
8. Joining PSInet conference sessions to receive papers submitted by other users.
9. Sorting lists of papers or messages by session, author, title or date.
10. Copying one or more messages or papers to DOS files for use with other programs.
11. Submitting papers to PSInet conference sessions for other participants to read.
12. Using another ASCII editor to create and edit papers and messages.
13. Editing and resending documents.
14. Learning about other PSInet by reading their abstracts.
15. Beginning new conferences and sessions to initiate

dialog about new topics.

16. Creating my own abstract for others to read.
17. Creating online forms to send as papers or messages for other users to fill out and return.
18. Using the built-in ASCII text editor, PSIdit.
19. Participating in "outside" conferences on other PSInet networks.

Summary of Research Question Number Four

This method of selecting those features of PSInet as most useful seems to indicate "new user" respondents prefer the features that were most easily understood. Some of those features receiving the lowest average responses are perhaps the least understood features rather than the least useful. Possibly a PSInet feature ranked by the respondents level of understanding, rather than the features usefulness to the respondent, is the built-in ASCII text editor, PSIdit. This feature was rated as nearly the least useful. It is probable that the respondents used the PSIdit feature to type their messages and papers. The respondents may not have understood the function of PSIdit. Respondents also ranked the automatic dial feature as the most useful. The function of this feature may have been better understood by the respondents.

Analysis of Research Question Number Five

What difficulties are encountered, by "new user" science teachers when setting up a PSInet workstation?

The respondents in Trial One had their equipment set up

for them, and received help from the author, the project director, the project system operator, or the IBM technical consultant assist them if problems developed. The respondents were given permission, even requested, to contact any or all of these individuals if there were problems. Most of the respondents did not choose to call.

The response to the question, (The hardware configuration was easy to set up (telephone, computer, monitor, printer, and modem.) seems to follow what was expected by the researcher. The equipment had already been set up, and/or help promised if difficulties should arise. Set up should have been easy. The respondents in Trial Two were 73% in agreement with the question.

None of the respondents in Trial One indicated they strongly agreed that getting online for the first time was easy. Six agreed that it was easy and four disagreed that it was easy. Only one respondent indicated they strongly disagreed that getting online the first time was easy. Trial One respondents responded with 60% in agreement and Trial Two respondents were 73% in agreement with the question (The process of getting online the first time was easy). It should be noted that Trial Two respondents had training available.

The most mentioned problems to the question (Please describe any problems you encountered during the process of setting up.) were inadequacies in the training. Fifty percent of the respondents in Trial One, and 16% of the

respondents in the Trial Two indicated some difficulty with the training provided. This problem was expected from respondents with Little or no training. The respondents in Trial One were provided only a minimum introduction to the hardware and software.

The 16% of the respondents reporting difficulties in Trial Two, may or may not have been trained. Formal training was offered in each of the AEA's surveyed before the server for that AEA was placed in operation. There could have been respondents in Trial Two with no formal training. There could have been users in existence with extensive informal training on the use of the software and probably were users with several years experience with the computer hardware.

More than one half of the respondents in Trial Two failed to answer the question. It is probable these respondents did not have serious problems setting up. If they had serious problems they would have had a tendency to report them by answering the question rather than choosing to not answer.

Summary of Research Question Number Five

Training was the most mentioned problem, even from the respondents in Trial Two that had received training. The Respondents in both trials expressed feelings of being unprepared and having difficulty with equipment. References to time management and time to familiarize themselves with equipment were other problems mentioned.

Analysis of Research Question Number Six

What are the difficulties encountered, by "new user" science teachers, learning to use PSInet?

The percent in agreement totals for the question (The training I received was enough to teach me how to get started using PSInet.) could indicate that respondents felt their training was adequate. Eighty percent of the respondents in Trial One and 77% in Trial Two agreed their training was adequate.

Trial One respondents were 100% in agreement and Trial Two respondents were 89% in agreement with the question (PSInet software was easy to install.). It appears the respondents considered PSInet easy to install. When asked if they used PSInet immediately after receiving their training, the respondents in Trial One were in 70% agreement and the respondents in Trial Two were 77% in agreement.

In response to the question (I have read the PSInet support manual.) is of some interest. Sixty-seven percent of the respondents in Trial One, and 87% of the respondents in Trial Two, indicated they had read the PSInet software manual. It is not known if the respondents expressing difficulty with the training were the same respondents that indicated they had not read the support manual for the PSInet software.

Training may be the key to successful use of telecommunications. In response to the question (Individual

training was helpful.), 90% of the respondents in Trial One and 91% of the respondents in Trial Two were in agreement.

The respondents in Trial One agreed with the question (Learning to use PSInet was challenging) at the 70% level and 50% on the respondents in Trial Two were in agreement. One half or more of the respondents reported they found learning to use PSInet a challenge.

When asked to discuss problems that occurred during the process of installing PSInet, problems with equipment were listed more frequently than any other. Forty percent of the respondents in Trial One reported problems with equipment. None of the respondents in Trial Two reported problems with equipment. More than one half, 60%, of the respondents in Trial One and 52% of the respondents in Trial Two failed to respond to the question. Most of the respondents in Trial One had little or no experience with MS DOS computers. In Trial One all computers were IBMs.

Summary of Research Question Number Six

The difficulties installing PSInet mentioned by the respondents were equipment problems, familiarization problems and having the time to learn how to install. The difficulties learning to use PSInet mentioned by the respondents included help not being readily available, lack of knowledge about MS DOS, and time constraints.

Analysis of Research Question Number Seven

What are the difficulties encountered by science teachers using PSInet in the teaching/learning process?

The responses to the question (Help was readily available from other individuals.) was 90% of the respondents in Trial One agreed and 76% of the respondents in Trial Two were in agreement. It was a stated mission of the investigator and others to provide as much support to the respondents in Trial One as possible. There were several people waiting to assist the respondents at their request.

Thirty percent of the respondents in Trial One and more than 50% of the respondents in Trial Two failed to provide a response to the question (Please describe any problems you had learning to use PSInet). This could be due to the lack of serious problems facing new users in learning to use PSInet. The high number of "no responses" indicates learning to use PSInet was "not" a problem. A significant problem in learning to use the program should have prompted a user to respond to the question regarding difficulty in learning to use.

The majority of the respondents in both trials, 90% in Trial One and 70% in Trial Two, indicated the placement of the telephone connection was in a convenient place.

Eighty-nine percent of the respondents in Trial One and 64% of the respondents in Trial Two indicated the computer stays hooked up to the telephone line.

None of the respondents in Trial One and only 25% of the respondents in Trial Two indicated the computer needed to be moved.

There appear to be no problems associated with the placement of the computer as related to telephone connections.

It was thought that some respondents might have to move their computers from the classroom to the telephone in order to go on-line. The responses in Trial One leads the researcher to believe this is not really a problem. However, responses in Trial Two indicate one quarter of the respondents must go through some moving of equipment before making contact with the server.

In Trial One, 43% of the respondents, and in Trial Two, 5% of the respondents indicated they felt pressure to not make computer calls. This may be one of the more significant problems concerning the placement and use of the telephone for purposes computer telecommunications. Respondents seemed to feel computer use of the telephone was somehow discouraged by unnamed persons, practices or policies.

The response to the survey question (I had difficulty gaining access to a telephone line for PSInet.), 29% in Trial One and 19% in Trial Two, would indicate the use of the telephone was not a serious problem. This response seems to be consistent with the responses to the previous question and may be a reflection of the same problem.

The responses to the question (Policies or existing practices make it difficult to have the needed access to the telephone.), were 0% in Trial One and 5% in Trial Two.

These responses tend to negate the response to the previous questions. These responses indicate these respondents did not feel limited by any kind of written policy or existing practice. Pressure from the respondent's peers may have been the source of the pressure to not use the telephone for computer calls

Existing telephone lines seemed to be adequate for the use of PSInet. However, there was at least one school that had a noisy telephone line that interfered with the use of PSInet. After this problem was remedied the calls made by the computer were more satisfactory.

The responses to questions about the availability of the telephone indicated availability was a problem for about 25% of the respondents. Seventy percent of the respondents in Trial One were in agreement and 82% of the respondents in Trial Two were in agreement with the question (The telephone is readily available when it is needed.).

The cost of making calls did not appear to be a problem to the respondents. Only one of the respondents in Trial One agreed the cost of making calls was a problem. None of the respondents in Trial Two considered this to be a problem.

Nearly 50% of the respondents in Trial One and slightly more than 10% of the respondents in Trial Two stated they had no difficulty with access to, or the use of the telephone. There were 40% in Trial One and 68% in Trial Two who did not answer the question (Please describe any

difficulties experienced with access to, or use of the telephone.). If there were significant problems with access to, or use of the telephone, it seems these problems would be foremost in the minds of the respondents and would have been reported.

Twenty-five percent of the respondents in Trial One and 35% of the respondents in Trial Two indicated they had the time to work with PSInet while at school. Apparently the respondents feel there is not enough time to work with PSInet while at school. Respondents did indicate they have time outside the teaching time frame. The responses to the question (I have time to use computer teleconferencing during my off hours (either at school or home.)), were 78% in agreement in Trial One and 70% in agreement in Trial Two.

This certainly suggests the respondents feel pressed for time during the work day and feel they have time to experiment with computer teleconferencing at home. Time considerations may be the largest obstacle in the path of computer teleconferencing in the classroom, or at least in the teaching/learning process.

The discussion question concerning time constraints, (Please describe other problems concerning time and your use of PSInet.) received a wide variety of responses. The third most common mentioned problem, was difficulty sharing the terminal with other users with 20% of the respondents in Trial One and 12% of the respondents in Trial Two mentioning this concern. The second most mentioned problem was the

non-availability of time in general, with 30% of the respondents in Trial One and 20% of the respondents in Trial Two making these comments. The most frequent response was to not answer the question. Thirty percent of the respondents in Trial One and 56% of the respondents in Trial Two failed to respond to this question. The lack of response to this question might suggest that the lack of available time while at school indicated in previous questions is not due to any specific time constraint. The perceived lack of time may be a question of time management or individual priorities.

Apparently respondents in this research were comfortable using PSInet. Only 12% of the respondents in Trial One and 13% in Trial Two indicated reluctance to use PSInet.

With 89% in Trial One and 88% in Trial Two indicating ready access, accessibility does not appear to be a problem.

Equipment availability did not seem to be a problem to the respondents. One hundred percent of the respondents in Trial One and 92% of the respondents in Trial Two agreed that availability of the equipment was not a problem.

The respondents indicated they would not use PSInet more if it were more conveniently located. In Trial One only 20% of the respondents agreed they would use PSInet more if it were more conveniently located. In Trial Two the rate of respondents in agreement was 19%. Suggesting, perhaps, that respondents might not use computer

telecommunications via PSInet to any greater extent even if it were made easier or more readily accessible to them.

The second most common response to the discussion question (Please describe the most convenient place for the PSInet workstation.) was the classroom. Thirty percent of the respondents in Trial One suggested the classroom was the most convenient place for the workstation. In Trial Two 36% of the respondents also indicated the classroom was the most convenient place for the workstation. Most frequently there were no responses to this question. Fifty percent in Trial One and 32% in Trial Two failed to respond to the question. The only other significant number of responses suggested placing the computer workstation in the library, or in the science office. Indications were student access to the workstation is important.

All of the respondents in Trial One reported they could think of ways to use computer teleconferencing in the teaching/learning process. Seventy-five percent of the respondents in Trial Two agreed.

Only 56% of the respondents in Trial One and 35% of the respondents in Trial Two agreed they often used PSInet to contact outside resources. A majority of the respondents in both Trial One and in Trial Two allowed students to use PSInet to make contact with outside resources. Seventy percent of the respondents in Trial One and 62% of the respondents in Trial Two let students contact outside sources. Respondents seemed willing to allow student use of

computer teleconferencing. However, respondents apparently were more reluctant to use teleconferencing for themselves.

The majority of the respondents, 70% in Trial One, encouraged students to use teleconferencing by giving a specific assignment. Only 18% of the respondents in Trial Two responded in agreement. The respondents in Trial Two were not all teachers, and had not been given any specific directions about how to use PSInet. The apparent lack of specific assignments provided to students in this second group may be insignificant.

Summary of Research Question Number Seven

Respondents in Trial One indicated pressure to not make computer telephone calls. They did not report any policy or existing practice that made it difficult to have the needed access to the telephone. It is possible that pressure from their peers to not use the telephone for computer calls may have made them reluctant.

Time always seems to be in short supply. Only 25% of the respondents in Trial One and 35% in Trial Two indicated having time to use PSInet while at school. Respondents in both Trials indicated they had more time for teleconferencing while not at work.

The answers to the question about using PSInet more if it were more conveniently located received about the same percentages in both Trials, 20% in Trial One and 19% in Trial Two. This may suggest some of the respondents may have been using "lack of time" as a reason for not using

PSInet. Reluctance to use PSInet was expressed by 12% of the respondents in Trial One and 13% in Trial Two. Some respondents for what ever reason, were hesitant to use PSInet.

Chapter 6

CONCLUSIONS

Summary of Research

The group of educators investigated recognized that PSInet offered an opportunity for students to use computer telecommunications and were positive about its educational benefits for students. They encouraged students to use PSInet. Instructors involved student in science projects that used teleconferencing for sharing data and information between geographically separated schools. The educators used teleconferencing to collect, tabulate and redistribute data, setting up large data bases for student use.

Computer teleconferencing using PSInet enhanced educator communication with colleagues and reportedly increased their sense of "belonging" to the teaching profession. Students were reported as eager to use computer teleconferencing to communicate with other students geographically remote to themselves. Teachers reported the students use of PSInet as educationally beneficial to the students involved.

PSInet is easy to use and is an important resource of information sharing for students as well as professional educators.

While educators indicate educational value in computer teleconferencing for their students, they do not appear to

see the same benefits for themselves. These educators emphasized student use of PSInet and student access to the computer. However, communication among educators and between educators and other geographically distant professionals appeared to be poorly utilized.

A problem mentioned by the educators responding to the survey was training. The educators expressed feelings of being unprepared and having difficulty with equipment. References to time management and not having time to familiarize themselves with equipment were other problems mentioned.

A serious concern are the apparent difficulties involved in merging the technology of computer teleconferencing with the teaching/learning process. The educators responding recognized educational benefits to teleconferencing, but were only beginning to understand applications to the teaching/learning process. Having the time to study and learn how to apply PSInet to the teaching/learning process and how to adjust the teaching/learning process to make the best use of computer telecommunications were concerns expressed by the educators, many indicating not having time to use PSInet during work hours.

Suggestions for Further Study

The respondents to the survey reported several problems related to not having the time required to implement computer teleconferencing into the curriculum. They

indicated not having time to learn to use PSInet, not having the time to teach other colleagues how to use it, and not having the time to investigate how to apply it to the teaching/learning process. An analysis of educator time constraints relating to the use of PSInet could be beneficial to the teaching/learning process.

There were several student science projects that involved the sharing and transferring of data among schools. Each of these projects required the adaptation of the teaching/learning process to accommodate the use of the technology. A study of the types of modifications made to the teaching/learning process that successfully incorporate teleconferencing might provide clues leading to improved teaching/learning.

Some of the respondents reported a lack of responses to their papers placed on the network. Some of this lack of response was due to the small number of individuals on the system at that time. Not receiving any acknowledgment to a paper presented to a conference may discourage any further use of conference or network. If some of the conferences available had moderators that welcomed new members and facilitated discussion, more individuals may be inclined to become active participants. A comparison of moderated to non-moderated conference might provide insight into the support educators need when applying teleconferencing to the teaching/learning process.

Forty percent of the teachers that were provided the computers, software and/or training either failed to use PSInet or to failed report on its use. An analysis of the reasons for this perceived reluctance might improve the percentage of educators applying the technology to the teaching/learning process.

Implement a needs assessment of teachers who are learning to use computer teleconferencing in the teaching/learning process. Provide training based on those perceived needs of the teacher.

Suggestions for Improving the Applicability of PSInet

Conferences could have moderators dedicated to maintaining interaction among users. This person could welcome new users, providing some initial response to the new user. Moderators could provide discourse intended to keep the discussion and user interaction flowing. A person in the position of moderator would need to be alert to the needs of members of the conference.

A group of educators could develop, initiate and moderate some of the larger collaborative projects on the network. Individual teachers may be reluctant to place a large project on the network. Possibly reluctant because of the effort required to get other teachers involved. If large projects were already "in place" and teachers had only to join the conference, they might be more likely to take part, than if they had to develop, initiate and moderate the project for themselves.

PSInet as a Teaching/learning Tool

Asynchronous teleconferencing using PSInet offers several powerful tools to educators. The ability to communicate with other professionals around the world opens a window of communications to the office or classroom through which knowledge not available in books can easily pass.

Through PSInet's conferencing feature the opportunities for collegial exchange is nearly limitless. Conferences on the network on pertinent topics offer avenues for continuous communication with professionals dealing with common problems or situations. Conferencing through PSInet creates opportunities to discuss issues and ideas with many peers and professionals in education and other fields.

The messaging feature provides for private communication with anyone on the network. A one page letter can be sent to any workstation on the network almost instantaneously at minimal expense. If a long distance call is involved in sending a message to a work station on another server, the costs are minimal. To send a single page message, the connection time on telephone lines is usually less than one minute. Many of the Iowa AEA's now have toll free numbers to the area server. Using the toll free number to the area server and the Internet Gateway at Drake University allows messages to go on Internet. Messages sent to PSInet work stations come through the Internet Gateway to a registered CSSS or state server and

are held until the work station contacts the server, then down loaded to the work station. Most communication using PSInet is less expensive and faster than other, more traditional methods.

Start up and operation costs are minimal. PSInet is now available for operation on the Apple's Macintosh as well as MS DOS machines. Cost of the software is reasonably inexpensive, presently priced around \$100. Those persons or institutions possessing Macintosh or MS DOS machines, wanting to become active on PSInet, can do so basically for the cost of a modem and the PSInet software. Most existing telephone lines are adequate for PSInet.

The PSInet software also files, on command, any communication received, saving them for future reference. This feature provides the user with a record of communications sent or received.

The teaching/learning process now makes use of PSInet in collaborative student projects that can involve students almost any where in the world. Projects that require sharing data gathered from several different remote places being one example. Student surveys, and issues research using PSInet, allow students to communicate freely with resources beyond the confines of the classroom.

Students communicating with other students, even when not a school project, provides the opportunity for insight into other cultures and communities. Students communicating with each other by writing to each other are learning

communication skills by doing. With a little structure, provided by the instructor, student communication projects can be excellent learning strategies.

There are adversities to using PSInet in the teaching/learning process. Most processes that require change in human behavior are difficult to initiate and maintain. PSInet is not an exception.

Today's educators are a busy group of people. Like other professionals their work day is already filled to overflowing. Starting another project will take time away from the existing work schedule. Time to set up the hardware and programs. Time to familiarize the users with the operation of the computer and PSInet. Time to plan lessons and projects for the students to use, and time for actual use.

Adapting PSInet to classroom use will require more than the instructors time. Some instructors will have to adapt their "teaching style" to include student participation, interaction, and collaboration. PSInet is a communications program in the broadest sense, and seems to be most easily applied to teaching/learning strategies that utilize communication and sharing information.

Asynchronous teleconferencing with PSInet adds another tool to the teaching/learning arsenal.

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Appendix A
Demographic Information

Demographics Questionnaire

First name and initial: _____ Age: ___ Gender: ___

Place an "x" in the appropriate boxes to answer the following questions.

1. Years teaching experience? 0-3: ___ 4-7: ___ 8-12: ___ 12-16: ___
16+: ___
2. Presently teaching? Elementary: ___ Middle School: ___
High School: ___ Mathematics: ___ Science: ___
3. Please list courses: _____

4. Personal perception of computer expertise? Novice: ___
Intermediate: ___ Proficient: ___
5. In which area do you have experience?
Word processing: ___ Programing: ___ Communications: ___
Games: ___ Databases: ___
6. School size? Number of students: _____
7. District size? Number of students: _____
8. How long have you been using PSInet? _____ months.

Demographics Data

Table A-1 shows the percentage of respondents in each age group involved in Trial One and Trial Two.

Table A-1

Age of Respondents

Age in years	Percent of respondents	
	Trial One %	Trial Two %
20-29	0	16
30-39	0	20
40-49	70	32
50-59	30	28
60 +	0	0

Table A-2 shows the percentage of respondents grouped by gender for Trial One and Trial Two.

Table A-2

Gender of Respondents.

Gender	Percentage of respondents	
	Trial One	Trial Two
	%	%
Males	78	60
Females	22	40

Table A-3 shows the percentage of respondents grouped by years of teaching experience for Trial One and Trial Two.

Table A-3

Teaching Experience

Years experience	Percentage of respondents	
	Trial One	Trial Two
	%	%
0-3 yrs	0	4
4-8 yrs	0	24
9-12 yrs	0	8
13-16 yrs	10	8
16 + yrs	90	56

Table A-4 shows the percentage of respondents presently working in Elementary School, Middle School (Junior High School), and Senior High School for Trial One and Trial Two.

Table A-4

Level of Experience

Teaching level	Percentage of respondents	
	Trial One	Trial Two
	%	%
Elementary School	10	24
Middle School	55	16
High School	36	56

Table A-5 shows the percentage of respondents presently teaching Mathematics, Science or other areas in Trial One and Trial Two.

Table A-5

Teaching Area

Teaching Area	Percentage of Respondents	
	Trial One	Trial Two
	%	%
Science	90	48
Mathematics	10	20
Other	0	32

Table A-6 shows respondents self perception of computer experience for Trial One and Trial Two.

Table A-6

Computer Experience

Computer Experience	Percentage of Respondents	
	Trial One	Trial Two
	%	%
Novice	40	8
Intermediate	50	44
Proficient	10	44

Table A-7 shows types of existing computer experience possessed by respondents in Trial One and Trial Two.

Table A-7

Computer Application Experience

Computer application	Percentage of respondents experienced with application	
	Trial One	Trial Two
	%	%
Word Processing	90	84
Programming	20	64
Communications	40	68
Games	30	48
Data Bases	30	60

Table A-8 shows the size of school the respondents were working in during Trial One and Trial Two.

Table A-8

School Size

School size (No. of Students)	Percentage of Respondents	
	Trial One	Trial Two
	%	%
0-99	0	4
100-249	20	16
250-499	30	20
500-999	50	32
1000 +	0	16

Table A-9 reports the size of school district the respondents were working in during Trial One and Trial Two.

Table A-9

Size of School District

Size of school district (No. of students)	Percentage of respondents	
	Trial One %	Trial Two %
0-999	0	40
1000-4999	60	24
5000-9999	0	24
10,000-19,999	10	0
20,000 +	20	0

Table A-10 reports educator experience with PSInet for Trial One and Trial Two.

Table A-10

PSInet Experience

PSInet experience No. of months	Percentage of respondents	
	Trial One %	Trial Two %
1-6	100	56
7-12	0	24
13-18	0	12
19-24	0	8
25 +	0	16

Appendix B
Tabulated Data

Table B-1 reports the results of "Likert-Type" questions 1 through 6 for Trial One and Trial Two.

Table B-1

Data Collected from Survey Questions 1 through 6 for
Trial One and Trial Two

Question	Response Number						nr	Ave. Res.	Percent Agree
	4	3	2	1	0				
1.									
	Trial 1	6	2	1	0	1	0	3.55	89
	Trial 2	9	6	5	1	3	0	3.10	71
2.									
	Trial 1	4	5	0	1	3	0	3.44	100
	Trial 2	4	8	4	0	8	0	3.00	75
3.									
	Trial 1	3	3	3	1	0	0	2.80	60
	Trial 2	4	8	5	1	6	0	2.80	67
4.									
	Trial 1	4	3	3	0	0	0	3.10	70
	Trial 2	2	7	4	2	8	1	2.60	60

table continues

Question	Response Number						nr	Ave. Res.	Percent Agree
	4	3	2	1	0				
5.									
Trial 1	5	3	1	0	1	0	3.44	89	
Trial 2	5	5	5	3	6	0	2.67	56	
6.									
Trial 1	5	3	1	0	1	0	3.44	89	
Trial 2	6	5	2	1	10	0	3.14	79	

Table B-2 reports the results of "Likert-Type" questions 11 through 15 for Trial One and Trial Two.

Table B-2

Data Collected from Survey Questions Number
11 through 15

Question	Response Number					nr	Ave. Res.	Percent Agree
	4	3	2	1	0			
11.								
Trial 1	4	1	2	0	2	1	3.30	100
Trial 2	5	10	1	2	2	5	3.00	83
12.								
Trial 1	5	3	1	0	0	1	3.40	89
Trial 2	9	7	1	2	2	4	3.21	61
13.								
Trial 1	5	0	2	2	0	1	2.90	56
Trial 2	5	6	3	4	2	5	2.67	61
14.								
Trial 1	0	2	3	3	1	1	1.90	25
Trial 2	1	3	6	5	5	5	2.00	27
15.								
Trial 1	4	4	0	0	1	1	3.50	100
Trial 2	5	11	2	1	1	0	3.45	84

Table B-3 reports the results of "Likert-Type" questions 16 through 18 for Trial One and Trial Two.

Table B-3

Data Collected from Survey Questions

Number 16 through 18

Question	Response Number					nr	Ave.	Percent
	4	3	2	1	0		Res.	Agree
16.								
Trial One	4	3	1	1	0	1	3.10	78
Trial Two	5	11	2	1	1	5	3.00	88
17.								
Trial One	4	3	2	0	0	1	3.20	78
Trial Two	7	4	5	2	3	4	2.89	61
18.								
Trial One	3	5	1	0	0	1	3.10	89
Trial Two	5	8	3	3	2	4	2.79	68

Table B-4 reports the results of "Likert-Type" questions 19 through 37 for Trial One and Trial Two.

Table B-4

Data Collected from Survey QuestionsNumber 19 through 37

Question	Response Number						Ave. Res.	Percent Agree
	4	3	2	1	0	nr		
19.								
Trial One	4	4	0	1	1	0	3.2	80
Trial Two	9	12	2	0	1	1	3.30	91
20.								
Trial One	2	4	1	1	2	0	2.9	75
Trial Two	6	7	4	1	6	1	3.00	72
21.								
Trial One	0	4	0	1	5	0	2.6	80
Trial Two	5	9	0	1	8	1	2.94	69
22.								
Trial One	0	1	0	1	8	0	2.0	80
Trial Two	5	9	0	1	2	1	3.28	93
23.								
Trial One	0	8	1	1	0	0	2.7	80
Trial Two	3	11	7	1	2	1	2.73	64

table continues

Question	Response Number						Ave.	Percent
	4	3	2	1	0	nr	Res.	Agree
24.								
Trial One	2	3	1	2	2	0	2.6	62
Trial Two	2	11	8	0	2	2	2.71	62
25.								
Trial One	6	3	0	1	0	0	3.4	90
Trial Two	11	6	3	0	4	1	3.40	85
26.								
Trial One	0	3	1	2	4	0	2.2	50
Trial Two	5	2	1	2	9	2	3.00	78
27.								
Trial One	2	2	1	1	4	0	2.8	67
Trial Two	1	2	3	3	13	2	2.11	33
28.								
Trial One	0	3	1	1	5	0	2.4	60
Trial Two	4	5	1	2	12	1	2.94	75
29.								
Trial One	2	1	1	1	5	0	2.8	60
Trial Two	3	5	3	3	10	1	2.57	57
30.								
Trial One	3	3	1	0	3	0	3.3	86
Trial Two	11	5	1	1	6	1	3.44	89

tables continues

Question	Response Number						Ave.	Percent
	4	3	2	1	0	nr	Res.	Agree
31.								
Trial One	6	2	0	0	2	0	3.8	100
Trial Two	8	8	1	2	5	1	3.16	84
32.								
Trial One	5	4	0	0	1	0	3.5	100
Trial Two	10	7	3	1	3	1	3.24	81
33.								
Trial One	3	5	0	0	2	0	3.4	100
Trial Two	6	8	3	2	5	1	2.95	74
34.								
Trial One	2	4	1	0	3	0	3.1	86
Trial Two	4	8	2	3	7	1	2.76	71
35.								
Trial One	3	6	0	0	1	0	3.3	100
Trial Two	12	8	3	0	1	1	3.39	87
36.								
Trial One	2	2	0	1	5	0	3.0	80
Trial Two	2	7	3	1	10	1	3.00	69
37.								
Trial One	2	5	0	0	3	0	3.3	100
Trial Two	3	11	2	1	6	1	2.94	82

Table B-5 reports the results of "Likert-Type" questions 38 through 39 for Trial One and Trial Two.

Table B-5

Data Collected from Survey Questions

Number 38 through 39

Question	Response Number						Ave.	Percent
	4	3	2	1	0	nr	Res.	Agree
38.								
Trial One	2	6	0	1	1	0	3.40	80
Trial Two	10	6	3	3	2	1	3.05	73
39.								
Trial One	0	6	3	1	0	0	2.50	60
Trial Two	8	8	2	5	1	1	2.65	70

Table B-6 reports the results of "Likert-Type" questions 41 through 46 for Trial One and Trial Two.

Table B-6

Data Collected from Survey Questions
Number 41 through 46

Question	Response Number						Ave. Res.	Percent Agree
	4	3	2	1	0	nr		
41.								
Trial One	3	5	1	1	0	0	3.00	80
Trial Two	7	10	1	4	2	1	2.90	77
42.								
Trial One	3	3	0	0	4	0	3.50	100
Trial Two	9	8	1	1	5	1	3.32	89
43.								
Trial One	4	3	3	0	0	0	3.10	70
Trial Two	5	12	3	2	2	1	2.91	77
44.								
Trial One	2	4	2	1	1	0	2.80	67
Trial Two	5	12	3	2	2	1	2.91	77
45.								
Trial One	5	4	0	1	0	0	3.30	90
Trial Two	7	13	1	1	2	1	3.18	91
46.								
Trial One	2	5	3	0	0	0	2.9	70
Trial Two	4	9	6	3	2	1	2.64	59

Table B-7 reports the results of "Likert-Type" questions 48 through 54 for Trial One and Trial Two.

Table B-7

Data Collected from Survey QuestionsNumber 48 through 54

Question	Response Number						Ave. Res.	Percent Agree
	4	3	2	1	0	nr		
48.								
Trial One	5	4	1	0	0	0	3.30	90
Trial Two	9	7	2	3	3	1	3.05	76
49.	Summary of responses can be found on page 65							
50.								
Trial One	5	4	0	1	0	0	3.30	90
Trial Two	9	7	5	2	1	1	3.00	70
51.								
Trial One	5	3	1	0	0	1	3.40	89
Trial Two	10	4	7	2	2	1	3.05	64
52.								
Trial One	0	0	2	4	4	0	1.30	0
Trial Two	3	2	6	9	3	2	2.00	25

table continues

Question	Response Number						Ave. Res.	Percent Agree
	4	3	2	1	0	nr		
53.								
Trial One	2	1	3	1	3	0	2.60	43
Trial Two	1	0	6	12	4	2	1.47	5
54.								
Trial One	2	0	2	3	3	0	2.10	29
Trial Two	2	2	5	12	4	0	1.71	19

Table B-8 reports the responses to the "Likert-Type" questions 55 through 61 for Trial One and Trial Two.

Table B-8

Data Collected from Survey Questions
number 55 through 61

Question	Response Number						Ave. Res.	Percent Agree
	4	3	2	1	0	nr		
55.								
Trial One	0	0	2	4	3	1	1.30	0
Trial Two	0	1	7	12	4	1	1.45	5
56.								
Trial One	3	5	0	2	0	0	2.90	80
Trial Two	9	8	2	4	1	1	2.96	74

table continues

Question	Response Number						Ave. Res.	Percent Agree
	4	3	2	1	0	nr		
57.								
Trial One	4	3	2	1	0	0	3.00	70
Trial Two	9	9	2	2	2	1	3.14	82
58.								
Trial One	1	0	3	2	4	0	2.00	17
Trial Two	0	0	8	10	5	2	1.44	0
59. Summary of responses can be found on page 67.								
60.								
Trial One	1	1	4	2	1	1	2.10	25
Trial Two	3	5	7	8	1	1	2.13	35
61.								
Trial One	3	4	2	0	0	1	3.10	78
Trial Two	6	10	4	3	1	1	2.83	70

Table B-9 reports the responses to "Likert-Type" questions 63 through 67 for Trial One and Trial Two.

Table B-9

Data Collected from QuestionsNumber 63 through 67

Question	Response Number						nr	Ave. Res.	Percent Agree
	4	3	2	1	0				
63.									
Trial One	0	1	3	4	1	1	1.60	12	
Trial Two	2	1	8	12	1	1	1.70	13	
64.									
Trial One	3	5	1	0	0	1	3.20	89	
Trial Two	13	8	1	2	0	1	3.30	88	
65.	Omitted from the survey								
66.									
Trial One	3	6	0	0	0	1	3.30	100	
Trial Two	14	8	2	0	0	1	3.50	92	
67.									
Trial One	0	1	3	1	5	0	2.00	20	
Trial Two	2	2	9	8	3	1	1.90	19	

Table B-10 reports responses to "Likert-Type" questions 69 through 72 for Trial One and Trial Two.

Table B-10

Data Collected from Survey Questions

Number 69 through 72

Question	Response Number						Ave. Res.	Percent Agree
	4	3	2	1	0	nr		
69.								
Trial One	5	5	0	0	0	0	3.50	100
Trial Two	10	7	4	2	1	1	3.10	74
70.								
Trial One	4	1	3	1	1	0	2.60	56
Trial Two	3	5	9	6	1	1	2.20	35
71.								
Trial One	4	3	1	2	0	0	2.90	70
Trial Two	4	9	2	6	3	1	2.50	62
72.								
Trial One	3	4	2	1	0	0	2.90	70
Trial Two	2	2	9	9	2	1	1.86	18